LANGUAGE SOLUTIONS

English for Oil and Gas

foundation course

A dedicated language course for the Petrochemical Industry

By Peter Levrai

LANGUAGE SOLUTIONS

English for Oil and Gas

Foundation Course

This course is designed for oil technicians undergoing training in English and is uniquely based on authentic technical training material. The aim of the course is to give you all the language functions and structures you need to work effectively and safely in an English speaking petrochemical environment.

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English for Oil and Gas

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Grammar	Present simple: 'to be' Present simple: negatives and questions Parts of speech Question forms	Countable/uncountable nouns How much/how many	Present simple passive 'Can' expressing ability
Vocabulary Areas	Identifying Equipment The English alphabet Opposites Shapes and shape adjectives Colours Oil industry Jobs	Large numbers Decimal numbers Fractions Percentages Ordinal numbers Units of measurement	Prepositions of place Prepositions of movement
Functional Language	Training Questions Basic personal questions Social English: meeting and introducing	Ranking items Measuring Describing area Describing mass Telling the Time	Describe the use of workshop tools Describe location Describe equipment
Technical Language	Training Language	Calculations Measuring pipelines Measuring pressure	Workshop tools and usage Measuring devices: level, pressure and temperature Pumps

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Course Syllabus – Module 2

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Grammar	Imperatives Present continuous	Zero conditional	Past simple Past continuous
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Functional Language	Giving warnings Identifying dangerous situations Hand signals	Describing diagrams Describing systems	Word formation Identifying hazards Risk assessment Reporting Incidents
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Course Syllabus – Module 3

	Unit 7 **Making Comparisons**	**Unit 8** **Describing Processes**	**Unit 9** **Expressing Possibility**
	"An electric drill is much more powerful and …"	*"How many steps are there in your description?"*	*"First, Tom ought to…"*
Grammar	Comparatives Superlatives as … as	Present Perfect – past experience Present Perfect- unfinished past	Modal verbs: obligation advice necessity Passive modal verbs Second conditional
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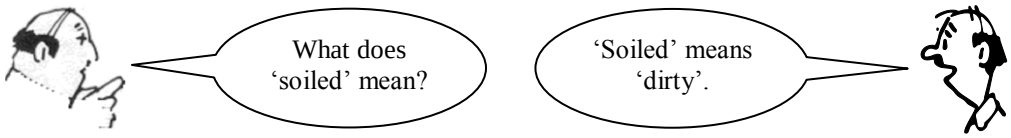
Functional Language	Describing objects and materials Expressing similarities and differences	Sequencing events Describing processes Describing past experiences Describing ongoing situations	Giving advice Expressing prohibition Expressing possibility
Technical Language	States of matter Methods of oil recovery Oil refining and oil products Types of engine Qualities of metals Temperature devices Pigging	Safe lifting procedures Lockouts and tagouts Thermostats Oil separation techniques	Troubleshooting and fault finding Driving safety Tool Box Talks Slip hazards

Unit 1

Training Skills



Training Skills - Unit Map

The aim of this unit is to introduce the language of training and give an introduction to social English, the English you will use to communicate with colleagues. By the end of this unit you will be able to:

- use the language of the training room
- introduce yourself and ask questions about personal information
- identify basic objects
- identify and describe shapes
- identify parts of speech

Complete the tables when you finish the unit.

I can	Difficult	Okay	Easy
ask training questions			
say the alphabet			
identify basic objects			
identify shapes and use shape adjectives			
give person information			
explain some oil industry jobs			
identify colours			

I understand	Difficult	Okay	Easy
the unit grammar: use 'to be'			
use present simple			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Personal Information

Read the text and look at the verbs in **bold**. Complete the table. (📼 1.1)

My name **is** Alan. I **am** 46 years old. I **am** a technical trainer. I **am** married. My wife's name **is** Anna. We have two children. My son **is** 22 and my daughter **is** 19. They **are students.** I **am** from Scotland. Anna **is not** from Scotland. She **is** from England. **Are** you married?

	Positive	**Negative**	**Question**
I	……	……	……
He/She/It	……	……	……
You/We/They	……	……	……

Complete the text below. (📼 1.2)

My name …… Bob. I …… 32 years old. I …… married. My wife's name …… Helen. We have a son. His name …… Mike. He is 9 years old. I …… a technical trainer, I …… a technical trainee.

Now, write a paragraph about you and your family. Tell a partner.

How Are You?

There are **five** mistakes in the dialogue below. Correct the mistakes and practise the conversation with in a group. Bob introduces Mike to Dave at a party. (🔊 1.3)

Bob: Hi, Dave.

Dave: Good night Bob. How are you?

Bob: Thanks. And you?

Dave: I very well, thanks.

Bob: Do you know Mike?

Dave: No, I do.

Bob: Dave, this is Mike. Mike, this is Dave.

Mike: Please to meet you.

Dave: Pleased to meet you too.

The expressions in the box are all possible answers to the question: *How are you?* Put them in the correct column.

Excellent	Not so bad	Alright	Can't complain	Fine
Okay	Very well	Awful	Terrible	Wonderful
So-so	Not so good	50-50	Marvellous	Surviving

Training Skills

If you don't understand something in your training - ask.

What do you say if: (🔊 1.4)

a) your trainer speaks too quickly.
please / could / speak / you / slowly / more
……..

b) your trainer is difficult to understand
clearly / speak / more / please / you / could
……..

c) your trainer speaks too quietly.
loudly / speak / please / more / you / could
……..

d) you did not hear what your trainer said.
repeat / could / you / please / that
……..

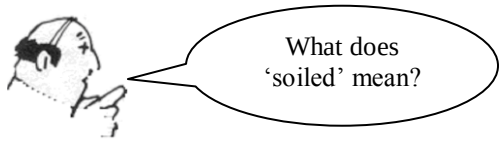
e) you did not understand what your trainer said.
understand / sorry / don't / I
……..

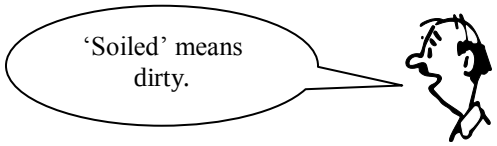
f) you do not understand a word your trainer said.
mean / does / what / 'extinguish'
……..

g) you want to know the spelling of a word.
'extinguish' / spell / you / do / how
……..

g) you do not know something
know / sorry / I / don't
……..

Check the meaning of the following words with a partner





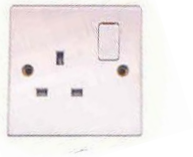
a) compress
b) flame
c) monitor
d) periodic
e) flexible
f) risk
g) inhale
h) ring
l) expand

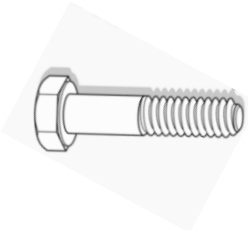
Identifying Equipment

Work with a partner and identify the equipment and devices below.

What is that?

That is a chainsaw





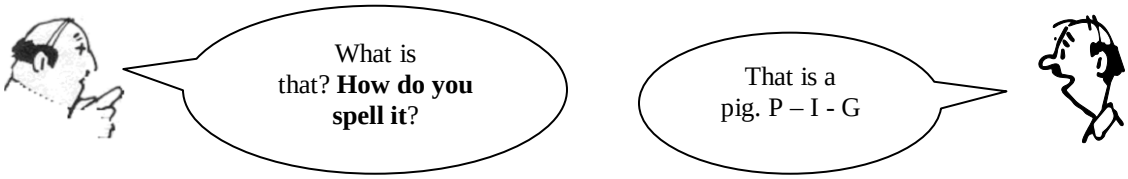
The Alphabet

Letters in the English alphabet use certain sounds. Look at the table below and group the letters in the appropriate phonetic column.

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Play /eɪ/	**See /i:/**	**Left /e/**	**Eye /aɪ/**	**Know /əʊ/**	**Are /a:/**	**You /u:/**

Now, practise spelling the equipment on the previous page with a partner.



Some of the words below contain spelling mistakes. Rewrite the words with mistakes. Check your answers with a partner.

1) instruement - ……
2) platform - ……
3) beautiful - ……
4) fourteen - ……
5) fourty - ……
6) daughter - ……
7) objecktive - ……
8) question - ……
9) mechanic - ……
10) traine - ……

Building English

Every word is a part of speech and has a special name.

Nouns = names **Verbs** = actions **Adjectives** = describing words

Put the words in the box in the correct column

exact	equipment	trainee	learn	difficult
consider	tired	examine	job	course
safe	pipeline	initial	calculate	remember

Noun	Verb	Adjective
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

We also use:
Articles: a, an, the
Prepositions: in, on, at, to, from, …
Conjunctions: and, but, so, …
Adverbs: well, quickly, almost, …

A standard sentence in English has the following form:

Bob		likes		his job
subject	+	**verb**	+	**object**

Ω

Adjectives usually come before the noun:

a complex machine	a difficult question
an interesting problem	an exact figure

Look at the sentences *in italics* on this page and identify the parts of speech. Check your ideas with a partner.

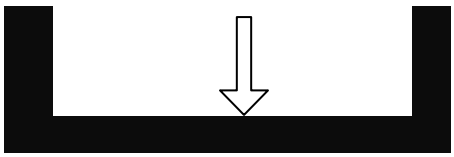
Opposites

Many adjectives and verbs have opposites. Match the words in the box with the pictures

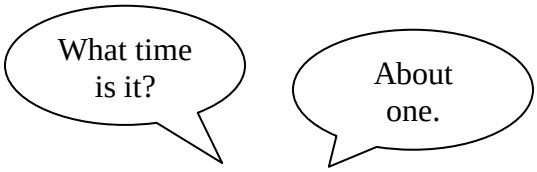
smooth	accurate	shallow	approximate	contract
deep	flexible	expand	rigid	rough

1) ……

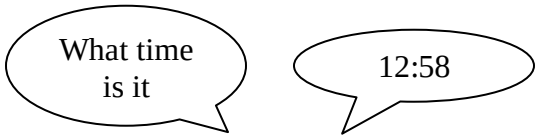
2) ……



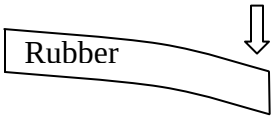
3) ……



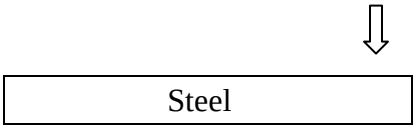
4) ……



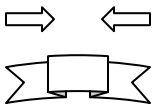
5) ……



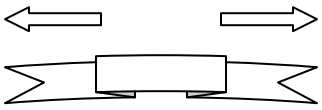
6) ……



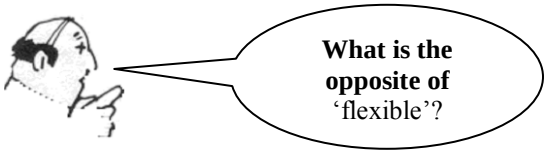
7) ……



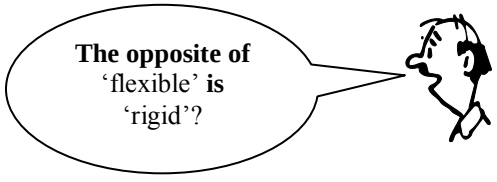
8) ……



9) ……



10) ……



Choose the correct word to complete the sentences.

1)	Iron is a …… material.	rigid / flexible
2)	When you heat metal it ……	expands / contracts
3)	It is important to be …… when measuring.	approximate / accurate
4)	A 20 meter well is ……	deep / shallow
5)	Glass is ……	smooth / rough

Now, write five example sentences using the words you did not use.

1) ……
2) ……
3) ……
4) ……
5) ……

Test your partner: Do they know all the opposites? Work together and complete the table.

a) good	……	b) complex	……
c) fast	……	d) dry	……
e) long	……	f) dirty	……
g) happy	……	h) heavy	……
i) early	……	j) dark	……
k) careful	……	l) dangerous	……
m) hot	……	n) loud	……
o) cool	……	p) wrong	……
q) big	……	r) flammable	……
s) difficult	……	t) fragile	……

Training Language

Find the words in the word search below

1. aim
2. provide
3. practical
4. theoretical
5. principle
6. device
7. associated
8. identify
9. consider
10. objective
11. knowledge
12. principal
13. delegate
14. definition
15. instrumentation

A	R	T	D	S	P	W	C	V	G	L	K
M	T	H	E	O	R	E	T	I	C	A	L
I	Y	E	G	B	I	K	L	D	Q	D	W
N	Z	S	E	A	N	E	R	E	U	E	I
S	P	R	I	N	C	I	P	L	E	F	D
T	R	A	I	D	I	B	T	E	H	I	E
R	A	L	Y	F	P	N	W	G	J	N	N
U	C	X	B	H	A	I	M	A	E	T	T
M	T	P	P	A	L	W	B	T	N	I	I
E	I	R	P	W	E	N	T	E	M	O	F
N	C	O	N	S	I	D	E	R	M	N	Y
T	A	V	C	E	A	I	N	D	B	D	C
A	L	I	S	L	R	N	H	P	Q	E	F
T	B	D	O	B	J	E	C	T	I	V	E
I	D	E	S	B	N	Z	T	S	L	I	R
O	K	N	O	W	L	E	D	G	E	C	R
N	Z	Q	X	N	A	H	L	L	Y	E	N
N	S	A	S	S	O	C	I	A	T	E	D

Now, match the definitions to the words above.

a. A synonym for ‘think’ - ……

b. Someone who goes to a course - ……

c. A synonym for ‘give’ - ……

d. Two words which mean ‘machine’ or ‘equipment’ - …… and ……

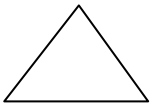
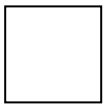
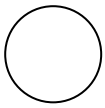
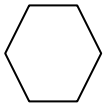
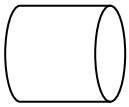
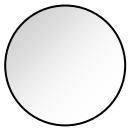
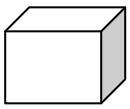
e. Two synonyms for ‘target’ - …… and ……

f. An explanation of the word is a - ……

Choose the correct word to complete the text below. (🔊 1.5)

Bob is a mechanical engineer. He finished university in the summer but he doesn’t have a job. He has a *theoretical / objective* understanding of mechanics and he can *consider / identify* all the *instrumentation / device* and equipment used in mechanical engineering but he has very little *principle / practical* experience.

Shapes and sizes

Shape	Noun	Adjective
	……	……
	……	……
	……	……
	……	……
	……	……
	……	……
	……	……
	……	……

How many things can you see in the room that are:

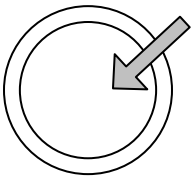
1. circular? ……..
2. triangular? ……..
3. rectangular? ……..
4. square? ……..

Shape Adjectives

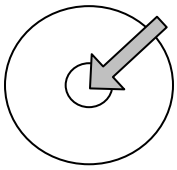
Write the opposites

Big	**……**
wide	……
deep	……
long	……
high	……
thick	……

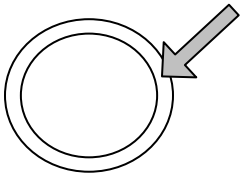
Use the adjectives and the nouns at the bottom of the page to describe the pictures



1) ……

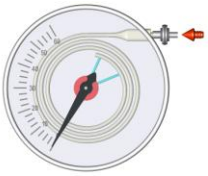


2) ……

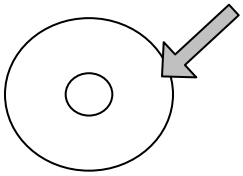


3) ……

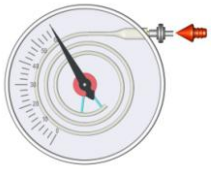
4) ……



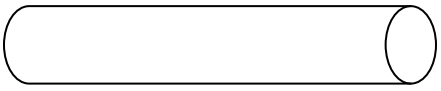
5) ……



6) ……



7) ……

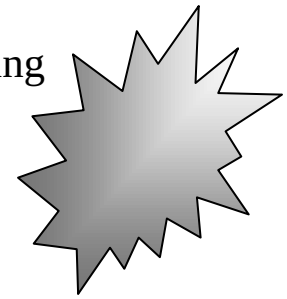


8) ……

explosion pipe hole pressure ring

9) ……

10) ……



Colours

Solve the anagrams to identify the colours.

a) edr	.....	b) theiw	.....
c) kaclb	.....	d) rpluep	.....
e) genre	.....	f) nrbow	.....
g) weylol	.....	h) kipn	.....
i) ubel	.....	j) yagr	.....

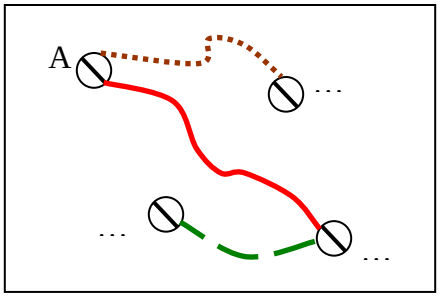
Work with a partner to complete the lists as quickly as possible.

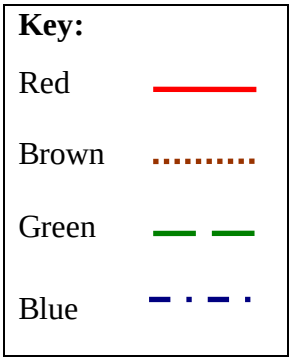
Name 10 things that are **naturally** …

… red	… blue	… yellow	… green
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Use the key to complete the sentences and the diagram.

- The red wire connects terminal A to terminal B.
- The brown wire connects terminal A to terminal ….
- The ……. wire connects terminal B to terminal D.
- The blue wire connects terminal C to terminal D.





What is the Question?

Write the questions for the following answers and then practise with a partner. (🎧 1.6)

…….
……..?

My name is Bob.

…….
……..?

I'm 32 years old.

…….
……..?

Yes, I'm married.

…….
……..?

Her name is Helen.

…….
……..?

Yes, we have two children.

…….
……..?

Paul and Emma.

…….
……..?

I live in Aberdeen.

…….
……..?

I'm a trainee operator.

…….
……..?

I'm very well, thanks.

Complete the table.

Subject	Possessive adjective
I	……
You	…*Your*…
He	……
She	……
It	……
We	……
They	……
You	…….

Write the correct form of the verbs.

	be	have	like	work
I	……	……	……	……
You	……	……	……	……
He/She/It	……	……	……	……
We/They/You	……	……	……	……

Now, use your partner's answers from the previous exercise and write a paragraph about him / her.

……

……

……

……

……

Tell the group about you and your partner.

Our names are Bob and Alan.
I am 32 and he is 46…

Negatives and Questions

'Do' is an auxiliary verb – it is used to help the main verb of a sentence in negative sentences and questions.

- I like my job
- I **don't** like my job
- **Do** I like my job?

- She like**s** her job.
- She do**es**n't like her job.
- Do**es** she like her job?

Complete the following sentences using the verb given at the end

1) 3.5 multiplied by 7 …*equals*… 23.5. (equal)

…… 3.5 multiplied by 7 …… 24.5?

3.5 multiplied by 7 …… 24.5.

2) …… a derrickman …… underwater? (work)

A derrickman …… underwater.

A derrickman …… at the top of derrick.

3) A hexagon …… seven corners. (have)

A hexagon …… six corners.

…… a hexagon …… six corners?

4) Crude oil …… water. (contain)

Crude oil …… gold.

What …… crude oil ……?

5) Bob usually …… lunch at 13:00 (eat)

Bob …… lunch at 8:00.

When …… Bob usually …… lunch?

6) A manual drill …… electricity. (use)

…… a manual drill …… electricity?

A manual drill …… physical energy.

Sentences that use 'be' don't use 'do'

- He isn't a driller. ✓
- Is he a driller? ✓

- He don't be a driller? ×
- Do he be a driller? ×

Oil Industry Jobs

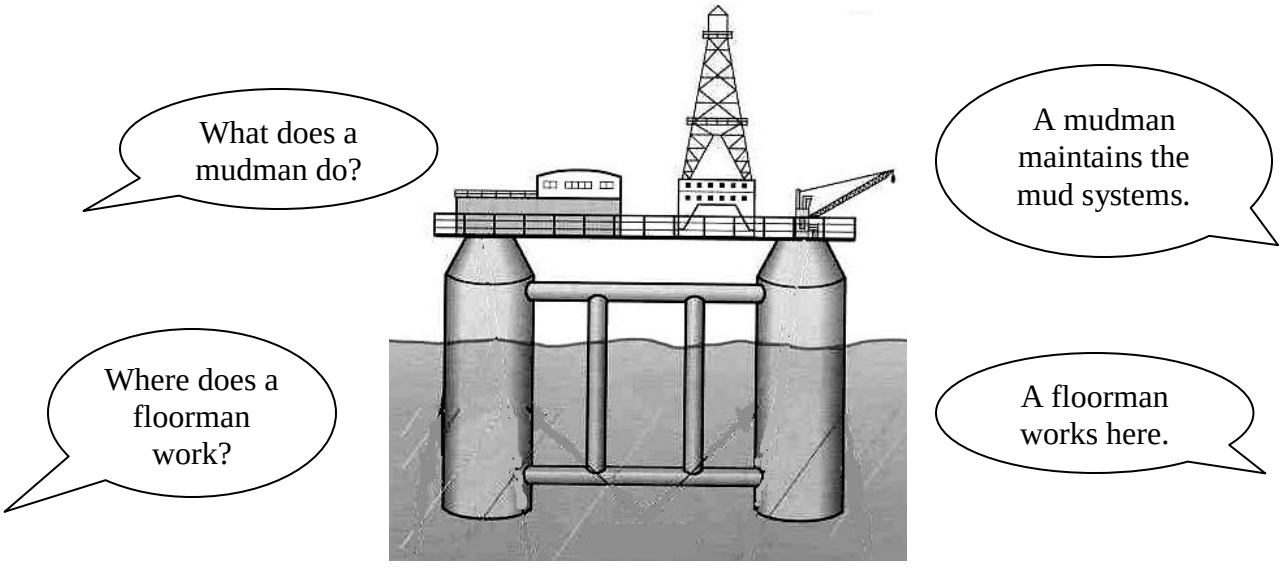
What do the words in the box mean?

seismic	deposit	derrick	assist	control
maintain	stem	operate	crew	handle

Match the jobs with the definitions. Put the verbs in the correct form. (🔊 1.7)

A derrick monkey	…… on the seismic crew	(work)
Divers	…… rocks to find oil deposits	(study)
A doodlebugger	…… the bottom of the drill stem	(handle)
Drillers	…… the driller	(assist)
A floorrman	…… at the top of the derrick	(work)
A jughustler	…… the drilling engine	(control)
A metallurgist	…… the mud systems	(maintain)
Motormen	…… underwater	(work)
A mudman	…… routine cleaning and maintenance	(do)
An roughneck	…… the drilling machinery	(operate)
Roustabouts	…… geophones in the seismic crew	(use)

Look at the picture of a bottle-type submersible platform below. Label the picture with the some of the jobs to indicate where the people work.



Types of Rig

Read the information and identify the types of rig shown in the picture.

There are many varieties of drilling rig suitable for different conditions. To decide what kind of rig to use you have to think about different factors. An important factor in offshore drilling is the ocean depth.

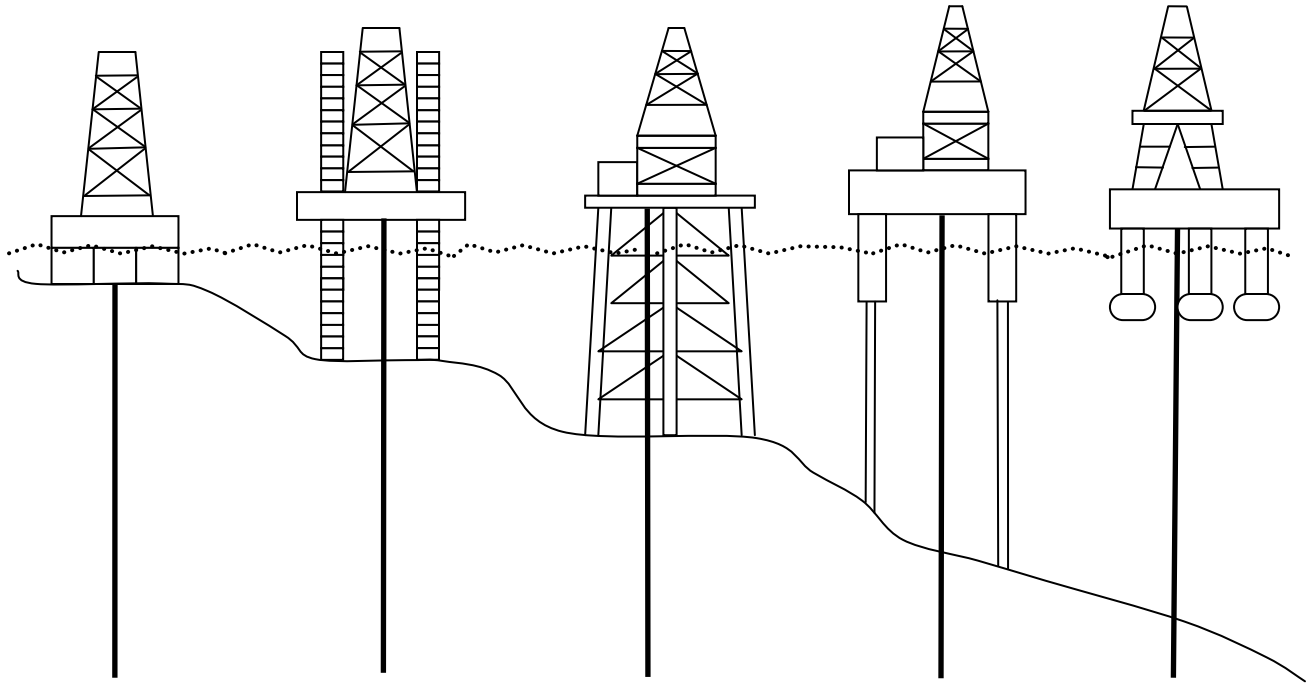
Fixed Platform: this kind of rig is suitable for deeper waters (usually 50-300 feet). It is a permanent structure with the drilling rig installed on an underwater jacket (steel structure).

Barge Type: this kind of rig is a flat bottomed barge, suitable for shallow waters. The derrick is over a moon pool in the centre of the barge.

Semi-submersible: this kind of rig is suitable for deep water operations (usually 200-1,500 feet). The rig is supported by floating pontoons submerged under the water.

Tension Leg Platform: this kind of rig is similar to a semi-submersible rig but it is attached to the ocean floor by tensioned steel cables.

Jack up: this kind of rig is suitable for shallow to medium waters. It has supporting legs that can be raised, or 'jacked up', when it moves to another location.



a) ……. b) ……. c) ……. d) ……. e) …….

Unit 1 – Training Skills

accurate
aim
associated
barge
bolt
chainsaw
compress
consider
contract
crane
delegate
derrick
dial
diver
doodlebugger
expand
extinguish
fixed
flame
flexible
forklift
hexagon
hexagonal
identify
inhale
jack-up
metallurgist
monitor
mud
objective
periodic
pig
platform
plug
pontoon
practical
principal
principle
provide
rough
rig
rigid
ring
risk
roughneck
roustabout
seismic
semi-submersible
shallow
smooth
socket
soiled
tension
theoretical

……

……

……

……

……

……

……

……

……

……

……

……

……

Unit 2

Numbers and Measurement

What is 10 Kpa **in** pascals?

10 Kpa is 10,000 pascals

Numbers and Measurement – Unit Map

The aim of this unit is to provide the opportunity to practise a full range of number forms used in the technical sphere and to be able to express different types of measurement. By the end of the unit you will be able to:

- read numbers
- know common units of measurements in English
- calculate dimensions for two and three dimensional shapes
- understand the difference between countable and uncountable nouns

I can	Difficult	Okay	Easy
say large numbers			
say fractions			
say percentages			
identify countable and uncountable nouns			
use ordinal numbers			
say different types of numbers i.e. dates			
use units of measurement			
read basic calculations			
tell the time			
discuss dimensions			

I understand	Difficult	Okay	Easy
the unit grammar: countable/uncountable nouns			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material

Saying Numbers

Write the following numbers as words and practise them with a partner. (🔊 2.1)

a) 1 - ……..

b) 12 - ……

c) 123 - ..……

d) 1,234 - ...……

e) 12,345 - ……

f) 123,456 - ...……

……...

g) 1,234,567 - ……

……

h) 12,345,678 - ……..

……...……...

i) 123,456,789 - ...……

……...……

j) 1,234,567,890 - ..……..

……

……

k) 1.23456789 - ...……..

……...……..

l) 123.456789 - ...……..

……

m) 12,345.7689 - ...……

……...……

n) ½ - ……

o) ¼ - ……

p) ⅓ - ……

What number is C?

C **is** one hundred and twenty-three.

Telling the Time

You can tell the time in two different ways. Complete the table.

UK Standard	Time	International
Twelve o'clock	.....	Twelve o'clock
Ten past twelve	12:10	Twelve ten
Quarter past twelve	12:15	.....
.....	12:25	Twelve twenty-five
Half past twelve	.....	Twelve thirty
Twenty to one	12:40	.....
.....	12:45	Twelve forty-five
Ten to one	12:50	.....

Now, work with a partner and answer the questions. Answer in complete sentences.

What time do you get up?

.....

What time do you start work?

.....

When do you eat lunch?

.....

What time do you arrive home after work?

.....

When do you go to bed?

.....

What time do you finish work?

I finish work **at** six o'clock.

Now, write the times you hear on the cassette. What do they mean? (🔊 2.2)

Types of Numbers

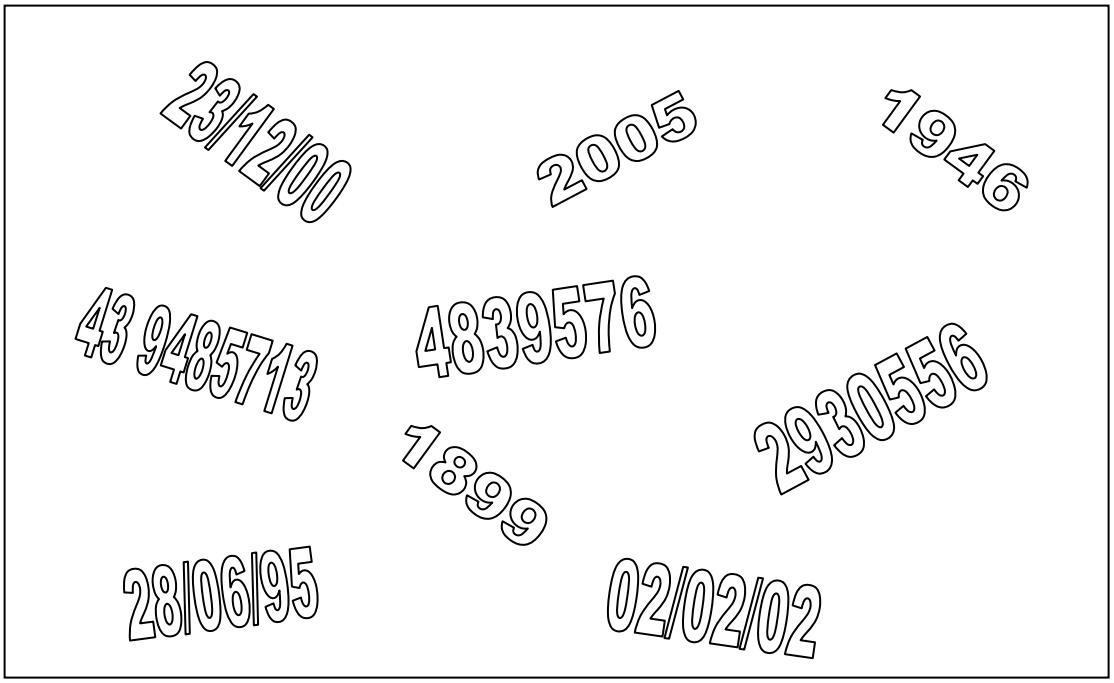
We say different types of numbers in different ways.

Telephone numbers: say individual numbers
427586 = four, two, seven, five, eight, five, six
586970 = five, eight, six, nine, seven, zero

Years: say numbers in pairs (*except for the first ten years of a century)
1985 = nineteen eighty-five
2010 = twenty ten
2004 = *two thousand and four

Dates: say full words
11/03/99 = **the** eleventh **of** March, nineteen ninety-nine
04/10/01 = **the** fourth **of** October, two thousand and one

Test your partner on the words in the box. Point to one of the numbers and they have to say it correctly.



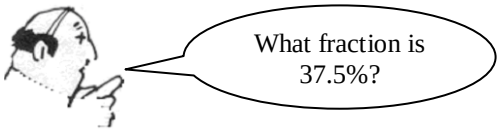
Write down five important dates and five important telephone numbers. Dictate your numbers to your partner and explain their significance.

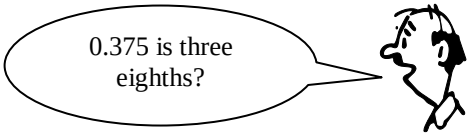
Percentages and Fractions

Match the percentages to the fractions

Percentage	Fraction
37.5%	½
33%	⅞
50%	⅜
25%	¾
75%	⅓
87.5 %	¼

Practise saying the numbers with a partner.





The table below shows the cause of injuries at work in a factory last year. Read the text and complete the table. (🔊 2.3)

Cause of Injury	Percentage
Slips, trips or falls	
Driving related	
Using faulty equipment	
Not using appropriate PPE	
Using the wrong equipment	
Falling objects	

The majority of injuries, 36%, are caused by slips trips or falls and a quarter of accidents are driving related. 21% of injuries involve equipment with 12% of the injuries caused by using damaged equipment and the rest caused by using the wrong equipment for the job. Just over a tenth of accidents (11%) are caused by not using the correct PPE and additional 7% of the injuries are caused by falling objects.

Most accidents are caused by slips, trips and falls. How can these be avoided?

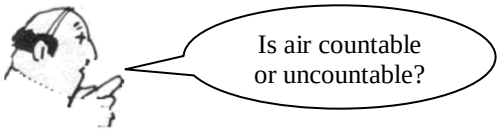
……
……
……

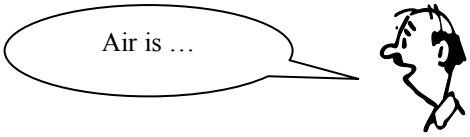
Countable / Uncountable

Nouns in English are either countable or uncountable. Put the following nouns in the correct column. Check your answers with a partner and then quiz them about different things. Add the information to the table

oil	pipeline	gas	tank	sand
accident	filter	engineer	water	report
work	power	engine	job	zinc

Countable	Uncountable
accident	





We can use countable nouns in the plural:

- There are three workmen...

We only use uncountable nouns in the singular:

- There is hydrogen...

Some of the sentences below contain mistakes. Correct the mistakes.

1. There are a lot of equipments in the workshop.
2. He works with many different machines.
3. He is very busy – he has many works to do today.
4. I need some informations to finish my report.
5. There are some tools in the workshop.

Some nouns can be countable or uncountable. What is the difference between:

- hair / hairs
- exercise/exercises
- glass/glasses
- cake/cakes

When we want to ask about countable nouns we use ‘how many’. When we want to ask about uncountable nouns we use ‘how much’. Use the prompts to make questions and ask your partner. Tell the rest of the class the answers.

1) chairs / room

   ……?

2) water / drink / day

   ……?

3) people / group

   ……?

4) money / pocket

   ……?

5) bread / eat / breakfast

   ……?

6) friends / have

   ……?

7) ……?

8) ……?

Some of the words below can only be used with countable or uncountable nouns. Delete the words you can not use.

all most a lot of many some a few a little no	sand	all most a lot of many some a few a little no	tanks

Now, choose the best word to complete the sentences.

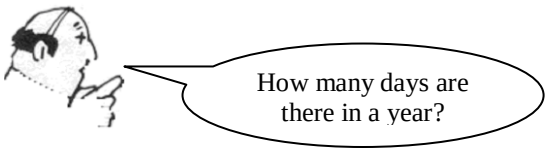
1) …… crude oil contains water.
   a) all b) some c) most
2) …… equipment is dangerous.
   a) no b) most c) some
3) …… chairs have three legs
   a) most b) a few c) some

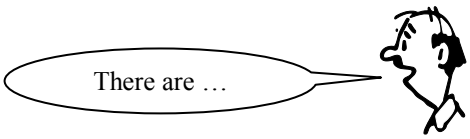
Numbers Quiz

Use the numbers in the box and your own knowledge to complete the sentences as quickly as possible. Check your answers with a partner.

112	21	2.2	1,609	3,600

1. There are …… days in the year.
2. There are …… elements in the periodic table.
3. There are …… chairs in the room.
4. There are …… letter in the English alphabet.
5. There are …… seasons in the year.
6. There are …… seconds in an hour.
7. There are …… inches in a foot.
8. There are …… meters in a mile.
9. There are …… electrical sockets in the room.
10. There are …… corners in a cube.
11. There are …… corners in a pyramid.
12. There are …… months in a decade.
13. There are …… elements in pure water.
14. There are …… consonants in the English alphabet.
15. There are …… grams in a pound.





Do the following numbers mean anything in your country?

a) 7 - ……..
b) 9 - ……..
c) 13 - ……
d) 18 - ……
e) 21 - ……
f) 33 - ……

Ranking Items

*To rank things is to put them **in order** i.e. 1st, 2nd, 3rd etc. Practise saying the numbers below.*

a) 1st	*f) 8th*	*k) 13th*
b) 2nd	*g)9th*	*l) 15th*
c) 3rd	*h) 10th*	*m) 21st*

For example, talking can be ranked in the following way:

Example: shout – whisper – talk

1. …shout… *loud*
2. …talk… ⇩
3. …whisper… *quiet*

Rank the following items in a similar way and check with a partner. (🔊 2.4)

Human movement

a) sprint – walk – run – jog – crawl

1. …… 2. …… 3. ……
4. …… 5. ……

Water

b) puddle – ocean – drop – lake – sea – pond

1. …… 2. …… 3. ……
4. …… 5. …… 6. ……

Distance

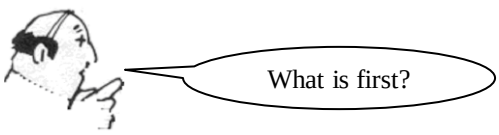
c) centimeter – mile – kilometer – inch – foot – millimetre – meter

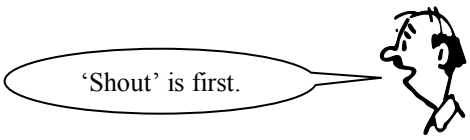
1. …… 2. …… 3. ……
4. …… 5. …… 6. ……
7. ……

Time

d) millennium – minute - hour – century – day – week – fortnight – second — season - month – year – decade

1. …… 5. …… 9. ……
2. …… 6. …… 10. ……
3. …… 7. …… 11. ……
4. …… 8. …… 12. ……





Units of Measurement

Match the categories to the abbreviations and write the full name of the unit.

Mass	Electrical	Length	Time	Movement	Pressure

Category	Abbreviation	Name
.....	mm cm m km in ft m	*millimetre*
.....	s min hr	
.....	psi pa Kpa bar	
.....	mg g kg t lb	
.....	a Hz V W Kw MW	
.....	mph fps rpm	

Practice saying the numbers below:

a) 250rpm
b) 125ft
c) 1,000lb
d) 4.68 Kpa
e) 1.5kg
f) 15.75 mm
g) 99mg
h) 240V
i) 19 bar
j) 2,458.5 km
k) 65mph
l) 105g
m) 25mins
n) 15ft
o) 78.95cm
p) 43fps

Calculations

Write the names of the mathematical symbols.

Mathematical Symbol	Name
+	
-	
×	
÷	
=	
≈	
≠	

Write the following calculations in figures. For question d) you also need to solve the calculation

a) Fifteen multiplied by seven point three five equals one hundred and ten point two five ……...

b) One hundred and twenty-eight divided by twelve point five equals ten point two four ……...

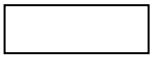
c) Eleven plus eighteen point two five, multiplied by six equals one hundred and seventy-five point five ……...

d) Twelve divided by four, multiplied by seven and plus eleven equals …… ……...

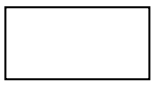
The area (a) of a rectangle is calculated by the length (l) multiplied by the height (h) so:

l × h = a

Use a ruler and calculate the area of the rectangles below. Write the full calculations (in figures).

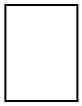


a) ……..……



b) …..……

c) ……..……



d) …..……

Which rectangle has the largest area? ……

Which rectangle has the smallest area? ……

Measuring

TEMPERATURE

Temperature is measured in degrees centigrade (^{o}C), degrees Fahrenheit (^{o}F) and degrees Kelvin (^{o}K). What are the following temperatures in degrees centigrade?

1. The freezing point of water is ……
2. The boiling poing of water is ……
3. Normal human body temperature is ……
4. The surface of the sun is ……
5. 0^{o}K is ……

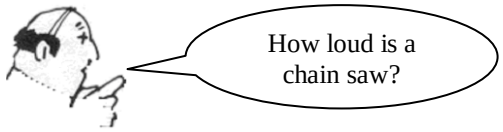
SOUND

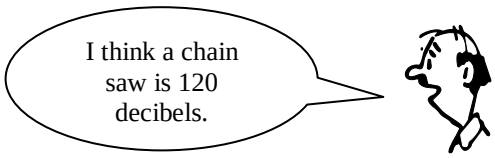
Sound is measured in *decibels (dB)*. Match the cause of the sound to the decibel level.

Noisy factory	Chain saw	Speech at 1m
Moon rocket at 300m	Ice cream van at 3m	Quiet office

Source	Decibels (dB)
	200
	120
	100
	80
	60
	40

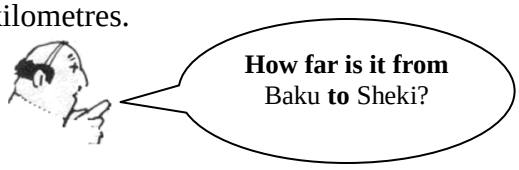
Check your answers with a partner. (2.5)

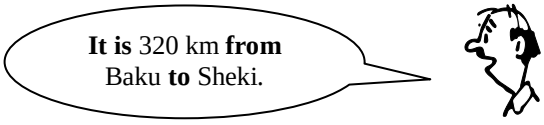




DISTANCE

Long distances are measured in miles (m) or kilometres (km). One mile is 1.61 kilometres.



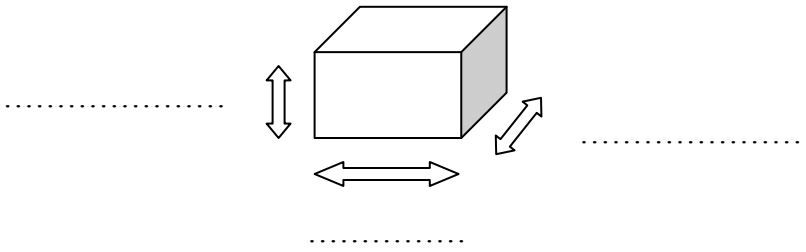


Baku - Tbilisi = 450 km
Tbilisi - Ceyhan = 1275 km
Baku - Ceyhan = …..…… km

Baku - London = 3975 km
London - Aberdeen = 545 km
Baku - Aberdeen = …… km

Measuring Dimensions

Objects (things) are measured in three dimensions; height, width and length. Label the diagram below with the correct dimension.



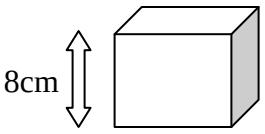
We use different adjectives to describe dimensions. Match the adjectives in the box below with the correct dimension. Some adjectives can be used more than once.

wide	short	tall	high	narrow	shallow	deep	long

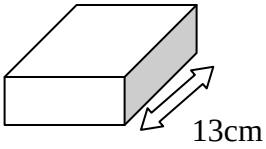
Height	Width	Length

We can describe dimensions in two ways:

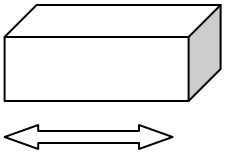
a) **The box is** ten centimeters **high**.
b) **The height of the box is** ten centimeters.



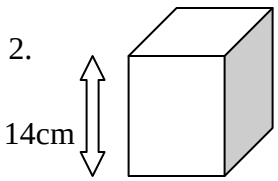
Describe the pictures below using both methods.

1. 

a) ……...
b) ……...

1. 

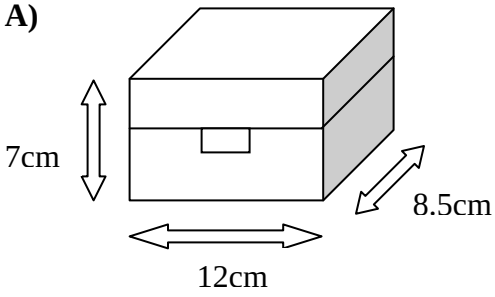
a) ……...
b) ……...

2. 

a) ……...
b) ……...

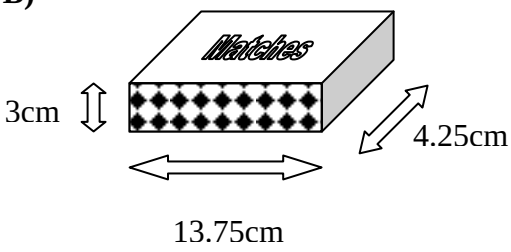
ow write full descriptions for the dimensions of the objects below.

A)



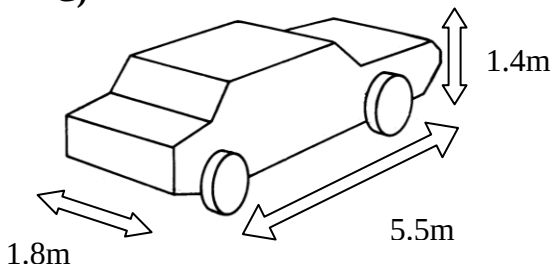
A) The box ……
……
……
……
……

B)



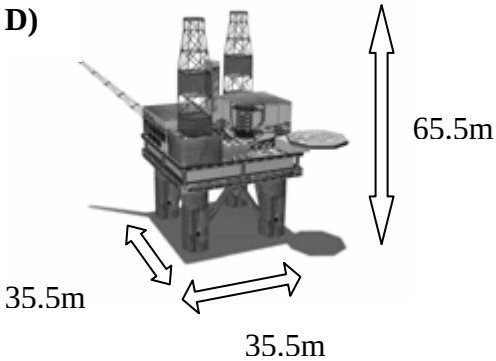
B) ……
……
……
……
……

C)



C) ……
……
……
……
……

D)

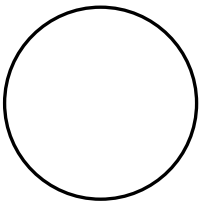
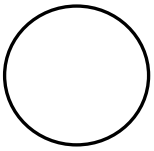
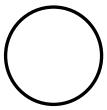


D) ……
……
……
……
……

Measuring Circles

Read the descriptions and write the names of the parts of a circle. Draw the parts on the diagrams.

Diameter (d)	Radius (r)	Circumference (c)

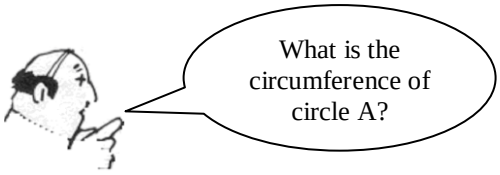
Description	Part of Circle	Diagram
The distance from the edge of a circle to the centre	……	
The distance from one side of a circle to the other, through the centre	……	
The length of the outside of a circle	……	

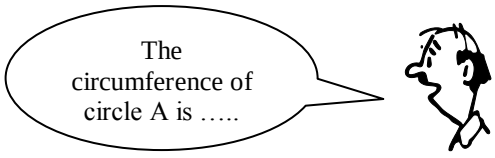
The circumference of a circle (c) = $2\pi R$
The area of a circle (a) = πR^2

Use a ruler and calculate the circumference and area of the circles above.

	Circle A	Circle B	Circle C
Circumference			
Area			

Check your answers with a partner.



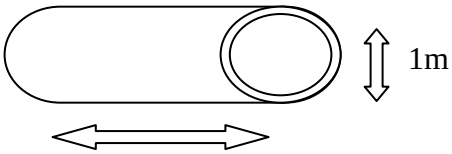


Measuring Pipelines

To calculate the volume of a pipeline the area of the internal circle is multiplied by the length of the pipeline:

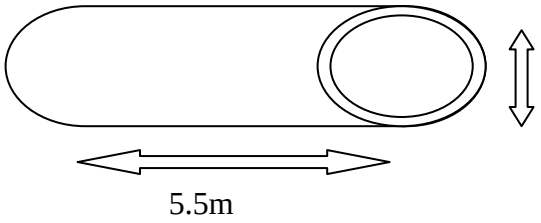
$$\pi R^2 \times l$$

The internal diameter of the pipeline below is 1 metre. The length is 4 metres. Therefore the volume is 3.141 x 25 x 5 = 3.141m^3 (three point one four one **metres cubed/cubic metres**).



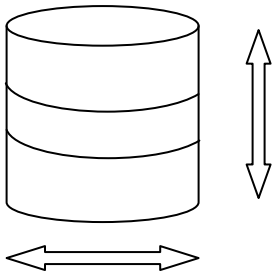
Use the formula to calculate the volume of the pipeline and barrel below.

A)



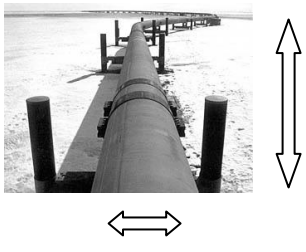
Volume = ……

B)



Volume = ……

C)



Volume = ……

Drilling Mud

Match words in the box with their definitions.

reservoir	how easy it is for a liquid to flow
mud	the oil field
viscosity	the weight of a unit of a substance
density	a mixture of earth and water

Now, read the text and answer the questions.

Drilling mud is a mixture put in a well to control the pressure of the reservoir fluids. It also cleans the drill bit and the bottom of the well and carries cuttings out of the well. A mud engineer is responsible for the drilling mud. He changes the mixture of the mud to suit the well.

Water based drilling mud is very common. It contains fresh water or sea water, bentonite clay to give viscosity and barite to give density. It also contains chemicals that the mud engineer changes for different conditions. To make 800bbl (barrels) of a water-based drilling mud with a density of 12lbs per US gallon mix:

Fresh water	672 bbl
Barite	1552 sacks x 100lb
Bentonite clay	104 sacks x 100lb
Filtration agent	320 lb
Co-polymer	120lb

1. Drill mud does three things. What are they?

   ……

   ……

2. What does the mud engineer do?

   ……

3. Does a mud engineer use barite to help the mud flow?

   ……

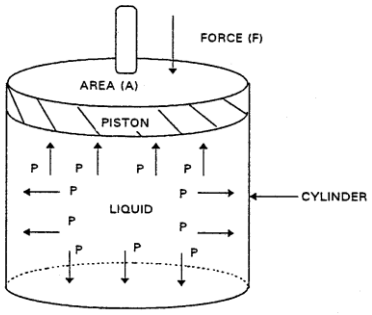
4. How many sacks of bentonite are in 400bbl of water based drilling mud?

   ……

5. A mud engineer wants a density of 9lbs per US gallon. What does he do?

   ……

Measuring Pressure



Pressure (P) is the Force (F) divided by the Area (A) so

$$P = F \div A$$

Pressure is measured in different units. Read the text below and complete the table.

> Some companies use Imperial Units (USA) and some companies use International Standard Metric Units (ISO). Imperial units measure the force in pounds and the area in square inches. This gives a pressure in pounds per square inch (psi). International Standard Metric Units measure area in square metres and force in newtons. This gives a pressure measurement called PASCAL (Pa) which is newtons per square metre. Because this is a very small unit the KILOPASCAL (Kpa) is often used.

	Imperial	ISO
Force		
Area		
Pressure		or

To convert (change) psi to Pa the following formula is used;

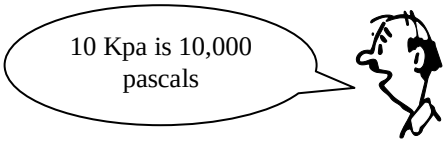
1 psi = 6895 Pa

High pressures are measured in bar.

100Kpa = 1 bar

Use the above formula to covert the following pressures and check your answers with a partner

a. 10 Kpa = …… Pa
b. 15 bar = …… psi
c. 250 psi = …… Kpa
d) 20 psi = …… Pa
e) 848085 pa = …… psi
f) 1 bar = …… psi



Write down the measurements you hear. Check your answers with a partner. (🔊 2.6)

Unit 2 – Numbers and Measurement

appropriate
ampere
avoided
bar
calculate
centimetre
circumference
clay
countable
crawl
decade
decibel
density
diameter
divide
drop
fall
faulty
fluid
foot
half
height
inch
injury
jog
kilogram
kilometre
length
mass
metre
mile
milligram
millimetre
multiply
Pascal
per cent
pi
point
pound
puddle
quarter
radius
rank
related
reservoir
responsible
revolution
sack
slip
sprint
subtract
tenth
third
tonne
trip
uncountable
viscosity
volume
volt
watt
width

……

……

……

……

……

……

……

……

……

……

……

Unit 3

Describing Equipment

What is this?
What does it **do?**

It is a bolt. It connects the vice to the bench.

Describing Equipment - Unit Map

The aim of this unit is to provide the language and skills necessary to describe a range of common oil industry hand tools. By the end of this unit you will be able to:

- identify a range of different hand tools
- express ability using 'can'
- describe the location of objects with accuracy
- identify the parts of common hand tools
- describe the relationships between the parts of common hand tools.

I can	Difficult	Okay	Easy
name hand tools			
describe hand tools and explain their use			
describe location using prepositions			
describe basic measuring devices			
describe basic pumps			

I understand	Difficult	Okay	Easy
the unit grammar: 'can' to express ability			
the passive voice			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Workshop Tools

What do the verbs in the box mean?

to saw	to slacken	to rotate	to tighten	to cut
to chip	to connect	to hold	to finish	to sharpen

Which hand tools do you use for the following jobs? (🎧 3.1)

A grinder	To cut a piece of wood or metal
A screwdriver	To make a hole in a piece of wood or metal
Calipers	To hold a piece of wood or metal securely in place
A file	To tighten a screw
A hammer	To rotate a pipe
A saw	To finish the surface of a piece of metal
A spanner	To grip small objects
A pipe wrench	To connect two pieces of wood with a nail
A drill	To sharpen other tools
A chisel	To measure internal or external dimensions
A vice	To slacken a bolt
Pliers	To chip away metal

What tools do you need to complete the following jobs and why?

1) To change an electric plug

   To change an electric plug you need .....

   .....

   .....

2) To make a bench

   .....

   .....

   .....

   .....

Expressing Ability

We use 'can' to express ability. Look at the table and the examples.

	Bob	Alan
speak English	✓	✓
drive a car	✓	×
swim	×	×

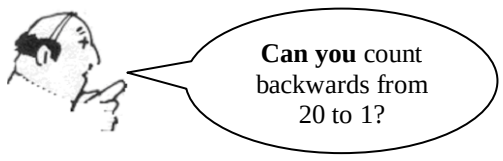
- Bob and Alan can speak English.
- Bob can drive a car but Alan can't drive a car.
- Bob and Alan can't swim.

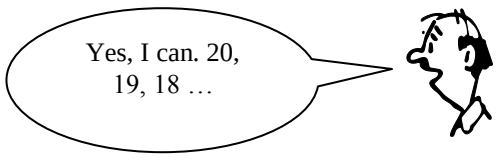
Complete the sentences with 'can' or 'can't'

1. You …… remove a nail with a file.
2. You …… cut electric cable with a pair of scissors.
3. You …… cut a pipe with a hammer.
4. You …… turn a bolt with pliers.
5. You …… chip away metal with a screwdriver.
6. You …… finish metal with a saw.
7. You …… hold a piece of wood with a vice.
8. You …… sharpen tools with a file.

Work with a partner and complete the table below.

Can you …	**You**	**Your Partner**
… say the English alphabet in less than 60 seconds?		
… count backwards from 20 to 1 without mistakes?		
… name 10 hand tools?		
… identify 5 objects in the room?		
… say the months		



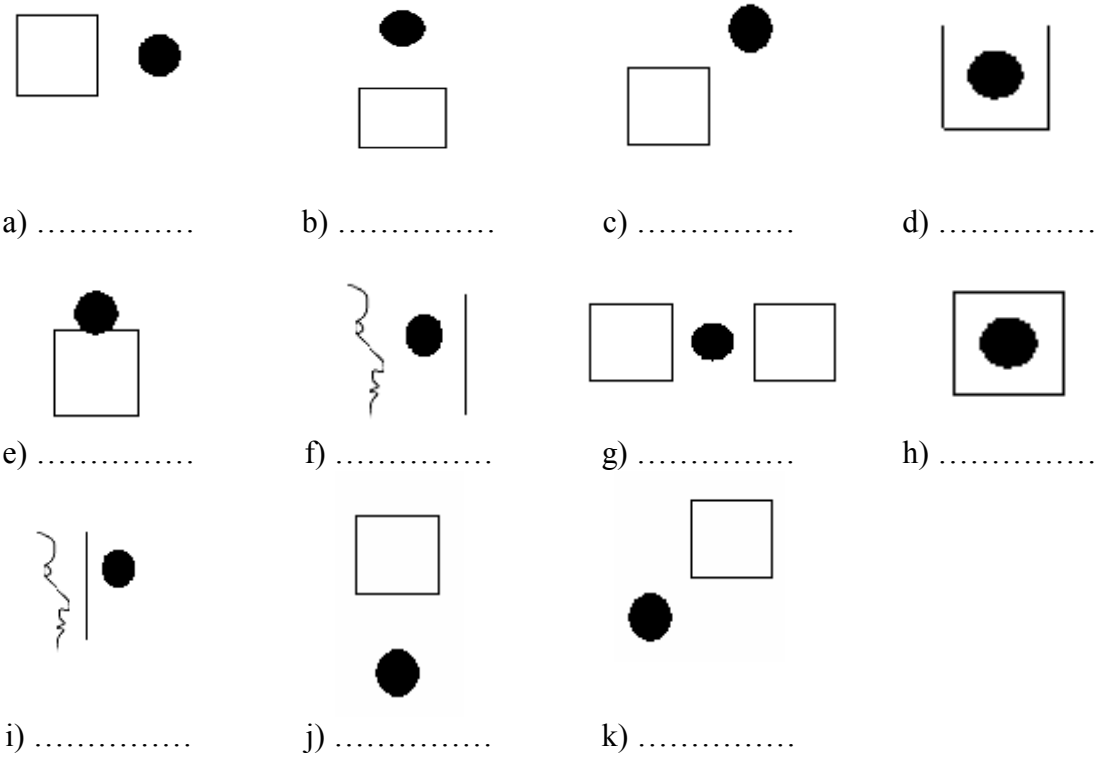


Prepositions

Find the prepositions of place and movement in the letters below and use them to describe where the sphere is.

oninoverabovebelowunderbetweeninfrontofbehindnexttoinside

PREPOSITIONS OF PLACE



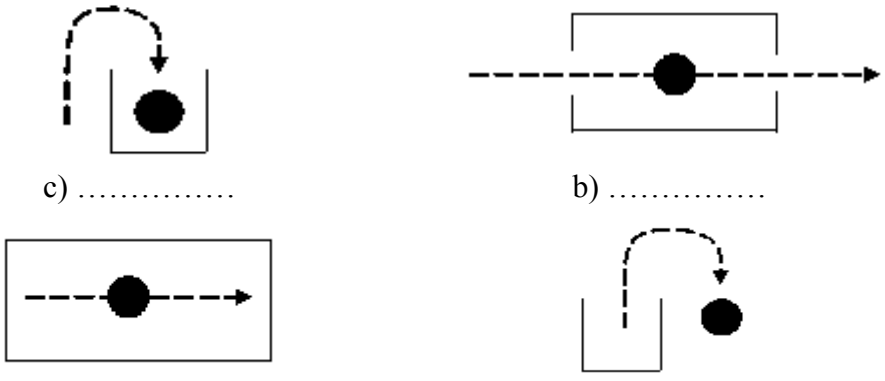
a) …… b) …… c) …… d) ……

e) …… f) …… g) …… h) ……

i) …… j) …… k) ……

intooutofacrossthrough

PREPOSITIONS OF MOVEMENT

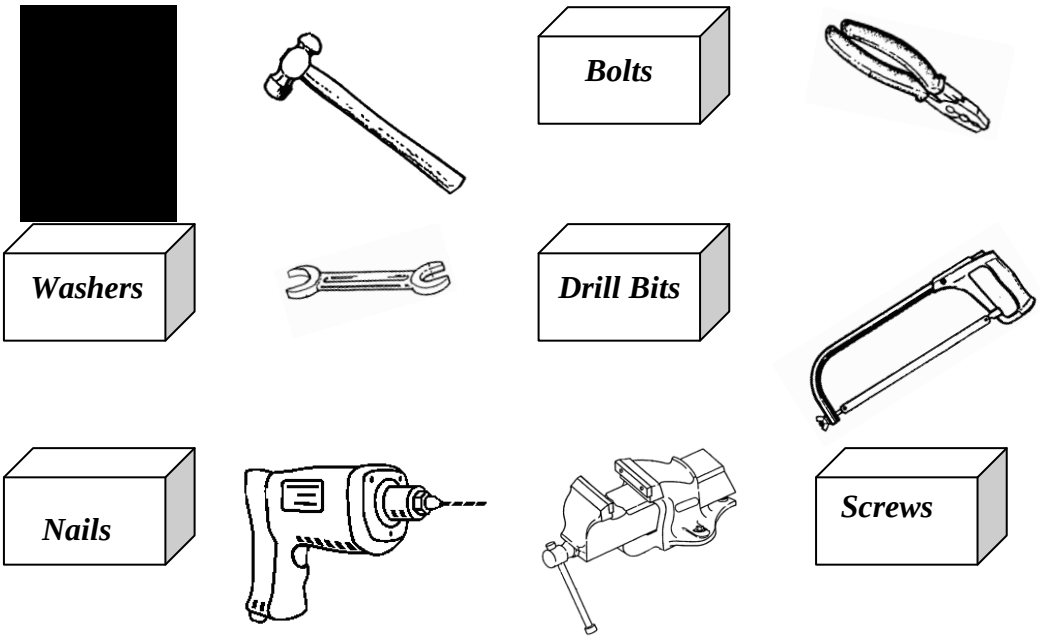


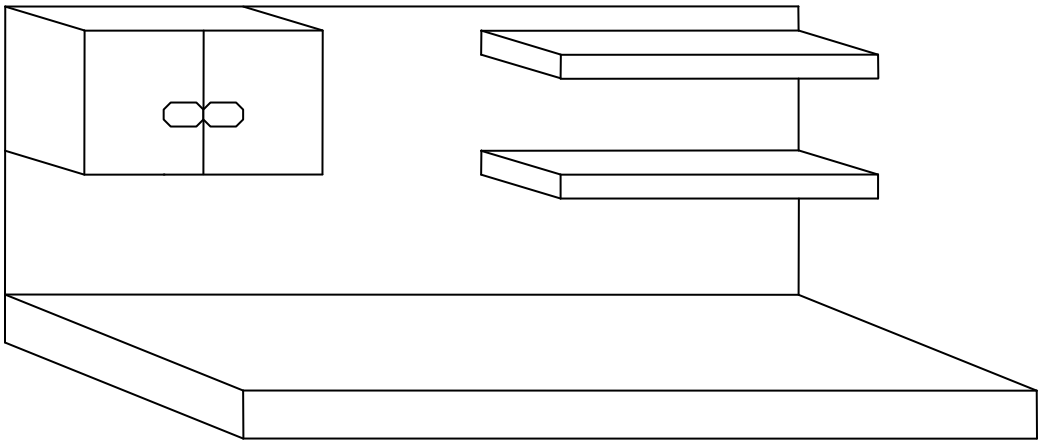
c) …… b) ……

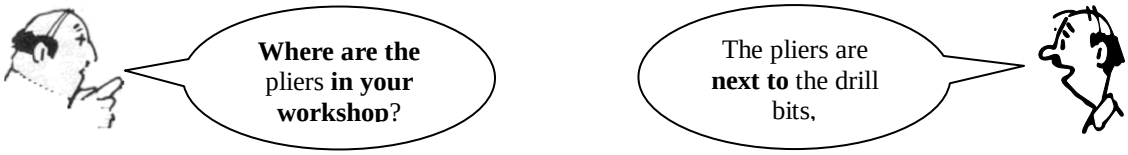
a) …… d) ……

Describing the Workshop

Put the tools the spaces in the workshop. Work with a partner to describe the location of the tools and compare your pictures, WITHOUT looking at your partner's picture.





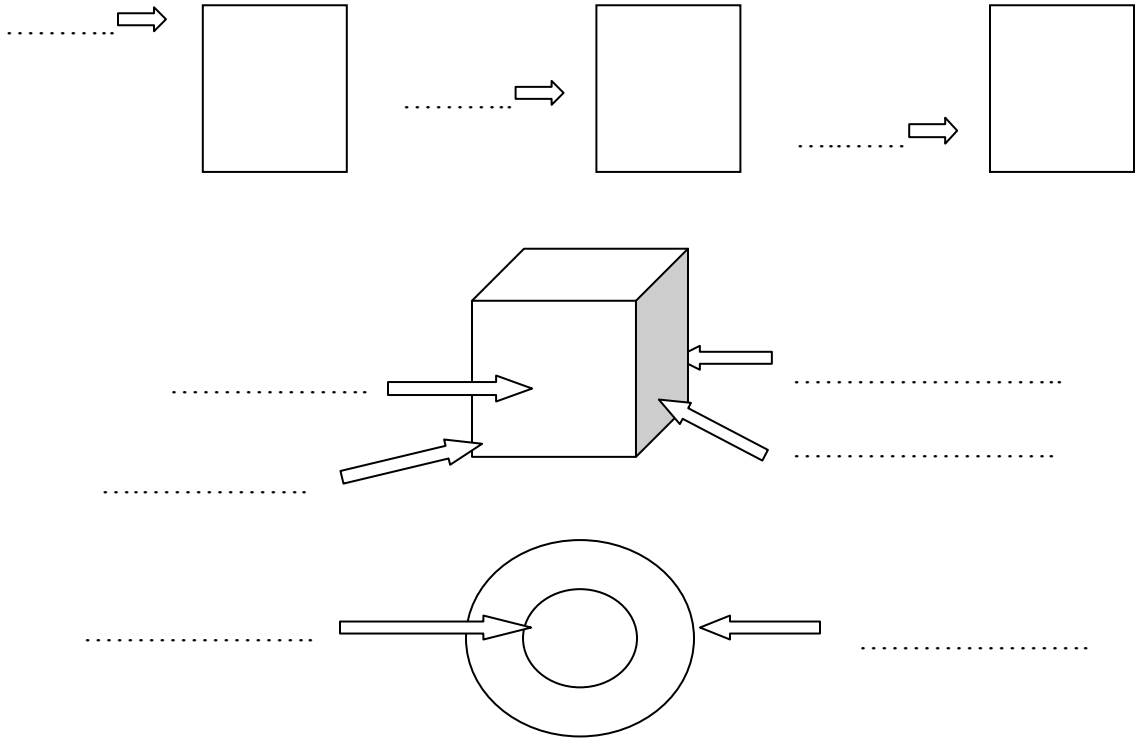


Now listen to the cassette and indicate where the tools are kept. (🎵 3.2)

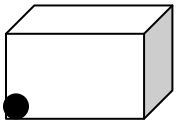
Describing Location

Match the words in the box to the diagrams below.

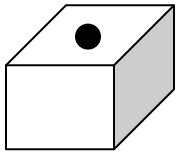
bottom	back	side
front	top	corner
internal	middle	external



Look at the diagrams and describe the location of the valve on the tank.



……
……



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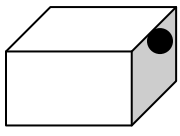


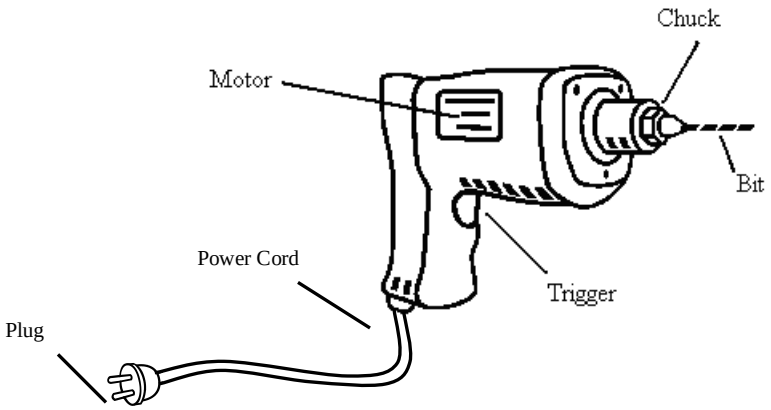
……
……

Describing Equipment

Look at the diagram below and complete the text. Put the verbs in the correct place in the correct form. (🔊 3.3)

be	supply	have
connect	hold	control

This …… an electric drill. It …… a power cord, a trigger, a motor, a chuck and a bit. The power cord …… power to the motor. The chuck …… the bit in place. The trigger …… the motor. The plug …… the power cord to the power supply.



Now, answer the questions using full sentences.

a) What does the power cord do?

……

b) Does the motor hold the bit?

……

c) Does the motor control the trigger?

……

d) What does the chuck do?

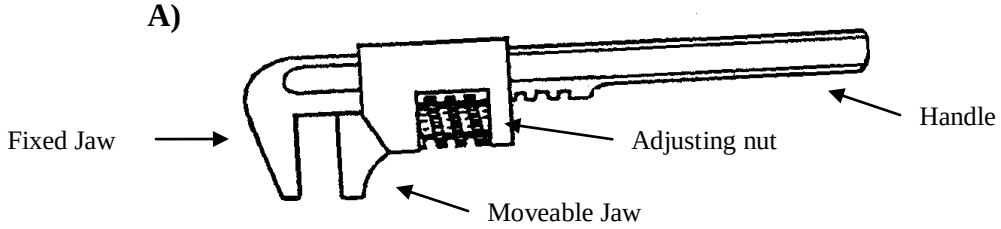
……

e) Does the plug supply power to the motor?

……

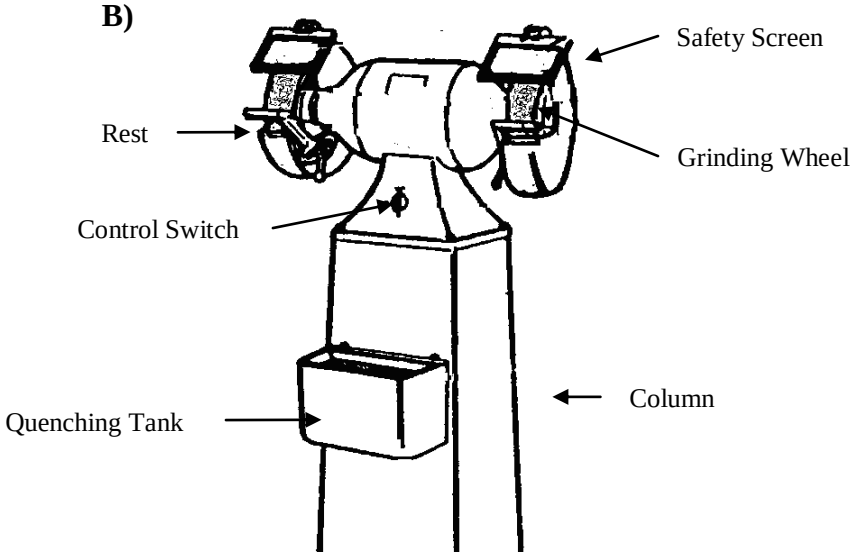
Look at the two diagrams and correct any mistakes in the texts that follow. (3.3)

A)



This is a pipe wrench. It is used for heavy duty work. It has a handle, two adjusting nuts, a fixed jaw and a moveable jaw. The adjusting nut is in front of the moveable jaw and adjusts the position of the fixed jaw.

B)



This is an off-hand grinder. It is used to recondition tools like screwdrivers and chisels. It has a column, a grinding wheel, safety screens, rests, a control switch and a quenching tank. The control switch on the left of the column operates the grinding wheels. The rests above the wheels hold the work in place and the screens protect the user from debris. The quenching tank behind the column is used to cool the work.

Measuring Devices - Pressure

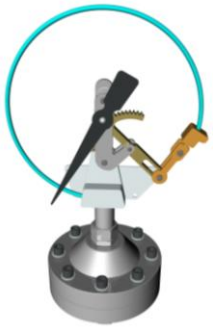
There are different instruments we can use to measure pressure. Read the descriptions of four types of pressure measuring equipment and match the descriptions to the pictures:

a) A **bellows** is made of thin metal in the form of a cylinder, closed at one end, and it has deeply corrugated walls

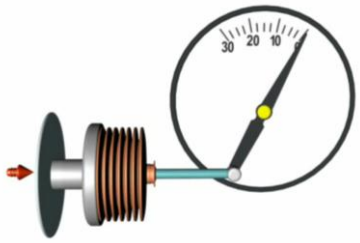
b) **A bourdon tube** consists of a thin metal walled tube. The bourdon tube is connected to a pointer

c) A **differential pressure bellows** consists of two bellows, working in opposition, connected to a pointer.

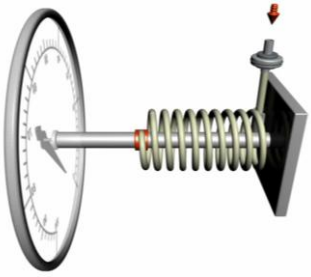
d) A **helical bourdon tube** consists of a bourdon tube in the shape of a spring, connected to a pointer



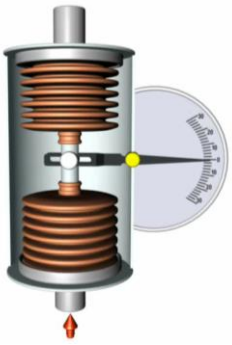
1) ……



2) ……



3) ……

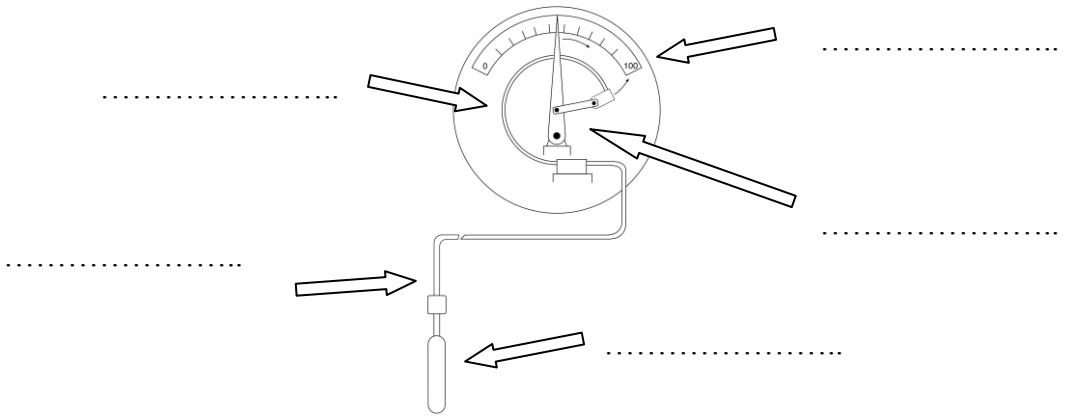


4) ……

Measuring Devices - Temperature

Label the diagram of a filled system thermometer with the words in the box below.

bourdon tube	temperature scale	capillary tube	pointer	bulb



Now, match the sentences below and write the complete text below, in a **logical** order. (🎧 3.5)

This type of system	filled system thermometer.
This is a	is transmitted into the movement of the pointer.
It consists of	it goes through the capillary tube and into the Bourdon spiral
When the mercury in the bulb expands	the temperature on the scale.
The pointer then indicates	is completely filled with a liquid, usually mercury.
The spiral uncurls and this movement	a bulb, a capillary tube, a bourdon tube, a pointer and a scale.

This is a …….....

…….

…….

…….

…….

…….

Talking About Objects

A basic English sentence has three parts, a subject, a verb and an object.

Subject	Verb	Object
The drill	has	a power cord
The power cord	supplies	electricity
The electricity	drives	the motor

The subject is what does the action (the verb) and so theses are called **active** sentences. Sometimes the object is more important than the subject or we do not know the subject. In these sentences, called **passive** sentences, the object comes first and 'be' shows the tense or time of the action and the verb shows the action.

Object	Be	Verb (past participle)	(by Subject)
The drill	is	driven	by electricity
Electricity	is	provided	by the power cord
The drill**s**	are	driven	by electricity

Which of the sentences below are correct? Tick (✓) the correct sentences.

1)
The drill makes a hole.
The hole makes a drill.
The hole is made by a drill.
The drill is made by a hole.

2)
The pumps are powered by diesel.
The pumps powers diesel.
Diesel powers the pumps.
Diesel is powered by the pumps.

3)
The pigs clear the pipeline.
The pigs are cleared by the pipeline.
The pipeline clears the pigs.
The pipeline is cleared by the pigs.

4)
The flow controls the dial.
The dial controls the flow.
The dial is controlled by the flow.
The flow is controlled by the dial.

5)
The gauge measures the pressure.
The gauge is measured by the pressure.
The pressure measures the gauge.
The pressure is measured by the gauge.

6)
The monitor displays the flow rate.
The flow rate displays the monitor.
The flow rate is displayed by the monitor.
The monitor is displayed the flow rate.

7)
Batteries supply the power.
Batteries are supplied by the power.
Power supplies the batteries.
Power is supplied by the batteries.

8)
The screwdriver turns the screw.
The screw is turned by the screwdriver.
The screwdriver is turned by the screw.
The screw turns the screwdriver.

Write the past participle of the words in the table.

measure	……	use	……	hold	……	have	……
connect	……	be	……	make	……	monitor	……
see	……	inspect	……	take	……		……

Identify if the sentences below are active (A) or passive (P) and rewrite them i.e. change from active to passive or from passive to active.

1) The plug connects the drill to the electricity supply. A/P

……

2) The spiral bourdon tube pressure gauge measures low pressure. A/P

……

3) The engineer uses a file to finish the metal. A/P

……

4) The holes are made by an automatic drill A/P

……

5) The pipe is held in place by a pipe wrench A/P

……

6) The engineer is protected from eye injury by safety goggles. A/P

……

7) A computer monitors the flow. A/P

……

8) The work is held securely in a vice. A/P

……

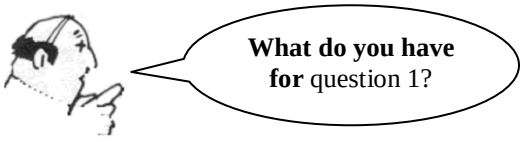
9) The engineer uses a grinder to sharpen tools. A/P

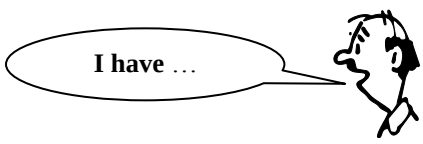
……

10) The kit is inspected by an engineer every day. A/P

……

Now, check your answers with a partner.



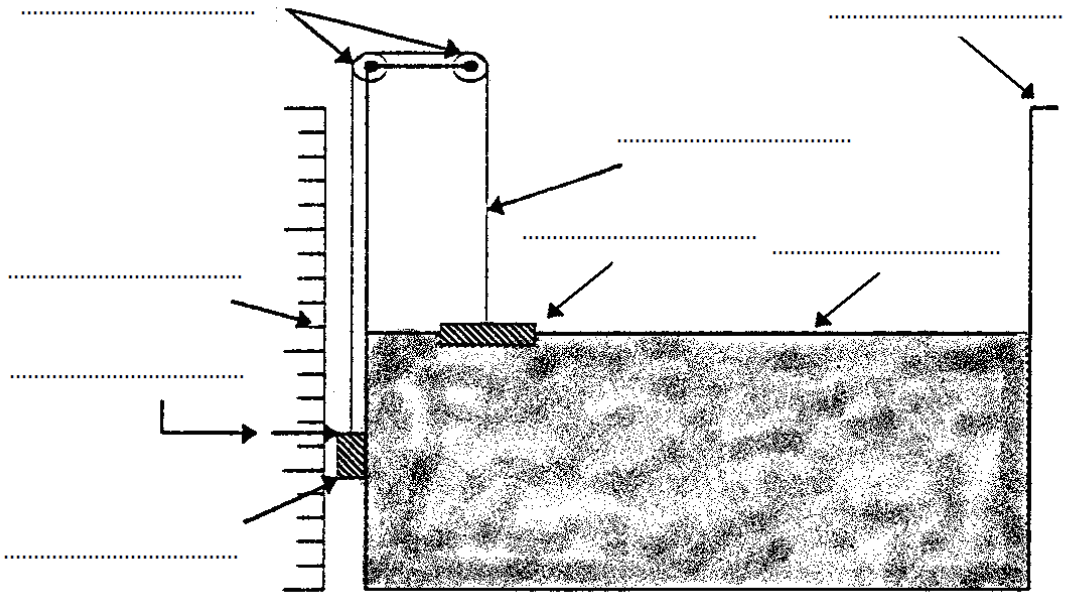


Measuring Devices - Level

Put the verbs in the text in the correct form, active or passive, and then label the diagram with the words in the box. (🎧 3.6)

One method to measure the level of a liquid in a tank …….. (be) with a float system. A wire …… (connect) a float to a counter-weight through a system of pulleys. A pointer on counterweight …… (indicate) the level on a scale. As the level of the liquid …… (decrease) the float …… (get) lower and the counterweight …… (pull) higher. As the level of the liquid …… (increase) the float …… (get) higher and the counterweight …… (lower). The change in level …… (show) by the pointer.

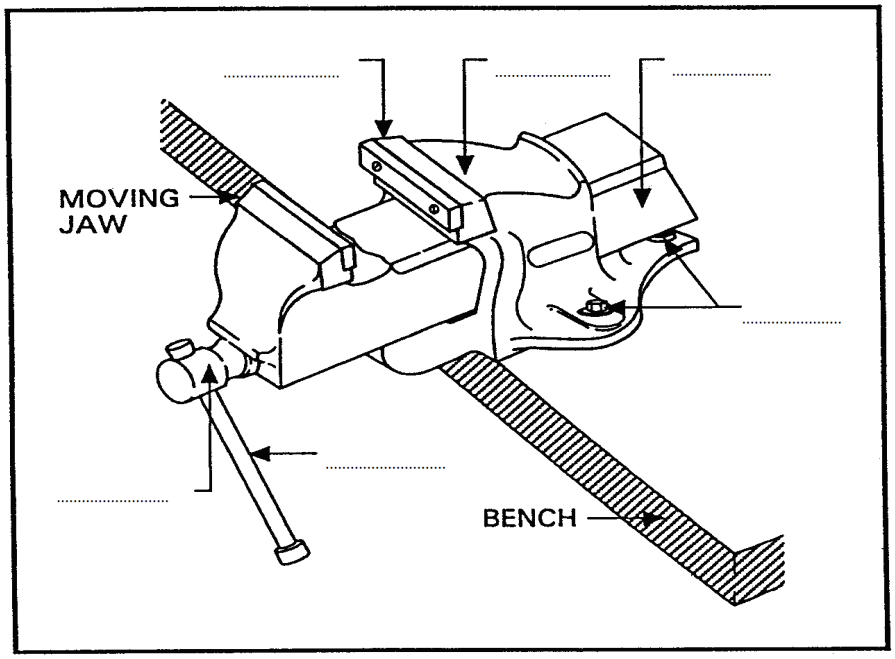
pulleys	wire	float	scale
pointer	tank	liquid	counter weight



Describing Tools

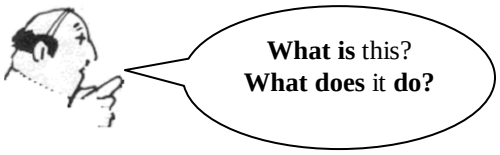
Read the description of how a bench vice works and label the diagram with the words below. Discuss the vice with a partner.

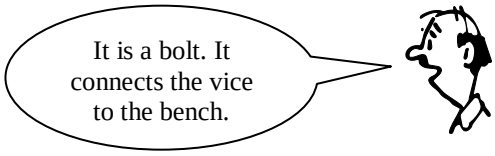
fixed jaw	**screw**	**slide**	**body**	**bolt**	**handle**



Engineer's Bench Vice

The bench vice is connected to the bench by bolts in the body of the vice. At the top of the body there is a fixed jaw to hold the work. A slide goes through the body and on the top of the slip there is a moving jaw. A handle or level is attached to a screw which goes into the slide. When you turn the handle clockwise the slide moves towards the bench and the moving jaw holds the work against the fixed jaw. When you turn the handle anti-clockwise the slide moves away from the bench and the moving jaw releases the work.

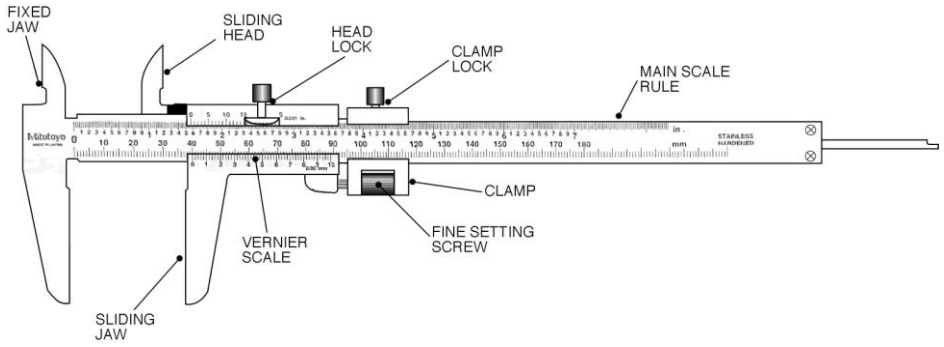




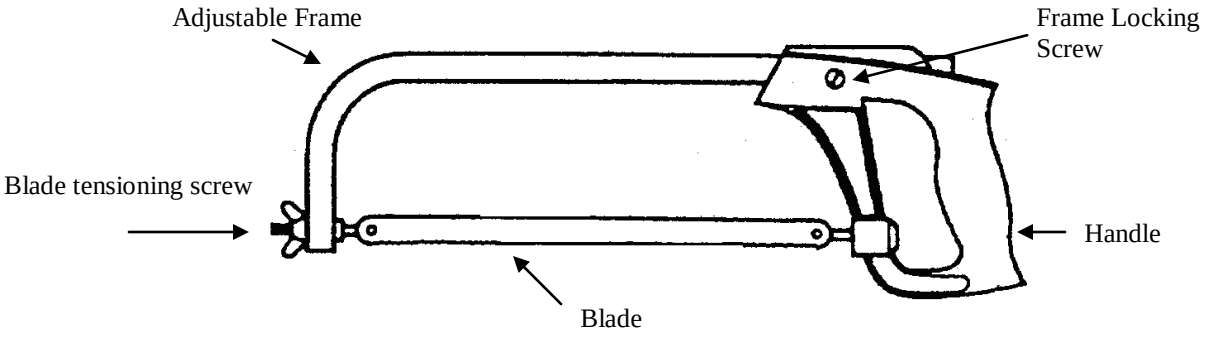
Put the phrases in the box in the spaces to complete the text.

It has a	is used to (x3)	in place	It can be used to	This is a

…… vernier calliper. …… measure internal or external dimensions. …… fixed jaw, a sliding head, a sliding jaw, a head lock, a clamp lock, a clamp and a fine setting screw. The sliding head …… measure internal dimensions. The sliding jaw …… measure external dimensions. The locks and clamps hold the sliding parts …… . The fine setting screw …… get exact measurements.



Now, look at the diagram below and write a description of the hacksaw.



……

……

……

……

……

……

……

Now, describe the drill below using the words in the box in an appropriate form.

connect	control	protect	hold	move
turn	behind	under	lower	clockwise

……

……

……

……

……

……

……

……

……

……

……

……

Pumps

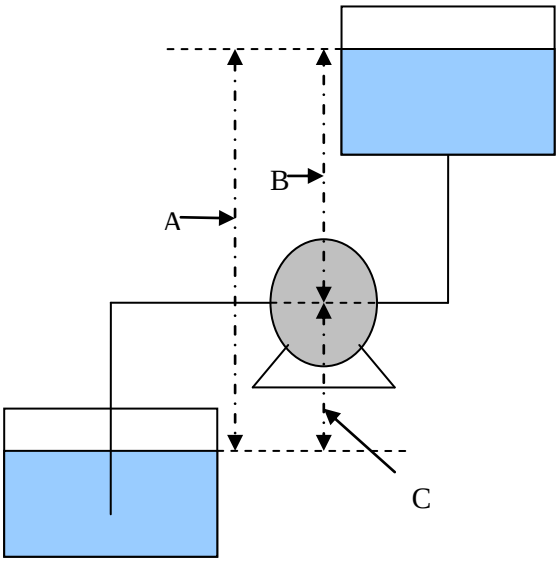
Pumps are essential to the oil industry and many different types of pump are used onsite. By definition a pump is a mechanism used to transfer liquid from one place to another by giving energy to the liquid. Match some of the more common type of pump found onsite with their usage. Then read the information about pumping theory and label the diagram (A,B and C).

Main and auxiliary oil pumps	used to supply water to plant fire lines.
Fuel oil pump	also called a cooling water pump. It is used to pump water through a heat exchanger such as a condenser or oil cooler.
Lubricating oil pump	small capacity units are used to pump chemicals into boilers; larger units are used as process pumps.
Circulating water pump	used in oil-fired treaters to pump fuel oil to the burners.
Chemical feed pump	used to move the oil through the pipeline as required.
Fire pump	used to supply water to plant washrooms, etc.
Domestic water pump	used to circulate oil to the bearings of a machine such as a turbine, engine, pump, or compressor.

Pumping Theory

Static Suction Head
The pump has to lift the water through the suction line. The distance, measured vertically, that the intake of the pump is placed above the surface of the water is called the static suction lift.

Static Discharge Head
The vertical distance, in metres or in feet, from the centre line of the pump to the free surface of the water in the discharge tank is called the static discharge head.



Total Static Head
The vertical distance from the surface of the source of supply to the surface of the water in the discharge tank is called the total static head. This is the sum of static suction lift plus static discharge head, thus it is the total height the water is raised by the pump.

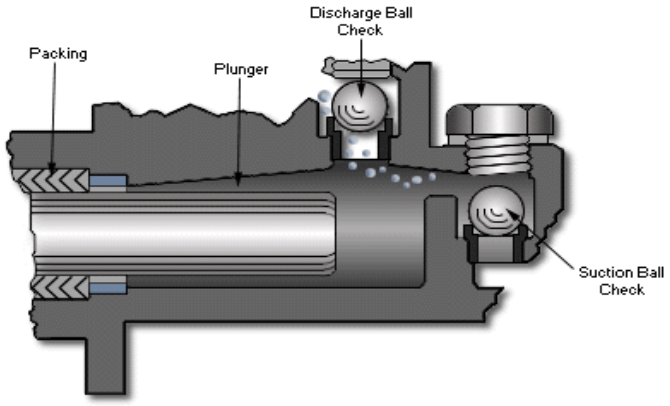
Pumps can be classified into three main groups: reciprocating, rotary, and centrifugal. Read the information about reciprocating pumps and put the verbs in the correct form, active or passive. (3.6)

Reciprocating Pumps

In this type of pump the pumping action …… (produce) by the to and fro (reciprocating) movement of a piston or plunger within a cylinder. The liquid …… (draw) into the cylinder through one or more suction valves and then …… (force) out through one or more discharge valves by direct contact with the piston or plunger.

Single-Acting Pump

When the plunger …… (move) from right to left the liquid …… (draw) into the cylinder through the suction ball check. When the plunger …… (reverse) and …… (move) from left to right, the liquid …… (force) out through the discharge ball check. The discharge ball check …… (force) open by the pressure of the liquid and, at the same time, the suction ball check …… (force) closed. The movement of the plunger in the cylinder in one direction …… (call) the stroke of the plunger.



The distance the plunger …… (move) in and out of the cylinder …… (call) the length of the stroke. Only one side of the plunger …… (take) part in the pumping action and water …… (discharge) only during one out of every two strokes. For these reasons the pump …… (call) single acting.

Unit 3 – Describing Equipment

above
across
anticlockwise
auxiliary
bellow
below
bit
blade
bourdon
callipers
capacity
capillary tube
centrifugal
chip (v)
chisel
chuck
classified
circulate
clamp
clockwise
connect
corrugated
counter-weight
discharge
drive
exchanger
external
finish (v)
float
flow
gauge
goggles
grinder
handle
internal
jaw
lower
piston
pliers
plunger
pointer
protect
reciprocating
raise
rotate
saw (v)
scale
secure
slacken
slide
sharpen
spiral
spring (v)
stroke
suction
through
transmit
trigger
vice
wire
wrench

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Module 1 Review

GRAMMAR BOX – Present Simple
The present simple tense describes general situations or habits. It is formed using the infinitive of the verb in the correct form.

- I study with ELS.
- He/She studies with ELS.
- We/You/They study with ELS.

We use 'Do'/'Does' to form questions and 'don't'/'doesn't' to form negatives.

- I don't have any children.
- Do you have any children?
- He doesn't have any children.

An exception to this is the verb 'to be'

- I am a technical trainee.
- He is not a technical trainee.
- Are they technical trainees?

Complete the text using the correct form of the verbs.

want	like	have	work (x2)	spend

Susan …… a degree in electrical engineering but she …… as an electrical engineer. She …… as a maintenance technician but she …… her job and …… to get a job in her speciality. She …… a lot of time studying electrical engineering manuals.

Now, use the same verbs to write six sentences about yourself or your class colleagues.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

GRAMMAR BOX – Passive voice

The passive describes the object, not the subject or what does the action. It is formed with 'be' to show the tense and the past participle of the verb to show the action.

- The machine is operated by a controller.
- The machines are operated by a controller.

To form negative sentence we use the 'not' with 'be'

- The valve isn't opened by control A.
- The valves aren't opened by control A.

We use the passive when the object is more important than the subject or when the subject is unknown.

- The machine is operated by a controller (this tells us about *the machine*)
- A controller operates the machine (this tells us about *the controller*)

Rewrite the following active sentences in the passive voice.

1) An electric motor powers the pump.

   ……

2) A maintenance engineer checks the fluid levels every day.

   ……

3) The piston forces the liquid along the shaft.

   ……

4) A gas turbine supplies the power.

   ……

5) A computer monitors the flow rate.

   ……

6) A computer automatically adjusts the valves to maintain a constant pressure.

   ……

7) The chuck holds the bit in place.

   ……

8) The thermostat measures the temperature in the system.

   ……

9) An operator uses vernier callipers to measure internal and external dimensions.

   ……

Write the correct form of the verbs.

CONTROL	Active		Passive	
Subject	Positive	Negative	Positive	Negative
I				
You				
He/She/It				
We/They/You				

MAKE	Active		Passive	
Subject	Positive	Negative	Positive	Negative
I				
You				
He/She/It				
We/They/You				

MOVE	Active		Passive	
Subject	Positive	Negative	Positive	Negative
I				
You				
He/She/It				
We/They/You				

Now write eight sentences using the above verbs in active and passive sentences, positive and negative. Use a variety of subjects.

1) ……

2) ……

3) ……

4) ……

5) ……

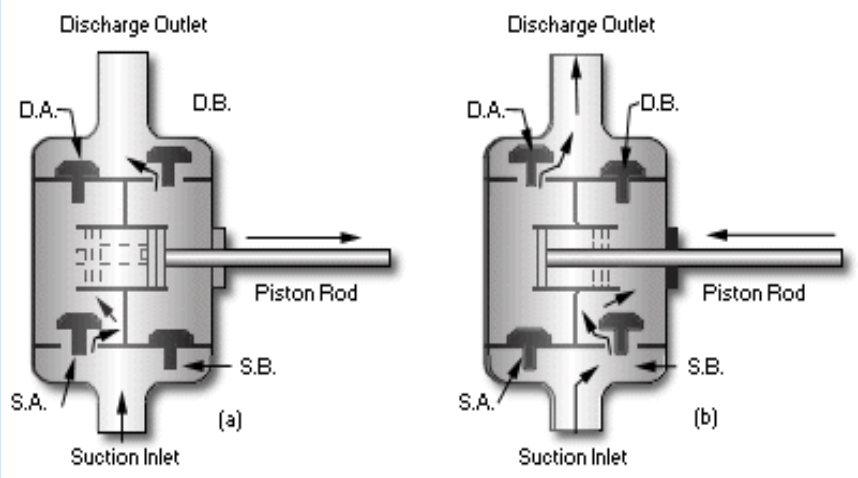
6) ……

7) ……

8) ……

Complete the text by putting the verb in the correct form, active or passive. Then decide if the sentences that follow are true (T) or false (F).

The diagrams below …… (show) a double-acting, piston type, reciprocating pump. The pump …… (have) two discharge valves D.A. and D.B. and two suction valves S.A. and S.B. When the piston …… (move) from left to right as shown in the first diagram, the liquid …… (be) drawn in through the suction valve S.A. At the same time liquid …… (force) out through the discharge valve D.B. Then when the piston …… (reverse) and …… (move) from right to left as in the second diagram, liquid …… (draw) in through the suction valve S.B. At the same time, liquid …… (force) out through the discharge valve D.A.



With this arrangement both sides of the piston …… (take) part in the pumping action and liquid …… (discharged) when the piston (move) in either direction. Therefore this type of pump …… (call) double acting.

1) When the piston moves to the right valve S.A. is open. T/F
2) Valves S.B. and D.B can be open at the same time. T/F
3) Liquid moves through the pump on every stroke. T/F
4) The direction of the piston stroke affects the amount of liquid pumped. T/F
5) Liquid enters at the top of the pump. T/F

GRAMMAR BOX – 'Can'
'Can' expresses ability. We follow 'can' with the infinitive of the main verb.

- I can speak English.
- He can speak English (not He can speaks English)

The negative form of can is 'cannot' or 'can't'

- He cannot finish the job on time.
- We can't solve the problem.

Look at the information in the table below and complete the sentences with 'can'.

Type of Saw	Metal	Wood	Thickness
Tenon Saw	✗	✓	2mm-30mm
Hacksaw	✓	✗	1mm-50mm
Ripsaw	✗	✓	30mm-300mm

1) A tenon saw …… metal 10mm thick.
2) A hacksaw ……. metal 6cm thick.
3) A ripsaw ……... wood 25cm thick.
4) A ripsaw …….. metal 15mm thick.
5) A tenon saw ……. wood 2.5cm thick.
6) A hacksaw …….. wood 5mm thick.

Complete the following sentences using 'can' and the verbs provided in the box.
Sentences may be positive or negative.

smoke	use	slacken	hold	sharpen	make

1) You …… a drill to make a hole.
2) A drill …….. a hole in metal.
3) You …… in the workshop.
4) You ……... chisels with a grinder.
5) You ……. work securely with a vice.
6) You …… a bolt with a hammer.

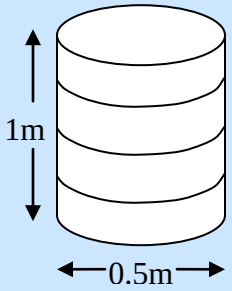
We say numbers in a variety of ways. Decide what kind of numbers are below and practise saying them with a partner.

a. 12/07/03	b. 1947	c. 5¾	d. 19.95
e. 16:54	f. 4859669	g. 863,578	h. 08:30
i. 12.67	j. 2,004	k. 2020	l. 84%

Write the full form of the following abbreviations. What are they a measurement of?

1) cm - ……	2) rpm - ……
3) psi - ……	4) mg - ……
5) mph - ……	6) Hz - ……
7) Kpa - ……	8) lb - ……
9) Kw - ……	10) hr - ……

Now describe the dimensions of the pictures below.



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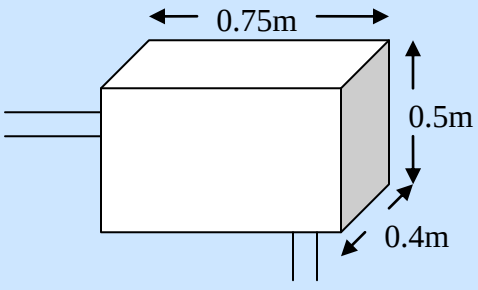

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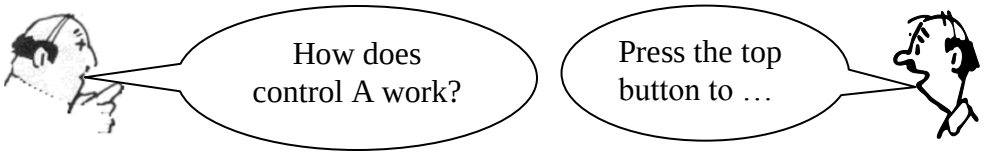
Unit 4

Giving Instructions



Giving Instructions – Unit Map

The aim of this unit is to provide the structures necessary to give and understand instructions and describe ongoing situations/activities.

- identify different types of controls and explain their use
- describe basic operations
- identify dangerous situations and give warnings
- describe what is happening at the moment of speaking

I can	Difficult	Okay	Easy
give instructions clearly			
understand instructions			
put instructions in sequence			
identify controls			
give warnings			
describe actions			
use synonyms			

I understand	Difficult	Okay	Easy
the unit grammar: imperatives			
the present continuous			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Following instructions

Put the words in the correct order to make instructions. (🎙 4.1)

1) of paper / inches / inches by four / three / cut a piece

   ……...

2) a horizontal line / one inch from / of paper / draw / the top / across the piece

   ……

   ……

3) paper into three / draw two / part of the / vertical lines to / divide the bottom / equal parts

   ……

   ……

4) carefully / vertical lines / tear up the

   ……

5) line / stop when / the horizontal / you reach

   ……

6) fold the / towards you / the paper up / left leg of

   ……

7) the right / the paper / leg of / up away / from you / fold

   ……

8) middle leg / clip on the / put the / paper / bottom of the /

   ……

9) up / stand

   ……

10) paper by / hold the / piece of / your head / the top / above

    ……

11) it / drop

    ……

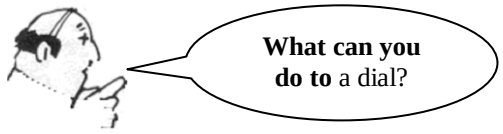
Now, follow the instructions. What do you make?

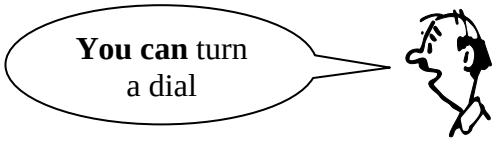
Controls and Control Verbs

Match the control verbs to the controls and check with a partner.

turn	push	pull	press	release	flick

……..	a dial	…….. …….. ……..	a handle
…….. ……..	a button	…….. ……..	a trigger
…….. ……..	a lever	…….. ……..	a switch
…….. ……..	a pedal		



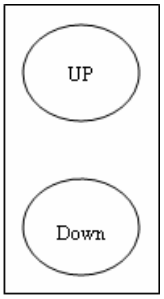


Explain the following words.

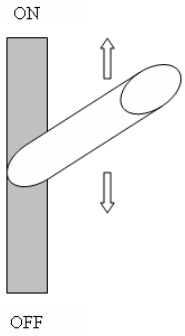
1) clockwise - ...…….
2) anticlockwise - ……..
3) set - ……
4) increase - ……...
5) decrease - ……..
6) initiate - …….
7) terminate - …….
8) raise - ……
9) lower - ……...

Now, write instructions for the following controls.

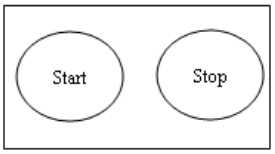
a)



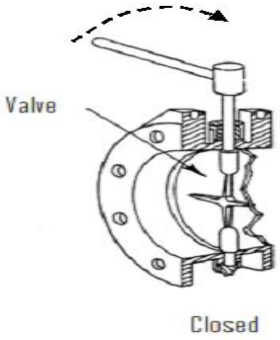
b)



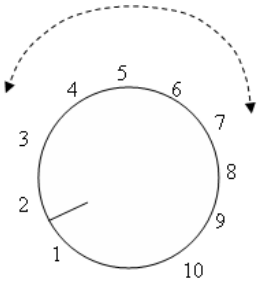
c)



d)

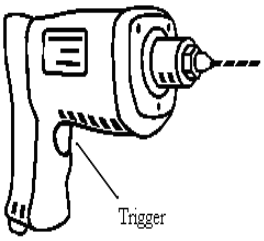


e)



Flow Rate

f)



1) ……
2) ……
3) ……
4) ……
5) ……
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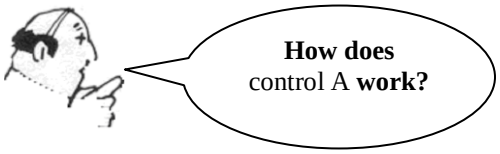
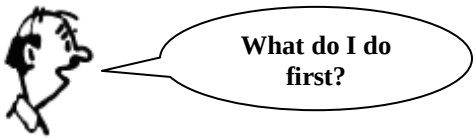
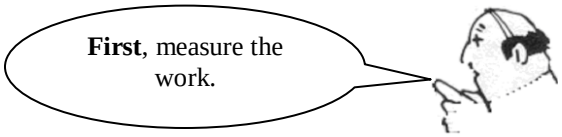
7) ……
8) ……
9) ……
10) ……
11) ……
12) ……



Using Tools

Bob wants to drill a hole and asks Tom for instructions. Put Tom's replies in the correct order and practise with a partner. (🔊 4.2)





Mark the hole		Tighten the chuck	Remove the bit from the hole
	Start the drill		Stop the drill
Drill the hole		Disconnect the drill from the power	Connect the drill to the power
	Place the bit over the mark		Remove the drill bit
Measure the work		Loosen the chuck	Attach the drill bit

1st) ……

2nd) ……

3rd) ……

4th) ……

5th) ……

6th) ……

7th) ……

8th) ……

9th) ……

10th) ……

11th) ……

12th) ……

13th) ……

Basic Operations

Check the meaning of the verbs in the box

insert	rotate	secure	adjust
remove	check	unscrew	loosen

Now, give instructions for the following situations.

I want to enter the workshop.

……
……
……
……

I want to replace a light bulb.

……
……
……
……

I want to open a lock.

……
……
……
……

I want to cut a piece of pipe.

……
……
……
……

Crane controls

Read the text below about crane controls and answer the questions that follow.

> A crane has a variety of controls. Some control the movement of the crane and some control the movement of the jib. The accelerator, brake and steering wheel control the movement of the crane. The accelerator increases the speed of the crane, the brake stops the movement of the crane and the steering wheel controls the direction of the crane. Three levels and one button control the movement of the jib. Lever A controls vertical movement of the jib, Lever B controls horizontal movement of the jib, Lever C controls the vertical movement of the load and Button A initiates an emergency stop.

1. Do the same controls control the crane and the boom?

   ……

2. Does the accelerator control the boom?

   ……

3. What is the purpose of the steering wheel?

   ……

4. Can Lever A move the boom to the left?

   ……

5. Can Lever C raise the load?

   ……

6. Which control is used if there is an incident?

   ……

Now, think about a car and write a description of the control system.

……

……

……

……

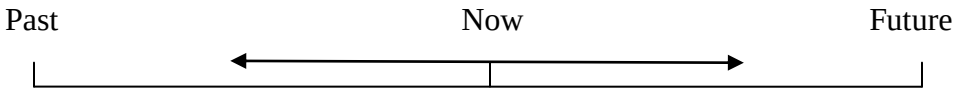
……

……

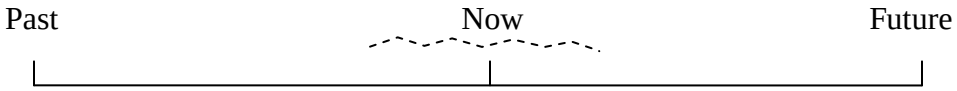
……

Describing Situations

We use **present simple** to describe a general situation: Elshan *lives* in Azerbaijan



We use **present continuous** to describe a specific situation: Bob *is living* in Azerbaijan.



Match the sentences

a) The valve doesn't work.	1. Check it.
b) The valve isn't working.	2. Replace it.
c) The room gets too hot.	1. Install air conditioning.
d) The room is getting too hot.	2. Open the window.
e) The torch doesn't work	1. Check the battery.
f) The torch isn't working	2. Use a different torch.

We form the present continuous with 'to be' and the main verb +ING.

Subject	+	**'to be'**	+	**VerbING**	
Bob		is		living	in Azerbaijan.
The valve		isn't		working	
You		are		studying	with ELS.

Answer the questions using complete sentences.

1) Is your trainer sitting down?

……

2) Are you living in London?

……

3) Are you reading?

……

4) Is your trainer wearing PPE?

……

Write three positive sentences and three negative sentences to describe what other members of your group are doing NOW.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

Look at the picture and describe what is happening. Use the verbs provided.

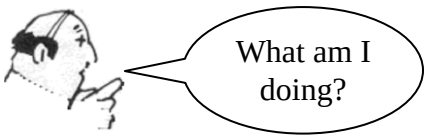
hold point

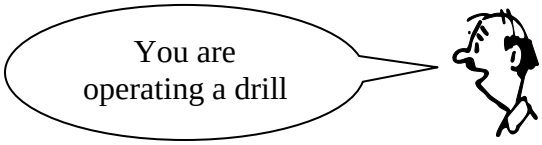
Mike ➔  ➔ Ken

wear tell

……
……
……
……
……

Think of different hand tools and mime using them to your partner. They have to guess what you are doing.





Repeat the exercise and mime doing different common actions.

Giving Warnings

To give warnings we use the infinitive form of the verb. Complete the table below and put the verbs in the correct form.

be	not/smoke	not/go	stop	not/do	put

Situation	Warning
Somebody …… (use) a circular saw without safety goggles.	……! …… some safety goggles on!
Somebody …… (talk) when the supervisor is explaining a job.	…… quiet and listen!
Somebody …… (enter) a restricted area.	…… in there!
Somebody …… (drive) and talking on a mobile phone.	…… that!
Somebody …… (smoke) near some flammable containers.	…… in here!

What warnings do you give in these situations?

a) Somebody is walking in the workshop with no PPE?

……...

b) Somebody is using scaffolding without a safety harness?

……...

c) Somebody is driving over the speed limit?

……...

d) Somebody is carrying a cup of coffee?

……...

e) Somebody is starting work without doing a risk assessment?

……...

Describe the situations below and give appropriate warnings.

Description: ……

……

……

Warning: ……

……

Description: ……

……

……

Warning: ……

……

Description: ……

……

……..

Warning: ……

……

Description: ……

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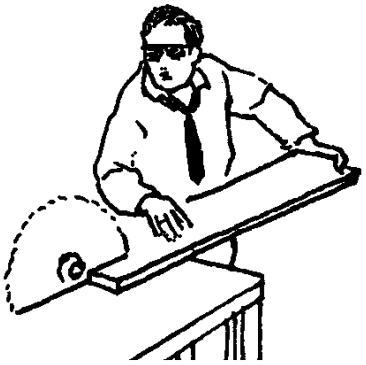
Warning: ……

……

In the Workshop

The pictures below show Bob doing some jobs in the workshop. What is he doing right? What is he doing wrong? Use present continuous.



Good points: ...……..

……

……

……

Bad points: ...……

……

……

……

Now, write rules for working in the workshop. Use present simple.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……

Complete the text using the correct form of the verb – simple or continuous

1. Bob …… (be) an electrical engineer. He …… (be) Scottish but he …… (not / be) in Scotland at the moment. He …… (work) in Algeria.
2. Mike can not hear the alarm because the machine …… (run)
3. Tom generally …… (wear) a suit to work but today he …… (wear) PPE because he …… (visit) on-site.
4. The pipe …… (leak) this morning because the valve …… (need) to be replaced.
5. **Tom**: What …… (be) the problem?
   Alan: The switch …… (not/ work) so the machine …… (not / stop)
   Tom: …… (try) the emergency shut down.
   Alan: That …… (not / work) either.
   Tom: …… (turn off) the power and …… (restart) in ten minutes.

Now, complete the text below using the verbs in the box in the correct form. (🔊 4.3)

want	find	have	do (x2)	see
enjoy	know	practise	study (x2)	explain

Ahmed …… to be an production engineer. He …… a degree and at the moment he …… a training course. On the course they …… all the aspects of his speciality and …… in the workshop and on site. He …… the training that happens on site because then he …… how things work in action and not just in theory. This week they …… pigging. He …… some things already but …… the course useful, especially when their trainer …… about the different types of pig and what they ……

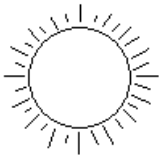
The Weather

The weather has a very important effect on the oil industry and the things you can do. Solve the anagrams to identify the weather conditions in the pictures below.

1) y r i a n

2) d y o l u c

3) n s y u n



4) w o n y s

5) w y d n i

6) g f y g o

Now, match the weather conditions with the descriptions.

icy	electricity discharges from a cloud
mist	the sound of electricity discharged from a cloud
lightning	ice falling from clouds
thunder	rain and snow together
sleet	thin fog
hail	frozen water on the ground

To talk about the weather we can use adjectives or we can describe what is happening:

or
- It is sunny
- The sun is shining

or
- It is raining
- It is rainy

Listen to someone talking about the weather (🔊 4.4) and then write a similar description of the weather toda

……

Which weather conditions are dangerous for the following operations? Why? Discuss your ideas with a partner and present your ideas to the group.

a) Helicopter flights
b) Crane operations
c) Digging
d) Scaffolding
e) Driving
f) Drilling

Crane Operations

Complete the text with the words in the box and answer the questions that follow

field of vision	paying attention	Otherwise,	clear and correct	in doubt
not sure	For instance	be sure	at all times	signal person

Crane operations need a signal person (a spotter). …… the operator may not be able to see the load and cause a lot of damage. ……:

- they may attempt a lift before the load is secured,
- they may lower the load on top of people, or
- swing the boom into the structure.

The signal person is the one who can help the operator use the crane safely. To do this, three things are important:

- the operator must see the signal person or be in contact ……,
- the signals they give the operator must be ……, and
- both must understand the meaning of each signal.

Problems that can happen

- As the boom swings, the operator can lose sight of the signal person if they don't stay within the operator's …….
- Carelessly given signals are difficult to understand. If you are careless in giving signals to the operator, they won't …… what to do, or worse, may mistake your signal for another one, *causing an accident.*
- It will be difficult to give the right signals to the operator if you're not ……..

Crane safety tips

- If you're ever ……, stop and wait for a signal.
- Have one signal person for each crane.
- If you're the operator, know who and where your …… is at all times. Both operators and signal persons must know each crane signal. If you're ……, take the time to learn the signals *before* the next lift.

1. What is the job of the operator?

   ……..

2. What is the job of the spotter?

   ……..

3. What can happen if the operator can not see the spotter?

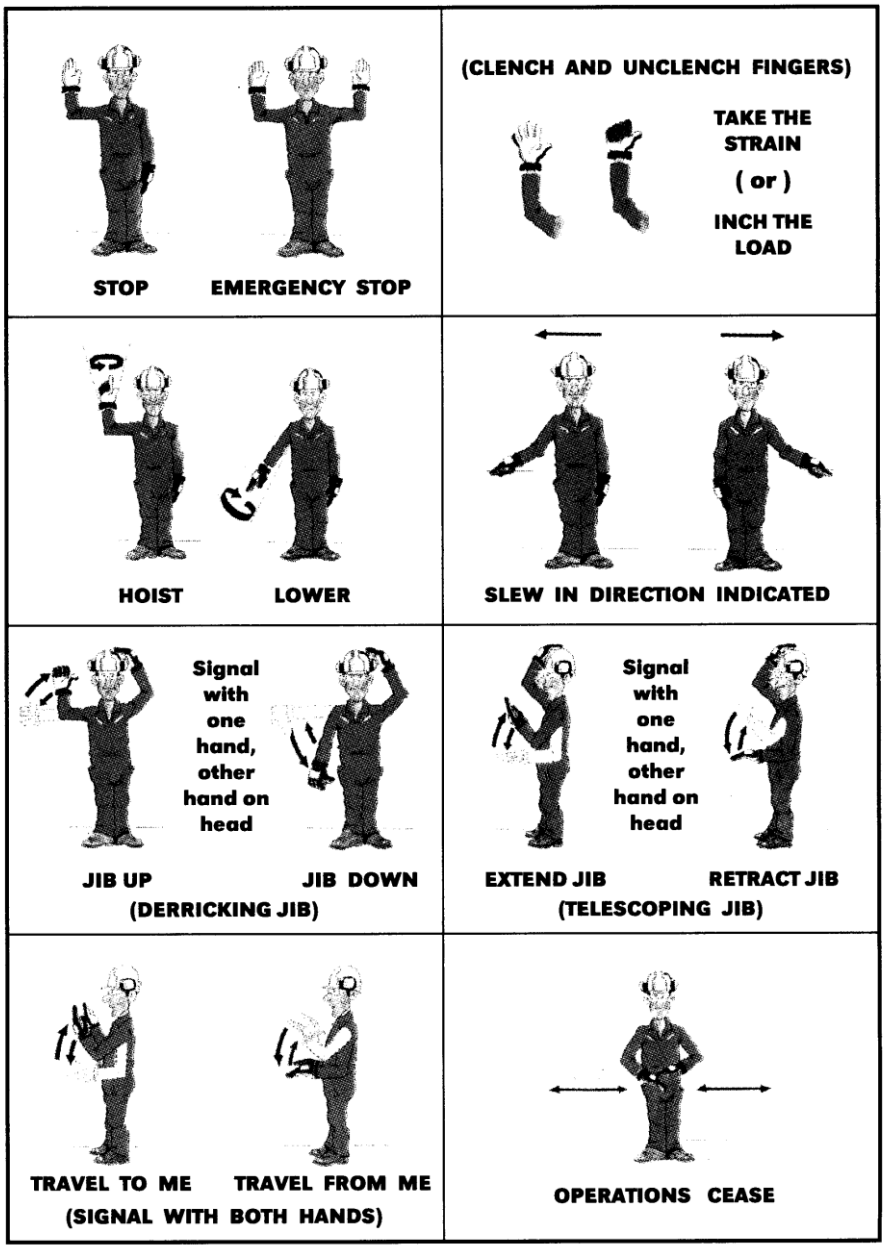
   ……..

4. What can happen if the spotter does not give clear instructions?

   ……..

Hand Signals For Crane Operations

Look at the guideline below for hand signals used for crane operations. Write down a sequence of instructions and then give those instructions to a partner who is standing on the other side of the room using the appropriate hand signals. They have to write down the instructions you give them in the correct sequence.



Synonyms

Many words in English have synonyms – other words with a similar meaning but not always *exactly* the same meaning. Think about the differences between the synonyms for 'change' listed below.

Change - Adjust
Adapt
Develop
Convert
Evolve

Now match the words in the box with their synonyms in the table

typical	observe	indicate	affect	very
perfect	smart	complex	keep	get

	Synonym
Usual	**……**
Extremely	**……**
Sophisticated	**……**
Intelligent	**……**
See	**……**
Change	**……**
Retain	**……**
Capture	**……**
Show	**……**
Ideal	**……**

Now, complete the sentences using the words above.

1. It is a very …… piece of equipment used to measure …… small changes in pressure.
2. Heat …… the flow rate so if you …… any irregular readings report them immediately.
3. A …… pig is only used to clean the inside of pipelines but there are some …… pigs that can also take useful measurements.

Unit 4 – Giving Instructions

accelerate
accelerator
adjust
adjustment
appropriate
attach
attachment
attempt
brake
capture
careless
clip
cloudy
complex
develop
evolve
extremely
flick
foggy
fold
for instance
general
generalise
hail
hoist
horizontal
ideal
initiate
insert
jib
lever
loosen
mark
otherwise
pedal
pigging
release
retain
scaffolding
sleet
slew
smart
sophisticated
specific
spotter
steering wheel
sunny
tear
termination
terminate
tighten
typical
unscrew
valve
vertical
windy

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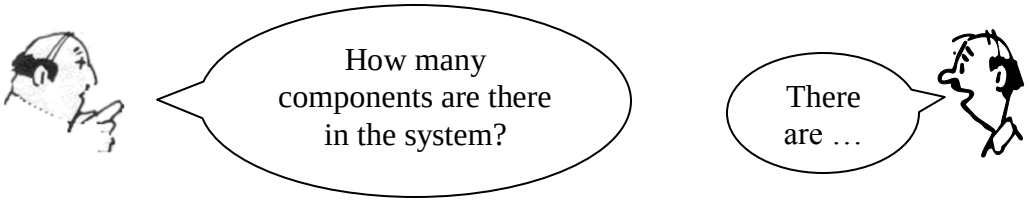
Unit 5

Describing Systems



Describing Systems – Unit Map

The aim of this unit is to provide the structures necessary to describe systems and explain technical drawings. By the end of the unit you will be able to:

- identify the parts of a system
- assess the advantages and disadvantages of systems
- explain the consequences of actions
- identify some P&ID symbols
- construct logical system descriptions

I can	Difficult	Okay	Easy
describe basic electrical systems			
describe basic systems			
explain the purpose of parts of a system			
Use tag numbers for equipment			
describe flow measurement systems.			

I understand	Difficult	Okay	Easy
the unit grammar: zero conditional			
adverbs of frequency			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Describing Systems

To describe a system you must identify the parts of the system, the purpose of those parts and how they interact with each other. Descriptions must be clear and concise so people can understand the system easily.

Read the following system description and answer the questions. Check your answers with a partner.

> This is a pressure measurement system. It consists of a monitoring device, a generator, a back-up generator, a relay, an alarm, a control panel and a visual display unit. The monitoring device measures the pressure in the pipeline and relays the information via the relay to the visual display unit. If the pressure reaches a pre-set low low level the alarm sounds and alerts the operator. The operator can then use the control panel to initiate an emergency shutdown. Power is provided to the system by a generator. There is a back-up generator which comes online in the event of a failure in the primary generator or when the primary generator is undergoing maintenance.

1) How many components are there in the system?

   ……

2) What is the purpose of the relay?

   ……

3) What does the monitoring device do?

   ……

4) When does the back-up generator start?

   ……

5) What does the control panel do?

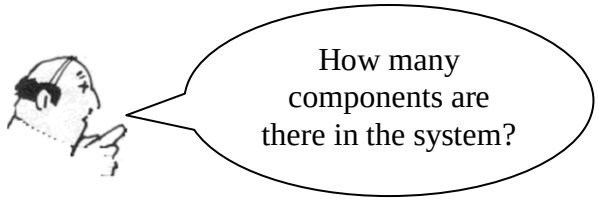
   ……

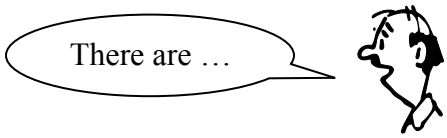
6) How does the operator know if there is a problem?

   ……

7) What is the purpose of the system?

   ……

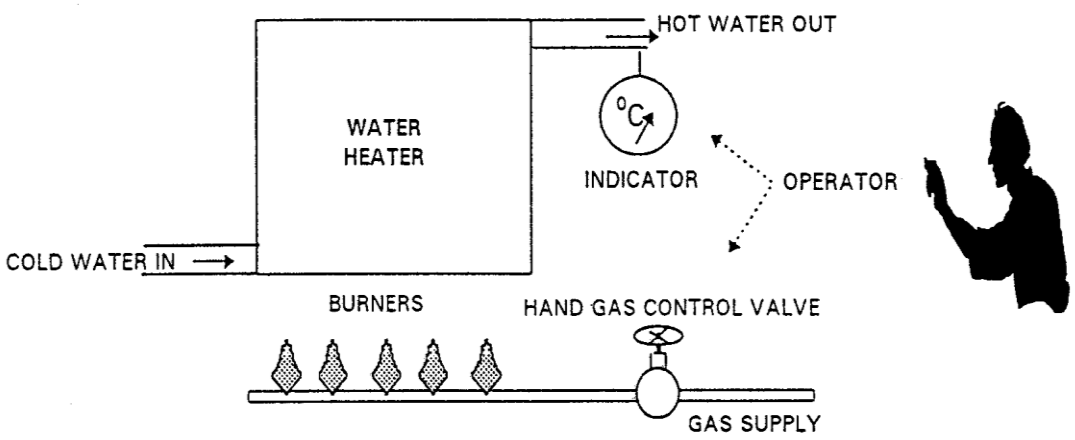




Open Loop Systems

Open loop systems are manual control systems. Look at the heating system below and describe how it works. Include information from the table about advantages and disadvantages of open loop systems.

Advantages	Disadvantages
• Cheap • Easy to install • Easy to maintain • Simple to operate	• Operator must be in place at all times • Can not be used in dangerous areas • Some processes are faster than operator reactions • Human error can cause an accident



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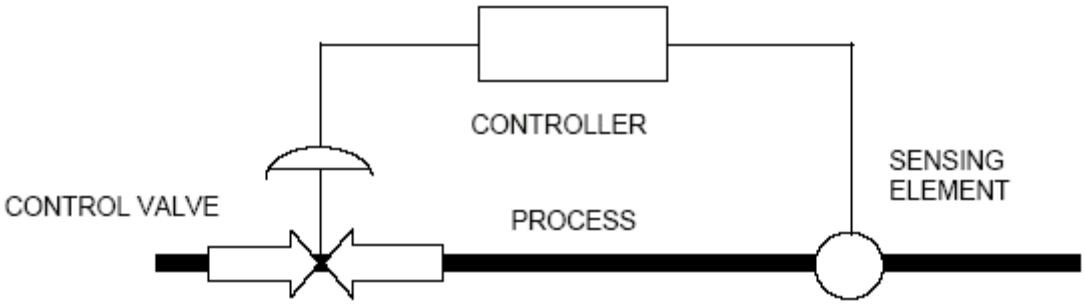
Closed Loop Systems

A closed loop system controls itself automatically – a controller takes the place of the operator. It is used to control a variety of processes including level, temperature, flow or pressure. Look at the diagram below and describe how a closed loop system works. Use the words provided in the box in an appropriate form.

monitor	pre-set	initiate	regulate	signal	flow



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Now, compare your descriptions and discuss the following questions with a partner.

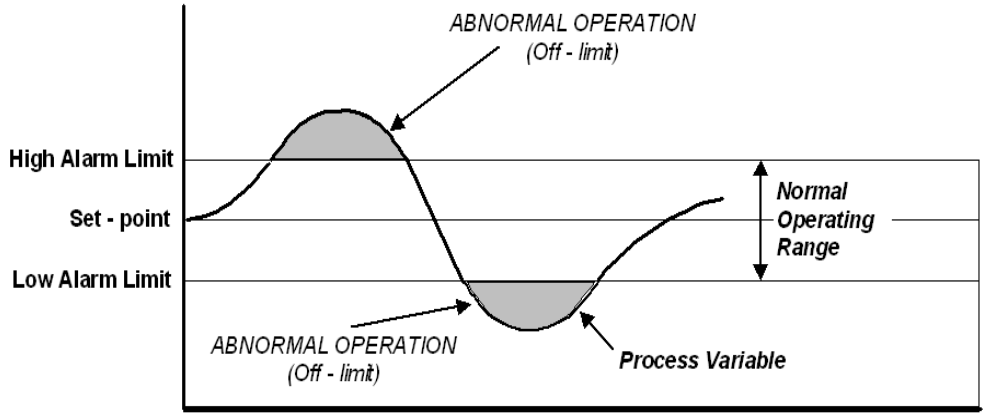
- What are the advantages of closed loop systems?
- What are the disadvantages of closed loop systems?
- What happens if the sensing element malfunctions?
- What happens if the control valve malfunctions?

Alarm Systems

There are two types of alarm - audible or visual. Often, both types of alarm are used to ensure the operator reacts to the problem. The audible alarm warns the operator there is a problem and the visual alarm can give a more specific indication of what the problem is.

Alarms operate to warn the operator if a process is operating outside the pre-set operating range (see the diagram below). The alarm system performs a very simple and important function. It is basically an ON-OFF control circuit that uses a limit-sensing device connected to a warning device. Depending upon the process variable, the limit-sensing device will be a pressure switch, a float-operated switch, a temperature switch or a flow actuated switch.

Each device responds to a specific process condition and acts to close an electrical switch mechanism. Once the switch contacts have been closed, an electrical circuit is energised to activate the alarms.



Now, answer the questions:

1. Why are audible and visual alarms sometimes both used?

   ……

   ……

2. What is the purpose of an alarm system?

   ……

   ……

3. How is an alarm activated?

   ……

   ……

4. What processes is this kind of alarm system suitable for?

   ……

   ……

Conditionals

A conditional sentence uses 'if'. It explains the consequence of an action i.e.

Action	Consequence
If the pressure is high	the alarm sounds
If the valve is closed	the oil flows to the overflow tank

These are **zero conditional** sentences. We often use zero conditional sentences to describe systems because this kind of sentence describes something that is generally true. It does **not** describe a specific situation at a definite time.
We make the zero conditional by:

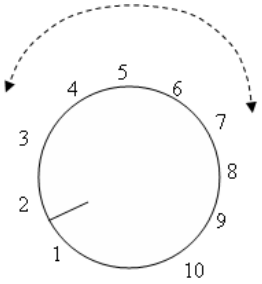
If + present tense, + present tense

Match the consequences in the box below to the actions in the table. Complete the last two sentences with your own ideas.

there may be an explosion	accidents should be avoided	the back-up system comes on-line
the lights are red	it becomes brittle and breaks	evacuate the building

Action	Consequence
If the primary system fails	
If rubber is cooled to -200^{o}C	
If safety measures are followed	
If the switch is in the off position	
If the temperature rises to over 400^{o}C	
If the alarm sounds	
If the pressure is too low	
If there is a fire	

Now, look at the diagrams and write zero conditional sentences to describe them.



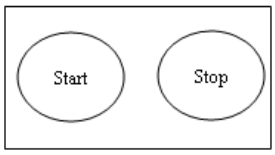
Flow Rate

If the dial turns clockwise ……

……

If the dial turns anticlockwise ……...

……



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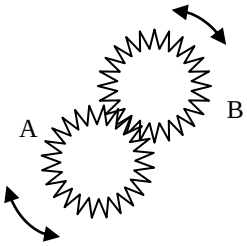

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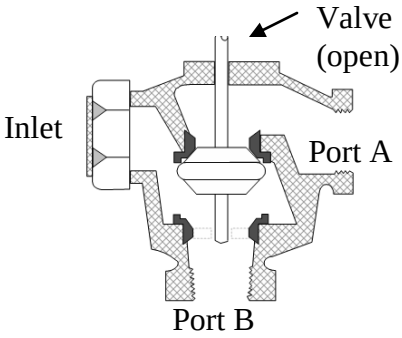

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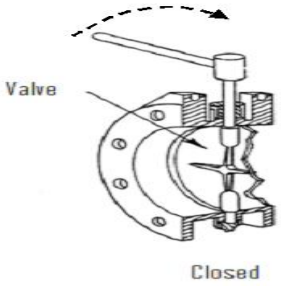

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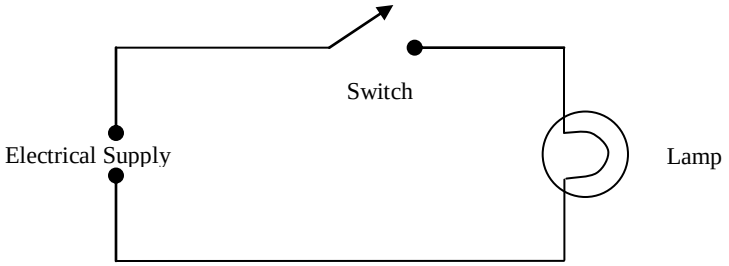
THE ELECTRICAL CIRCUIT

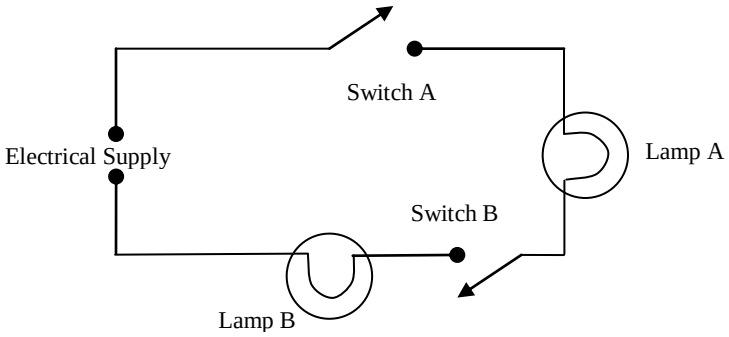


The diagram above shows a basic electrical circuit. It consists of an electrical supply, a switch and a lamp (the electrical load). The parts are connected with insulated wires (conductors). If the switch is in the on position the circuit is made and the electricity powers the lamp. If the switch is in the off position the circuit is broken and the lamp goes off.

Complete the sentences:

- If the circuit is closed …….
- If the circuit is open ……

Now, write a similar description for the system below



……

……

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……

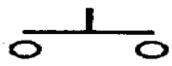
Complete the sentences:

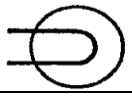
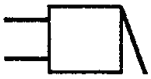
- Lamp A lights if …….
- Lamp B lights if …….
- Lamp B doesn't light if …… but

  …….

Describing Electrical Systems

Use the information in the legend below to draw a basic electrical system and then describe it to your partner. Draw the system your partner describes to you.

			
fuse	switch	push button (normally open)	battery

			
work	bell	buzzer	contact (normally closed)

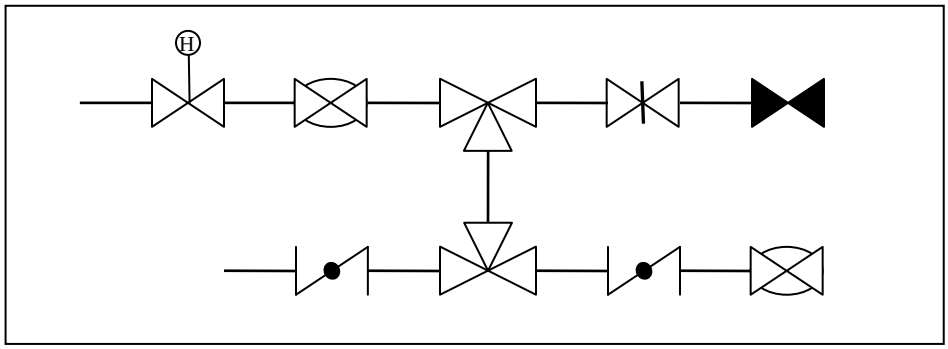
Your Diagram:

Your Partner's Diagram:

Adverbs of Frequency

The diagram below shows a network of valves in a system. Label it with the names given.

Gate valve	Butterfly valve	Three way valve
Hand operated control valve	Ball valve	Normally closed valve



It is an old system and some of the valves need replacing. Look at the information below and rank the first six valves that need to be changed.

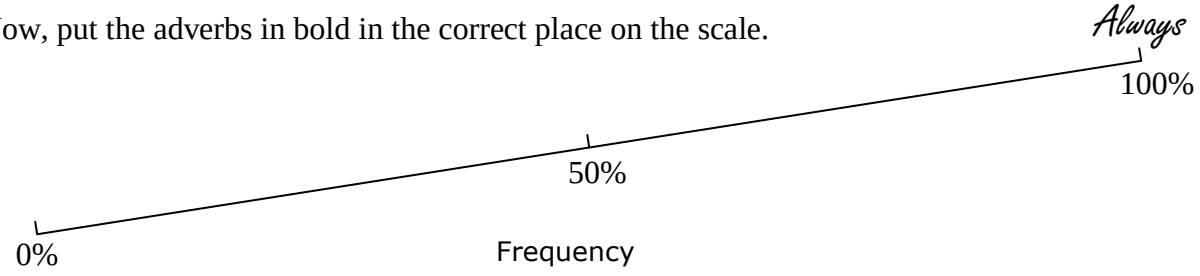
- The hand operated control valve **never** leaks
- The first ball valve **seldom** leaks
- The first three-way valve **always** leaks
- The gate valve **usually** leaks
- The normally closed valve **occasionally** leaks
- The second three-way valve **often** leaks
- The left butterfly valve **frequently** leaks
- The right butterfly valve **sometimes** leaks
- The second ball valve **rarely** leaks

1st) …… 4th) ……

2nd) …… 5th) ……

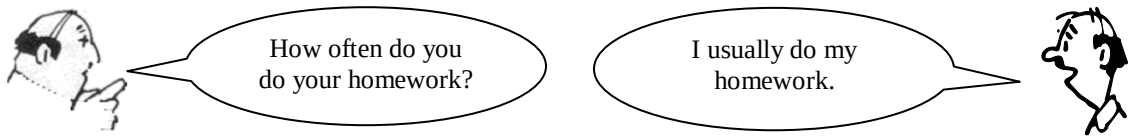
3rd) …… 6th) ……

Now, put the adverbs in bold in the correct place on the scale.



Now, interview a partner about learning English. For each question ask extra questions to get more details i.e. if the answer is 'never' then you could ask why not.

How often do you …	Frequency	Details
… study English at home?		
… watch films in English?		
… read things in English?		
… speak in English with colleagues?		
… do your homework?		
… try to improve your English vocabulary?		
…		



Work together to think of ideas of how you could improve your English outside the classroom. What are the best ways to expand your vocabulary? What opportunities do you have to use English?

……

……

……

……

……

Process and Instrument Drawings

Process and Instrument Drawings (P&IDs) are a simple way to show complex industrial systems, using standard abbreviations and symbols. Work with a partner on the exercises below.

1) What do you think are the abbreviations for the common equipment below?

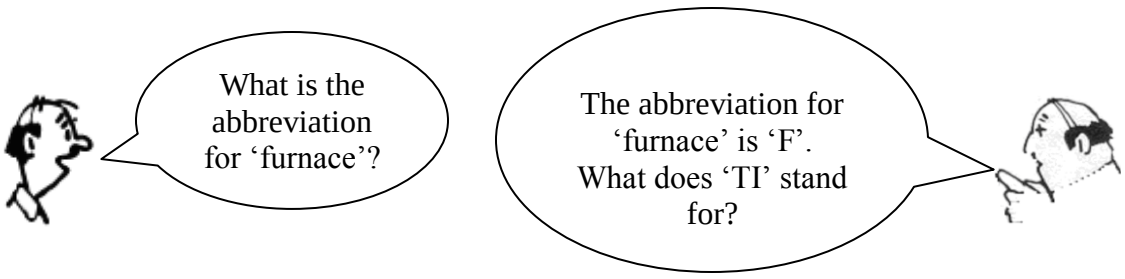
Tank	……	Compressor	……
Pump	……	Filter/Strainer	……
Heat Exchanger	……	Ejector	……
Furnace	……	Reactor	……

2) What do you think are the abbreviations for the processes and instruments below?

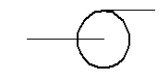
Pressure	……	Controller	……
Flow	……	Alarm	……
Speed	……	Recorder	……
Temperature	……	Indicator	……
Level	……	Transmitter	……

3) What do the following abbreviations mean?

LI	……	TI	……
PA	……	LRC	……
FR	……	SIC	……
FIC	……	PRI	……

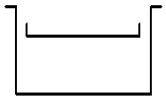


Now, look at some of the common symbols below. Read the explanations that follow and draw the appropriate symbol.

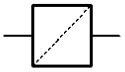


Compressor, blower or pump basic symbol

Electric motor



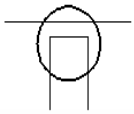
Floating roof tank



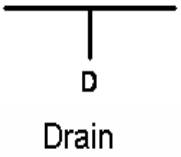
Filter, basic symbol

Butterfly Valve

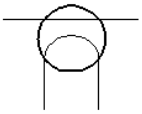
Four way Valve



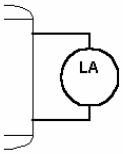
Cooler/condenser



Drain



Heater



Level Alarm

This device provides power to the system		This device stops the flow in the pipeline	
This device removes solid particles from the liquid		This device redirects the flow in the pipeline	
This device stores liquid		This device allows liquid to leave a tank	
This device heats the liquid		This device warns the operator if the level is high-high	
This device cools the liquid		This device moves the liquid along the pipe	

Tag Numbers

In addition to using symbols P&IDs also use tag numbers. Tag numbers are unique to pieces of equipment. This number indicates the function of the equipment using a letter and is coupled to a series of numbers that identify the unit and the individual equipment number.

Match the sentences below and write the description of the system below in a logical order.

PR427-C automatically closes	for measuring high pressures.
The PR monitoring systems	high high level the alarm PR427-A alerts the operator
PR427-C2	system PR427-C2
This leads to	if both PR427-C systems fail
The PR427-C has a back-up	valves PV576A/B.
The PR427 series are suitable	initiates if PR427C malfunctions.
When the pressure reaches a pre-set	a reduction in the flow and lowers the pressure.
The operator also has emergency override PRO993	are used to monitor pressure.

The PR monitoring systems ……

……

……

……

……

……

……

……

……

……

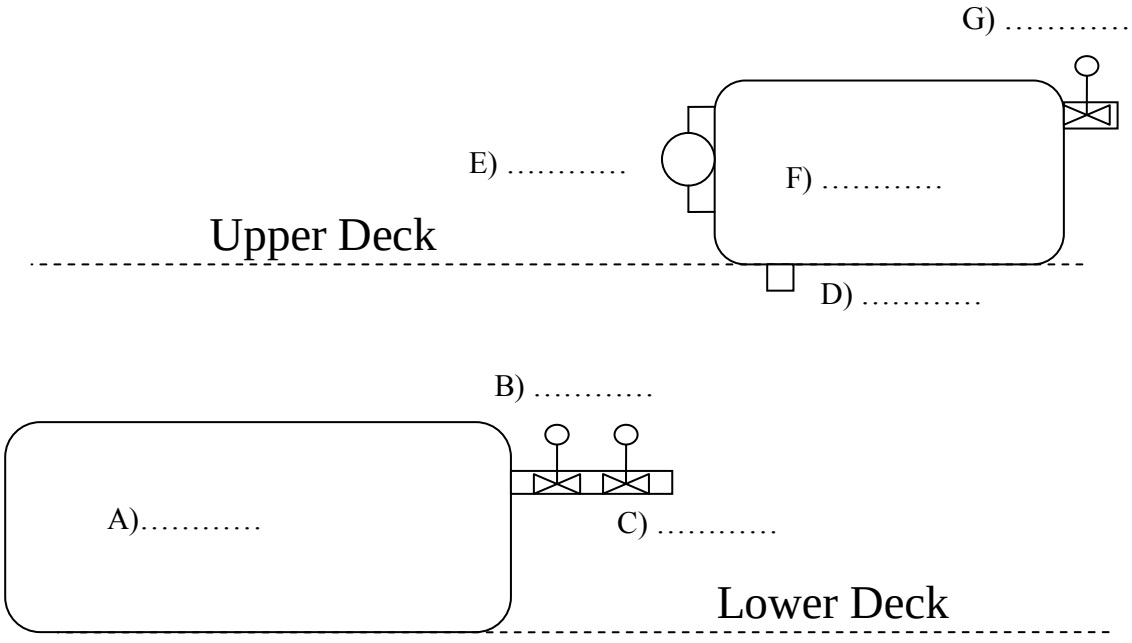
……

Filling a Tank

Choose the best word to complete the text.

1) a) under	b) on	c) in
2) a) feed	b)feeds	c) fed
3) a) from	b) at	c) in
4) a) filling	b) fill	c) fills
5) a) continue	b) maintain	c) stay
6) a) overflowing	b) is overflowed	c) overflows
7) a) empty	c) disconnect	c) lose
8) a) Mark	b) Marked	c) Marks

The T-4501 is a water storage tank located 1) …… the upper deck. Water is 2) …… to T-4501 from T-3501 located on the lower deck. To fill T-4501 connect a hose 3) …… 3501-MV-028 to T-4501 tank fill nozzle N4. Then open manual valves 3501-MV-005 and 3501-MV-028 to begin 4) …… the tank. Open oil skim nozzle isolation valve 4501-MV-006 and 5) …… to fill the water tank until water 6) …… from the oil skim nozzle. Close hose supply valve 3501-MV-028, close isolation valve 3501-MV0005 and then 7) …… the hose. Close 4501-MV-006. 8) …… the liquid level on level gauge 4501-LG-102.



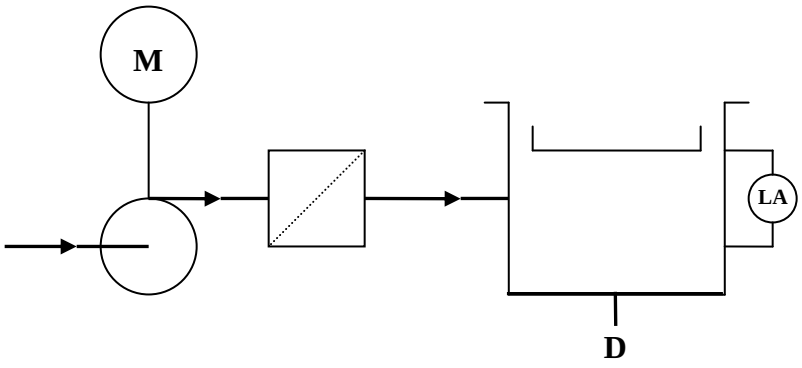
Now, label the following on the diagram above and draw a hose showing how the two tanks are connected.

1. T-4501
2. T-3501
3. 3501-MV-028
4. N4
5. 3501-MV-005
6. 4501-MV-006
7. 4501-LG-102

Read the description and draw the system in the box using the P&ID symbols.

The system is powered by an electric motor. The motor powers a pump which forces the oil through the pipeline. The temperature of the oil is monitored by a temperature recorder. If the temperature reaches a pre-set low level the oil is directed to a heater by a four way valve. If the temperature reaches a pre-set high level the oil is directed to a cooler. If the oil is at an appropriate temperature it flows directly to a floating roof tank.

Now, look at the diagram below and write a description of the system. Describe the flow of the oil (➞) and the purpose of each piece of equipment.



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Relative Clauses

When we want to give a lot of information about something we don't always want to repeat the name. Compare the following sentences.

- The FMA193/A alerts the operator if the flow is outside pre-set levels. The FMA193/A is connected to the flow measurement and control systems.

- The FMA193/A, which alerts the operator if the flow is outside pre-set levels, is connected to the flow measurement and control systems.

By using a relative clause we can give additional information about something. We make a relative clause by replacing the subject with a relative pronoun. Combine the following sentences using relative clauses and 'which', 'who' or 'that'

1) Mike is an operator. Mike works a four and two rotation.

   ……

2) The main pump forces the oil through the pipeline. The main pump is powered by a gas turbine.

   ……

3) The butterfly valve can fully close the pipeline. It is controlled by a handle.

   ……

4) The emergency shutdown is on the control panel. It can fully close the system within ten seconds.

   ……

5) Sarah is a lead engineer. She works on an oilrig. The oil rig is in the North Sea.

   ……

If we want to define something we can also use a relative clause. Complete the sentences with one of the words in the box.

which	where	who	when

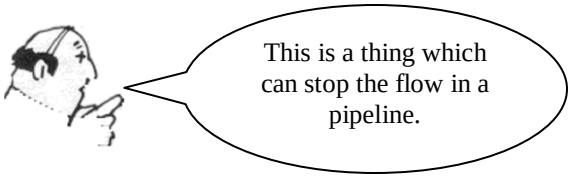
1) A heater treater is a piece of equipment …… water and oil are separated.
2) An alarm is something …… alerts the operator to a problem.
3) A fire drill is a time …… the fire procedures are practised.
4) A driller is someone …… operates the drilling machinery.

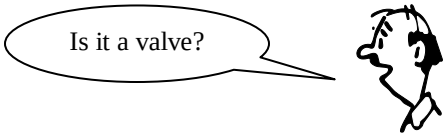
Now, write definitions for the following.

roustabout	geophones	reservoir	shift	rig

1) ……
2) ……
3) ……
4) ……
5) ……

Work with a partner and test your colleagues. Write definitions for pieces of equipment or jobs. Read your descriptions and see how many your colleagues can guess.





Read the text and answer the questions.

The Lincon9384-A and Lincon9384-B are both storage tank facilities. The Lincon9384-A, which can hold twice as much as the Lincon9384-B, is used to hold produced water which is released from the heater treaters. When the Lincon9384-A is full excess water is sent to the Lincon9384-B via the overflow pipe OP4359 which is closed by gate valve GV384765-G during normal operations. The Lincon9384-B comes online as a back-up system when the Lincon9384-A is undergoing maintenance. Flow is diverted to the Lincon9384-B by three way valve TWV85766, which can also divert flow directly to the next stage of water treatment if required.

1) What is the purpose of Lincon9384-A/B?

   ……

2) Is there a size difference between Lincon9384-A and Lincon9384-B?

   ……

3) When does flow go to Lincon9384-B?

   ……

4) What is the purpose of GV384765-G?

   ……

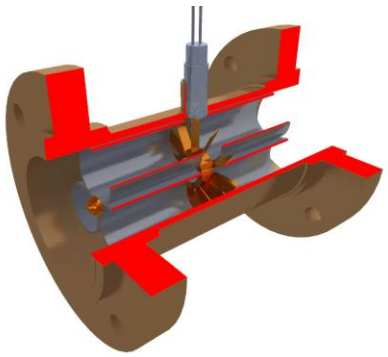
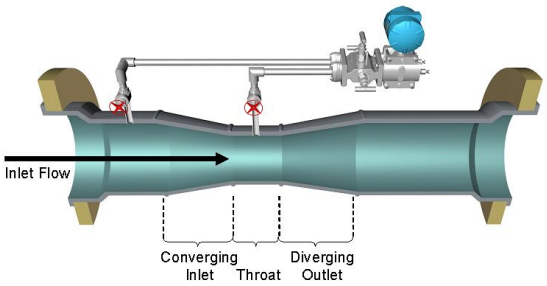
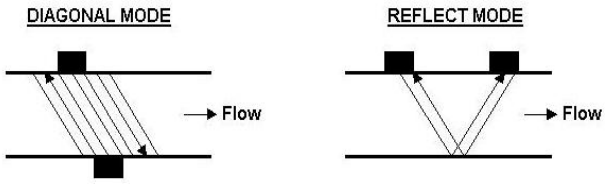
5) Where can TWV85866 direct flow?

   ……

Flow Measurement

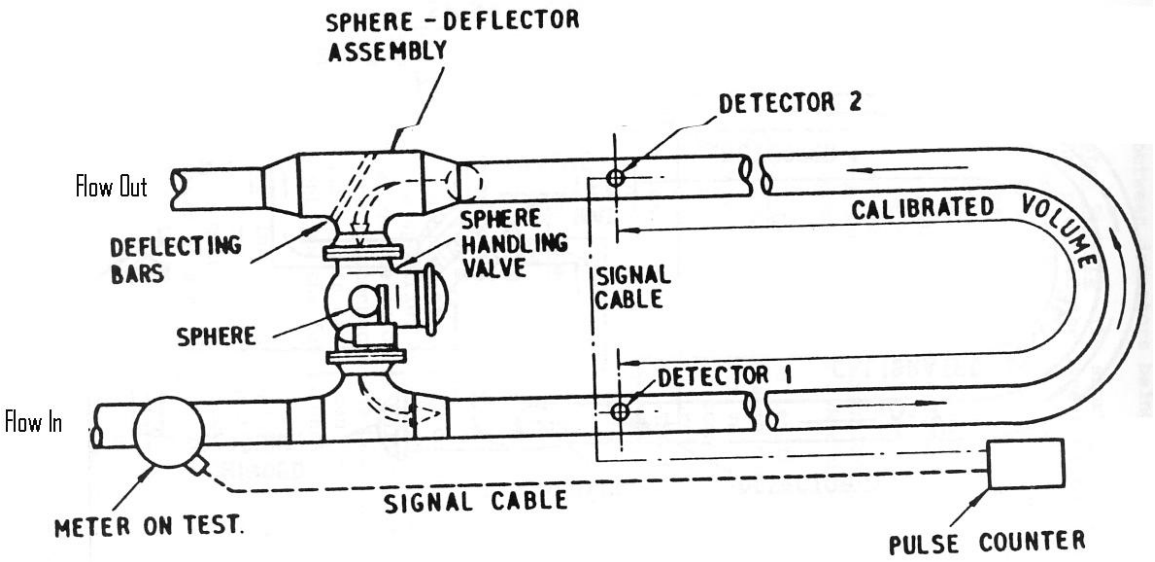
The flow rate of a well shows us how much fluid is being produced at a given time. There are different methods of measuring flow, depending on the requirements of the well. An important factor they all share is the need for laminar (straight) flow to get an accurate picture of the flow rate. Outlined below are brief descriptions of different flow metres.

Read the descriptions and complete the table on the following page.

Turbine Meters At the centre of all turbine metres is a free spinning rotor whose speed of rotation is proportional to the flow rate. As the gas or liquid passes through the pipeline it turns the rotor and this movement can be measured to give the flow rate. The main disadvantage of this kind of measuring device is that it has an effect on the pressure in the pipeline and disrupts the flow.	
Venturi Meters A venturi meter measures the pressure in the pipeline before the converging inlet and then at the throat. By calculating the differential in pressure between these two points the flow rate can be calculated. An advantage of this kind of device is that it has little effect on downstream pressure and flow.	
Ultrasonic Meters By sending an ultrasonic signal through the pipeline the flow rate can be calculated from the time it takes for a signal to be transmitted and received. While this method is non-invasive and has no effect on pressure or flow rate it is limited in use to fluids that are ultrasonically conductive and have a well formed flow.	

Type of Meter	How Flow is Measured	Advantages/Disadvantages
Turbine		
Venturi		
Ultrasonic		

To prove all flow meters we need to measure the flow under controlled conditions. This can be done by measuring the time it takes the fluid to push a displacer a known length along a pipeline. The diagram below shows a unidirectional prover that uses a sphere as a displacer. Discuss the diagram with a partner and then make a presentation to the group explaining how the system works.



What is the purpose of the sphere deflector assembly?

The deflector assembly stops the sphere entering the main pipeline

Describing Systems – wordlist

back-up
brittle
concise
converging
deck
differential
displacer
diverted
energise
excess
float
frequently
generator
hose
interact
laminar
loop
mechanism
non-invasive
nozzle
pre-set
primary
proportional
prover
rarely
relay
regulate
rotor
seldom
tag
throat
ultrasonic
undergo
unidirectional
variable

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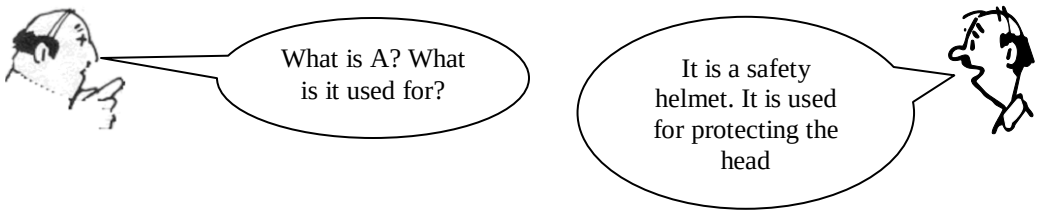
Unit 6

Safety



Safety – Unit Map

The aim of this unit is to provide the language and structures to talk about safety, both in terms of identifying hazards and reporting incidents. By the end of the unit you will be able to:

- identify parts of the body
- identify different types of injury
- identify and explain the use of PPE
- identify safety signs
- identify hazards
- report incidents using appropriate language

I can	Difficult	Okay	Easy
name parts of the body			
recognize and explain safety signs			
name and explain the use of safety equipment			
name different types of injury			
use the past tense to describe incidents			
complete incident reports			
identify different types of hazard			
Explain BP's 8 Golden Rules of Safety			
Identify uses of question words			

I understand	Difficult	Okay	Easy
the unit grammar: Past simple			
Past continuous			
First conditional			
word formation			
the unit vocabulary (see word list)			

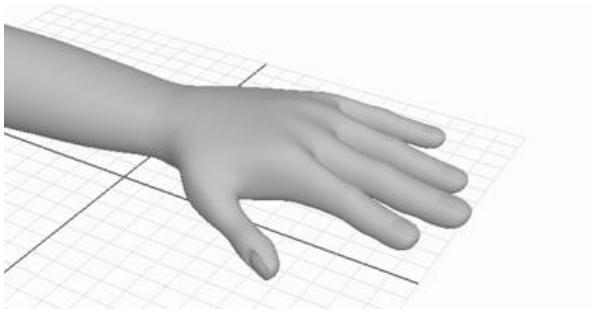
If there is anything you are not sure of ask you trainer to revise the material.

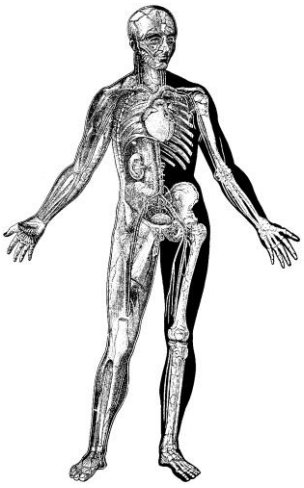
Parts of the Body

Put the words in the box in the correct column and then label the pictures below.

toe	neck	thumb	finger	back
shoulder	chest	elbow	ankle	ear
face	leg	nose	mouth	eye
hand	foot	knee	arm	wrist

Torso	Head	Limb	Joint





Types of Injury

Read the paragraph and identify the types of injury in the pictures. For one of the pictures more than one answer is possible.

…….. …….. ……..

There are different types of injury. A fracture is when you break a bone. There are two types of fracture. A normal fracture is a simple break. A compound fracture is when you break a bone and it comes out of your body. A sprain is when you twist and damage a joint i.e. ankle or wrist. A laceration is when you cut your skin and a contusion is when you bruise an area of your body. A dislocation is when a joint is separated.

Read the medical report below and indicate on the picture where Alan was hurt and how serious the injury is.

Alan was in an accident and **sustained** lacerations to the face, **multiple** fractures to the left leg and **severe** contusions to the left side of his body. He also sprained his right ankle and sustained some **superficial** lacerations to his right knee as well as dislocating his right thumb.

Alan

What do the words in bold mean?

sustained - …… **multiple** - ……

severe - …… **superficial** - ……

Alan was in a second incident. Listen to the report and indicate where he was hurt.

Word Forms

There are different parts of speech. Match the parts of speech in the box to the words in the sentence below.

preposition	pronoun	adverb	verb	adjective	conjunction	verb	article	noun

Bob	walked	quickly	and	slipped	on	the	wet	floor.
……	……	……	……	……	……	……	……	……

Now, identify the form of the words in bold below and use the correct form of the word to complete the sentences.

a) **safe** – …… **unsafe** – …… **safety** – …… **safely -** ……

1) An …… action is one that can cause an accident or injury.
2) …… is everybody's responsibility.
3) Always check conditions are …… before you start work.
4) Always drive ……

b) **hazard** – …… **hazardous** – ……

1) A …… is a possible danger.
2) Acid is a …… liquid.

c) **communication** – …… **communicate** – ……

1) It is important to …… clearly with your colleagues.
2) Good …… makes the workplace safe.

d) **correctly** – …… **incorrect** – …… **corrective** – ……

1) It is …… to enter the workshop without PPE.
2) You should tell someone if they do something ……
3) …… training can stop someone doing unsafe acts in the future.

e) **observe** – …… **observation** – …… **observant** – ……

1) If you …… an unsafe act, you should talk to the person.
2) Always be …… at work to see any possible hazards.
3) …… and communication are the keys to safety.

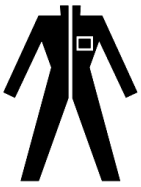
Personal Protective Equipment

Identify the PPE in the pictures below and say what it is used for.

What is A? **What is it used for**?

It is a safety helmet. **It is used for** protect**ing** the head

a) 

b) 

c) 

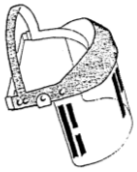
d) 

e) 

f) 

g) 

h) 

i) 

a) ……

b) ……

c) ……

d) ……

e) ……

f) ……

g) ……

h) ……

i) ……

Listen to the cassette. What PPE do the technicians need? (🎧 6.2)

Safety Gloves

Read the text and complete the table.

Hands and fingers are the part of the body most at risk of injury. Your hands are your principal tools and it is important to look after them. One way to protect your hands is to wear appropriate gloves. There are different types of glove available that are suitable for different jobs. Disposable gloves protect the hands against mild irritants but chemical resistant gloves protect hands against corrosive chemicals. Fabric gloves are lightweight gloves that improve grip so you can hold slippery objects. They are also useful for protecting hands against mild heat or cold. Leather gloves are heavy duty gloves that offer more protection. They insulate the hands against heat and cold and they are also able to protect the hand when working with sharp objects or rough edges. However, no pair of gloves can protect you from not concentrating on the job.

Type of glove	Heat	Cold	Corrosives	Carelessness	Sharp Edges
	×	×	×	×	×

Look at information above and then decide which type of gloves are suitable for the following situations.

1) Working outside in winter - ……
2) Handling cut pieces of pipe - ……
3) Handling barrels of solvents - ……
4) Cleaning an oil spill - ……
5) Using a cutting machine - ……
6) Welding - ……
7) Handling irritating chemicals - ……
8) Handling greased machine parts - ……

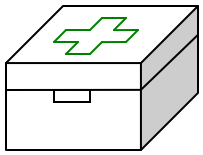
Safety Equipment

Solve the anagrams to identify the safety equipment below and explain why it is used to a partner.

a) 

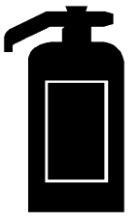
chamnei graud

……

b) 

ftirs dai tki

……

c) 

eifr tnusehxigire

……

d) 

steyfa gnis

……

e) 

etfasy epat

……

f) 

brrraei

……

g) 

sag smak

……

h) 

elarf

……

i) 

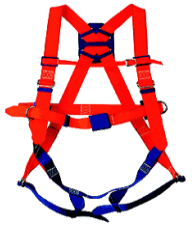
eilf yobu

……

j) 

file enil

……



setfya seharsn

……

efayst econ

……

What is A? **Why is it used**?

It is machine guard. **It is used to** protect you when you use cutting machinery

8 Golden Rules

Read the text and explain the following words below, give synonyms if possible.

Getting the basic right

BP's safety policy states no harm to people and no accidents. Everyone who works for, or on behalf of, BP is responsible for their safety and the safety of those around them.
The following safety rules will be strictly enforced to ensure the safety of our people and our communities.

Although embedded in each of these rules, it is important to emphasize that:

- *work will not be conducted without a pre-job risk assessment and a safety discussion appropriate for the level of risk.*
- *all persons will be trained and competent in the work they conduct.*
- *personal protection equipment will be worn as per risk assessment and minimum site requirements.*
- *emergency response plans, developed from a review of potential emergency scenarios, will be in place before commencement of work.*
- *everyone has an obligation to stop work that is unsafe.*

a) policy - …….....

b) harm - ……

c) on behalf of - …….

d) strictly - …….

e) enforced - ……..

f) ensure - ……..

g) embedded - ……

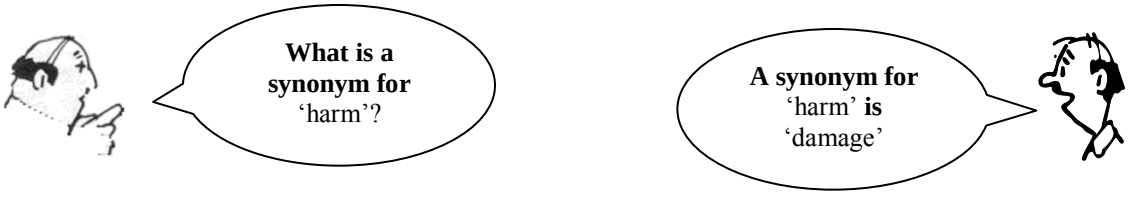
h) emphasize - ……...

i) conducted - ……

j) discussion - ……

k) competent - ……

l) commencement - ……...



Now, use one of the words above to complete the following sentences.

a) Safety training is ……. into all training courses.
b) …….. the car is in good condition before you start driving.
c) This vehicle can only be operated by …… employees.
d) After the accident there was a long …….. between the management and employees.
e) Safety signs are in red to …… their importance.
f) Bob didn't follow the company …… so he lost his job.
g) Alan …… a risk assessment before the …….. of the job.
h) The supervisor spoke to the manager …… Tony.
i) An oil spill can cause …… to the environment.

BP has **8 Golden Rules of Safety**. Match the rule to the explanation in the table below.

Permit to Work	Energy Isolation	Ground Disturbance	Confined Space Entry
Working at Heights	Lifting Operations	Driving Safety	Management of Change (MOC)

a)	……	involves operating vehicles safely
b)	……	involves working in small, closed spaces
c)	……	involves controlling any different ways of doing a job.
d)	……	involves working at high places
e)	……	involves using mechanical devices to lift equipment
f)	……	involves explaining the job and identifying any hazards
g)	……	involves preparing equipment for work by stopping the power
h)	……	involves digging

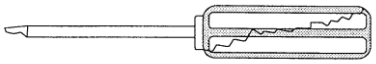
Causes of Accidents

There are different types of hazard in the workplace. Identify the hazards in the pictures below.

……..

……..

……..



……..

Match the sentences in the box below.

If the floor is wet	a person can trip
If a box blocks the aisle	they might injure their feet
If the power isn't isolated	a person can slip
If a person doesn't wear safety boots	a person might get an electric shock

What can happen if…

1. … a cable lies across an aisle?

   ……

2. … a non-competent person uses a vehicle?

   ……

3. … a person operates electrical equipment with wet hands?

   ……

4. … a ladder is at the wrong angle?

   ……

5. … a person does not use a guard on a grinding machine?

   ……

6. … a person uses a damaged tool?

   ……

First Conditional

In the previous unit we looked at zero conditional sentences that describe something that is generally true. We can also first conditional sentences.

- If I see an accident I will report it.
- If it is windy we won't raise the scaffolding.

These sentences talk about a specific possible situations in the future and are formed by:

If + present tense, + future simple

Put the words in the correct order to make first conditional sentences.

1) spill / clean / will / if / coffee / I / some / it / I

   ……

2) won't / the / raining / it / helicopter / if / fly / is

   ……

3) sounds / fire / evacuate / I / alarm / the / building / the / if / will

   ……

4) follow / not / will / have / do / procedures / you / you / accident / an / safety / if

   ……

5) weather / complete / the / the / if / good / will / we / complete / is / job

   ……

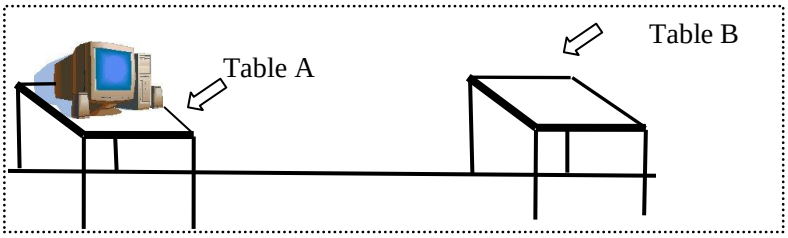
Now, interview a partner using the questions below.

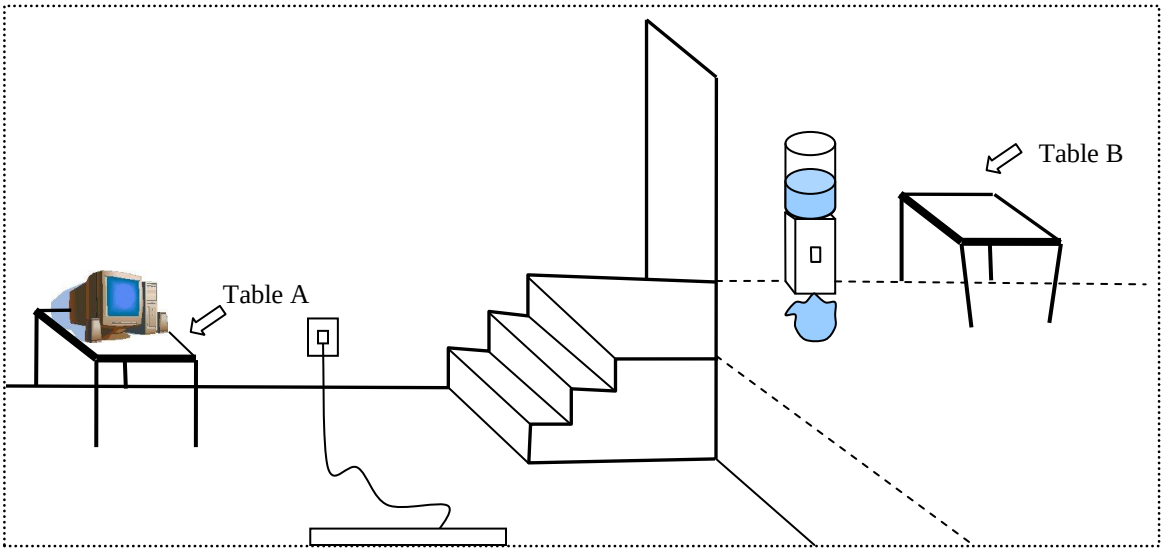
What will you do if …	
… your trainer gives you homework?	
… you do not understand something?	
… you have free time next week?	
… a colleague asks you for help?	
… you see somebody working unsafely?	

Identifying Hazards

There is a difference between 'hazard' and 'risk'. A hazard is some **thing** which might cause an accident or injury. A risk the **possibility** that an accident or injury happen.

Look at the two situations below. Bob needs to move the computer from Table A to Table B. In both situations identify the hazards, assess the risks and make recommendations for what he should do to move the computer safely.





……

……

……

……

……

……

……

Listen to the description of the second situation. Did you find any additional hazards? (🔊 6.3)

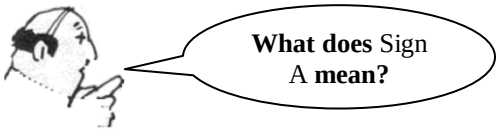
Safety Signs

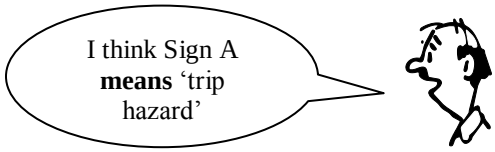
a)  b)  c)  d) 

e)  f)  g)  h) 

i)  j)  k)  l) 

Write an explanation of the above safety signs and practise with a partner





a) .....

b) .....

c) .....

d) .....

e) .....

f) .....

g) .....

h) .....

i) .....

j) .....

k) .....

l) .....

Reporting Incidents

When we talk about the present we can use present simple or present continuous. When we talk about the past we can use past simple. Read the dialogue and complete the table in full.

Alan: When did you start your shift yesterday?
Bob: At 7:00a.m.
Alan: What did you do?
Bob: I turned on the monitoring equipment and checked the system. At 11:05 an alarm sounded.
Alan: Did you initiate an emergency shutdown?
Bob: No, I didn't initiate a shutdown. I adjusted the flow rate and that lowered the pressure in the pipeline.

	Past Form		
	+	**-**	**?**
start	……	……	……
turn	……	……	……
check	……	……	……
initiate	……	……	……
sound	……	……	……
adjust	……	……	……
lower	……	……	……

In negative sentences and questions we use 'did' and the infinitive form of the verb. In positive sentences we use '–ed'. There are irregular verbs in English that have a different form in the past positive. Write the past form of the verbs below.

be	……	see	……	read	……
have	……	make	……	write	……
go	……	can	……	come	……

Correct the mistakes in the sentences below.

1. She didn't finishes the job on time.
2. Did he checked the pressure properly?
3. I goed to work by bus.
4. When did you came to work today?
5. Bob went home and reads a training manual.

Put the words in the correct order to make sentences or questions. Tom is talking to David about a problem with the flow rate. Identify who says each sentence. (6.4)

Example problem / a / there / yesterday / rate / the / was / with / flow
… *There was a problem with the flow rate yesterday…* Tom / (Dave)

1. alarm / what / do / you / when / ? / you / the / heard / did
…… Tom / Dave
2. panel / checked / I / control / the
…… Tom / Dave
3. flow / low / sounded / so / rate / the / too / alarm / was
…… Tom / Dave
4. ? / rate / try / increase / to / did / flow / you / the
…… Tom / Dave
5. fully / didn't / I / opened / problem / but / valves / it / all / solve / the / the
…… Tom / Dave
6. happened / so / next / ? / what
…… Tom / Dave
7. system / you / ? / shut / the / did / down
…… Tom / Dave
8. down / I / shut / didn't / no / it
…… Tom / Dave
9. called / station / I / they / increased / pump / the / and / the / pressure
…… Tom / Dave
10. stopped / rate / the / when / normal / flow / reached / alarm / levels
…… Tom / Dave

Now, interview a partner to complete the table.

	… yesterday?	**… last weekend?**
What did you do …		
Where did you go …		
What did you see …		
Who did you meet …		

Safety Training Observation Programme

Match the words to the meanings.

observe	to try and make somebody do something	= ……
encourage	to stop from happening	= ……
corrective	something happens again	= ……
prevent	to make stronger	= ……
reinforce	to get rid of something	= ……
indicate	to solve problems	= ……
recurrence	to see	= ……
procedures	to show	= ……
accountable	to change	= ……
modify	rules for how to do things	= ……
eliminate	responsible	= ……

Now complete the text using the words above and answer the questions. (📼 6.5)

The STOP system is based on the following idea. Everyone is …… for safety and all injuries can be eliminated if safe …… are reinforced. STOP report cards can be positive or negative because people who work safely should be told. The key to reducing incidents and injuries is to …… people, talking with them to …… safe work practices and therefore …… their behaviour to …… unsafe acts and behaviours.

a) Who is responsible for safety?

……

b) Why should you talk to someone who does an unsafe act?

……

c) What can happen if safe procedures are reinforced?

……

Now, look at the following STOP report cards and put the verbs in the past tense. (6.6)

1. A technician …… (observe) a piece of wood with nails sticking out in front of the equipment lockup. He first …… (bend) the nails over with a hammer, and then …… (put) the wood in garbage container. I …… (congratulate) him on his action.

2. A man …… (wear) a ring in the workshop. I …… (notice) and …… (tell) him it is prohibited to be in the workshop with a ring and that it …… (be) hazardous to him. He …… (listen) to me and …… (take off) the ring and …… (say) he …… (will/not) wear it again at work.

3. I …… (notice) a broken mirror frame in the bathroom which …… (be) in danger of falling. I …… (inform) administration and the company …… (repair) the frame.

4. The light in a classroom …… (be) malfunctioning before lunch. The light …… (switch) on and off several times and I …… (think) it …… (be) a short circuit and a fire hazard. I …… (notify) the administration and they immediately …… (send) a worker to repair the light.

Now write a STOP card report about the pictures below. Remember to say where the incident happened, what you saw, what you said to the person and what happened after.

A) 

……
……
……
……
……

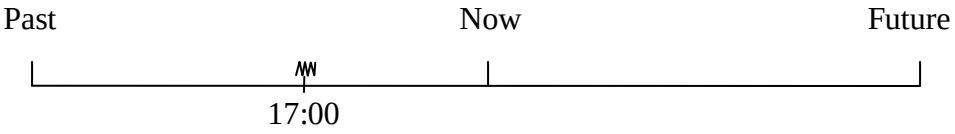
B) 

……
……
……
……
……

We can also use the past continuous to describe the past. The past continuous has two main uses.

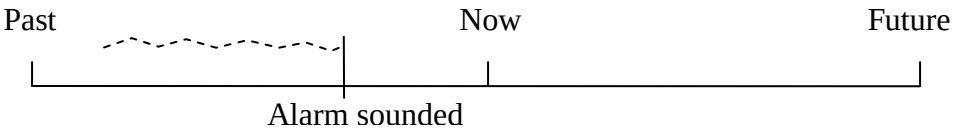
It can show action at an exact time in the past.

- At 17:00 I was working in the workshop.



It can also show an interrupted action.

- I was checking the pressure when the alarm sounded.



Answer the questions below using full sentences.

1) What were you doing this time yesterday?

   ……

2) What were you doing at 8:00am this morning?

   ……

3) What were you doing at 10:00pm last night?

   ……

4) What were you doing on last Monday morning?

   ……

5) What were you doing at 12:00pm last Sunday?

   ……

Talk to the other members of the group. Who was doing the same things as you?

We can also use the past continuous to give background information in a situation. Look back at the STOP report cards and the incident reports you wrote. Can you use past continuous for any of the answers?

Question words

Write the questions and complete the table with the appropriate question words.

1) ……. ……?

It is a valve.

2) ……. ……?

It is on the left side of the tank.

3) ……. ……?

It was installed two years ago.

4) ……. ……?

A maintenance technician installed it.

5) ……. ……?

Because the old one was faulty.

6) ……. ……?

He isolated the section of pipe, removed the cover and replaced the valve.

7) ……. ……?

It took just under thirty minutes.

Question Word	Use in questions about …
…WHAT…	things
	place
	time
	people
	reason
	choice
	ownership
	method
	frequency
	quantity
	age
	length of time
	distance

Prepare questions in pairs and then interview a new partner. Try to use all the question words.

Unit 5 – Safety

aisle
angle
ankle
barrier
behaviour
bone
buoy
chest
circuit
commencement
competent
compound
cone
confined
congratulate
conjunction
contusion
corrective
coveralls
dislocation
disturbance
ear protectors
elbow
embed
encourage
ensure
face mask
flare
fracture
frame
harm
harness
hazard
isolation
joint
knee
laceration
lightweight
limb
malfunction
minimum
modify
multiple
neck
observe
permit
policy
potential
prohibit
reinforce
risk
scenario
severe
sprain
strict
superficial
sustain
thumb
toe
torso
twist
wrist

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Module 2 Review

GRAMMAR BOX – Present Continuous
The present continuous describes an action happening at the time of speaking. It is formed using 'to be' and the main verb followed by –ing.

- You **are** study**ing** the present continuous.
- Your trainer **is not** read**ing** a newspaper.
- **Is** your colleague read**ing** his book?

The present continuous also describes temporary situations.

Anne studies English at ELS (Anne always studies English, it is an ongoing situation)
Jack is studying English at ELS (Jack might be on a short course)

Choose one of your class colleagues and write six sentences to describe what they are doing now.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

Read your sentences to the class. Can they guess who you are talking about?

Now write a description of what is happening in the picture. Include information about what the technician is wearing.

……

……

……

……

……

……

GRAMMAR BOX – Zero Conditional
The zero conditional describes cause and effect. If A happens, then B happens. It is formed using two clauses (parts of a sentence). The first clause uses 'if' and the present form of the verb. The second clause uses the present form of the verb. These clauses can change place without changing the meaning of the sentence.

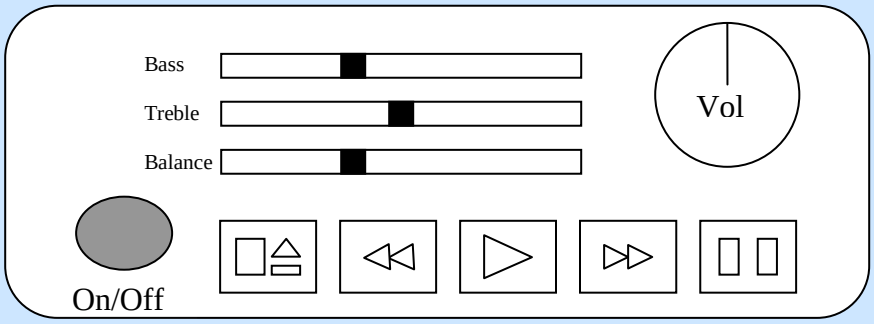
- If you press the switch, the light comes on.
- The light comes on if you press the switch.
- If the dial is turned anticlockwise, the pressure increases.

It describes real situations that are always true.

In the sentence below put the verbs in the correct form and decide which clause describes the cause and which clause describes the effect. Put 'if' in the appropriate place.

1) …… you …… (press) the emergency stop …… the system …… (shut) down.
2) …… everybody …… (vacate) the building …… the alarm …… (sound).
3) …… Bob …… (sound) the alarm immediately …… he …… (notice) a change in pressure.
4) …… an engineer …… (not/wear) safety goggles …… their eyes …… (not/be) protected from injury.
5) …… the lever …… (pull) down …… the crane hook …… (lower).

Look at the picture of a cassette player. Work with a partner to describe what happens when you use the different controls.



Present your ideas to the class. You need fifteen sentences to describe all the controls fully. Do you have them all?

GRAMMAR BOX - First Conditional
The first conditional describes future cause and effect.

- If the report is late, I will telephone the pump station.
- If I need help, I will ask you.

It is formed using if and a present tense in the first clause and a future tense in the second clause. These clauses can change place without changing the meaning of the sentence.

Rewrite the sentences below without mistakes.

1) If I will see Bob I will tell him you want to talk to him.

   ……

2) If he misses the work bus he will takes a taxi to the site.

   ……

3) If it rain we won't dig the trench.

   ……

4) If you not wear safety gloves you will injury your hand.

   ……

5) The platform will be installed in time if the sea will be calm.

   ……

Now, finish the following sentences in a logical way.

1) If I am late for work ……..
2) I will learn English well if ……
3) I won't be happy if ……
4) If a car runs out of petrol ……..
5) If I work rotation ……..
6) I won't do my homework if …….
7) I will get a promotion if ……
8) Our LS trainer will be pleased if ……..

GRAMMAR BOX – Infinitive of Purpose
The infinitive of purpose explains *why* we do something – it gives the reason.

A: Why did you go to the workshop?
B: **To get** some callipers.

A: Why are you wearing safety gloves?
B: I'm wearing safety gloves **to protect** my hands.

Why do we use the following parts of a car?

clutch	accelerator	brake	steering wheel	indicator
gear stick	hand brake	headlights	side mirror	horn

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……
9) ……
10) ……

Now interview a partner and complete the table. Share the information with the group.

Why …	
… do you study English?	
… do you talk to your ELS trainer?	
… did you come to training today?	
… does your trainer give you homework?	
… do you work in the oil industry?	

Grammar Box – Past Simple
The past simple describes actions or states that happened in the past. It is formed using the past form of the verb. In negative sentences and questions we use 'did' and the infinitive form of the verb.

- My father **worked** in the oil industry.
- My uncle **didn't work** in the oil industry.
- **Did** your father **work** in the oil industry?

With the verb 'to be' we don't use 'did'.

- I **was** late to work yesterday.
- They **weren't** late for work yesterday.
- **Were** you late for work yesterday?

Test your partner on the past form of the following verbs.

1) make	-	……	2) do	-	……
3) work	-	……	4) be	-	……
5) see	-	……	6) get	-	……
7) take	-	……	8) go	-	……
9) have	-	……	10) finish	-	……
11) meet	-	……	12) like	-	……

Now work with your partner to prepare 10 questions for another trainee using the past simple and the verbs above.

1) ……?
2) ……?
3) ……?
4) ……?
5) ……?
6) ……?
7) ……?
8) ……?
9) ……?
10) ……?

GRAMMAR BOX – Past Continuous
The past continuous describes an action at a specific time in the past. It is formed using was/were and the main verb followed by –ing.

- I **was travelling** home at 18:10.
- She **was working** in the workshop at 11:00/

We also use the past continuous to describe a past action interrupted by a second action.

- I **was typing** my report when the fire alarm **sounded**.
- He **was smoking** a cigarette when the explosion **happened**.

Interview a partner to complete the table below. Use full sentences.

What were you doing at …	Action
……?	
……?	
……?	
……?	
……?	

Now complete the sentences putting the verbs given in the correct past form.

Yesterday afternoon I …… (work) onsite. I …… (change) a faulty valve because there …… (be) a problem with the flow. While I …… (remove) the faulty valve my pipe wrench …… (slip) and I …… (cut) my left hand. The wound …… (bleed) heavily so I …… (wrap) it in a handkerchief …… (apply) pressure. A colleague …… (take) me to the medical block and a doctor …… (examine) me. He …… (tell) me I …… (need) stitches. While he …… (stitch) the wound I …… (feel) faint but when he …… (finish) I …… (feel) better.

GRAMMAR BOX - Relative Clauses
Relative clauses are part of a sentences related to something in another part of the sentence.

- I work in Atarau, which is in Kazakstan.
- The wire strippers, that are insulated, have a red handle.

They are used to define things or to give extra information about known things.

Complete the following sentences using relative clauses.

1) Safety goggles are an item of PPE that ……
2) A foreman is an engineer who ……
3) An incident report is something which ……
4) The floor on a rig is the place where ……
5) A crane ……
6) An oilfield ……
7) An HSE officer ……
8) Calipers ……

Use the prompts to write full descriptions.

1) Bob / engineer / graduated 2002.

   ……

2) screwdriver / stubby handle / square blade

   ……

3) hydrogen / first element / lightest

   ……

4) crane operator / cause accident / given warning

   ……

5) Mustafa / injuries severe / taken hospital

   ……

6) JVA 2108 / connected main pump / monitors temperature

   ……...

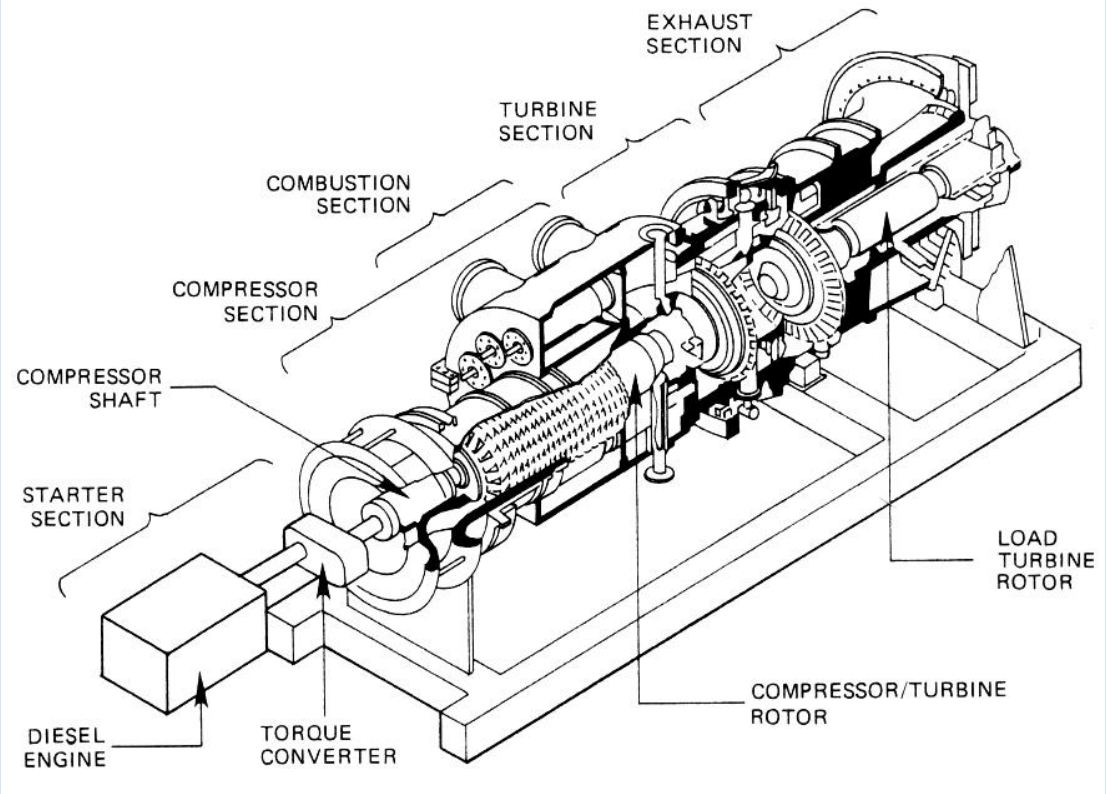
7) training manual / written LS / gives information technical English

   ……

Complete the description of a gas turbine using the verbs given in the correct form.

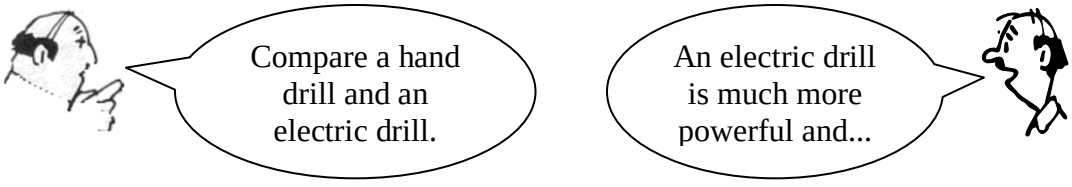
A gas turbine …… (burn) fuel to create rotational energy. Atmospheric air …… (draw) into the compressor section of the machine and …… (compress). Fuel …… (add) to the compressed air and …… (ignite). The ignition …… (cause) the compressed air and gas mixture to become exhaust gas with a further increase in pressure and this exhaust gas …… (drive) the rotor of the power turbine. Then the exhaust gas …… (discharge) to atmosphere. However, gas turbine engines are not very efficient because they …… (use) two thirds of the power created to turn the engine compressor. The faster the rotor shaft turns, the more air …… (suck) into the compressor. It …… (become) harder to compress the air, so more power …… (need). Therefore, as the gas turbine …… (produce) more power it …… (use) more power.

Look at the diagram with a partner and describe what happens in each section of the gas turbine.



Unit 7

Making Comparisons



Making Comparisons - Unit Map

The aim of this unit is to provide the structures of comparison. By the end of the unit trainees will be able to:

- use comparative and superlative structures
- use quantifiers to show the degree of difference between things
- discuss the qualities of metals
- identify the materials objects are made from
- express similarities between things

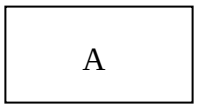
I can	Difficult	Okay	Easy
compare objects			
explain the similarities between objects			
compare different types of oil recovery			
use superlatives			
discuss pressure measurement devices			
discuss states of matter			
discuss oil refining and oil products			
describe a basic pig			

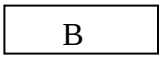
I understand	Difficult	Okay	Easy
the unit grammar: comparatives			
superlatives			
as … as structure			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the materia

Making Comparisons

When we want to compare two or more objects we use *comparatives*. Comparatives are made with adjectives. Look at the examples





A *is* big*ger than* B

B *is* small*er than* A

C

D

C *is* long*er than* D

D *is* short*er than* C

A comparative is made by adding '–er' to the end of an adjective or using 'more' before an adjective. Write the comparative for of the adjectives in the box in the correct column. What does '●' stand for?

big	far	flexible	pretty	good
useful	long	bad	sophisticated	dangerous
heavy	expensive	easy	safe	complex

●	●+y	●+	Irregular

Now, complete the sentences with one of the comparatives above.

1) An electric drill …… a hand-drill.
2) A mobile telephone …… a landline.
3) Rubber …… than steel.
4) A job off-shore …… a job in an office.
5) Lead …… wood.
6) A mile ……... a kilometer.
7) A jet engine …… a combustible engine.

Oil Recovery

Azerbaijan has a long history of producing oil and there are different types of oil recovery. Look at the pictures of two types of recovery and compare them using the prompts in the box.

Nodding Donkey

Offshore Platform

sophisticated	expensive	easy to maintain	simple	modern
dangerous	reliable	effective	useful	practical
small	cheap to run	traditional	drills deeply	????

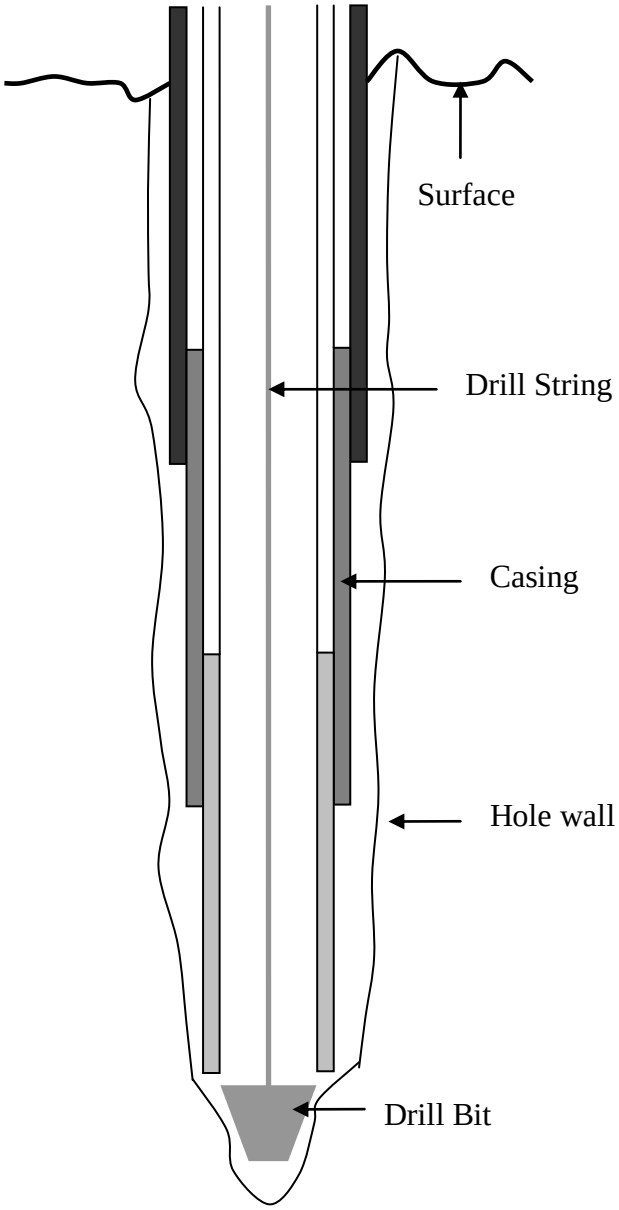
1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……
9) ……
10) ……..
11) ……..
12) ……..
13) ……..
14) ……..
15) ……..

Well Casing

Look at the diagram and use the comparative form of the adjectives in the box to complete the text

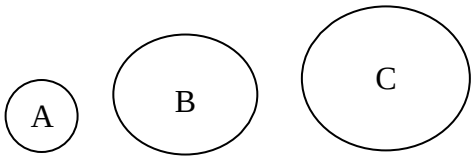
large	narrow	wide	high	thin

- Deep formations have …… pressures than shallow formations and well casings protect weaker upper formations from high pressure.
- When a well is drilled the top diameters are …… than those deeper in the well.
- The hole and casing diameter are ……. at the bottom of the well than at the top.
- The hole is always …… than the casing so that a cement bond can be pumped between the outside of the casing and the wall of the hole.
- After the first section of well is drilled a wide diameter casing is fitted inside the hole. A drill bit ……. than the casing is then used to drill the next section of the hole.



Comparatives

Sometimes we want to be more specific using comparatives. We want to say if there is a big or small difference. Look at the example below and complete the sentences.



Small				**Big**		
much smaller	smaller	slightly smaller	x	slightly bigger	bigger	much bigger

1) A …… B.
2) A …… C.
3) B …… A.
4) C …… A.
5) B …… C.

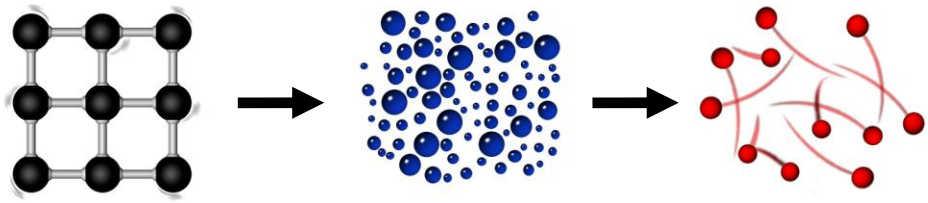
Use the adjectives at the end of the sentences and 'much' or 'slightly' to complete the following comparative sentences.

1) Steel …… paper. (heavy)
2) Oil …… water. (viscous)
3) Acid …… water. (corrosive)
4) Glass …… wood. (flexible)
5) A digital gauge …… a pneumatic gauge. (accurate)
6) Natural gas …… crude oil. (explosive)
7) A mobile phone …… a landline. (useful)
8) Rocket fuel …… petrol. (expensive)

Now, quiz a partner about different objects.

States of Matter

Matter exists in three states – solid, liquid or gas. Listen and complete the text (🎧 7.2)



Solids have a definite volume and shape as the molecules are held together by strong forces. Liquids have a definite volume but the forces holding the molecules together are …… the forces in solids and so liquids do not have a definite shape. The forces holding molecules together in gases are even …… the forces in liquids and so gases have no definite volume or shape.

Matter can change from one state to another by giving the molecules …… and making them vibrate more than normal. This energy is usually provided in the form of heat. As the temperature gets …… a substance will change from a solid to a liquid and, finally, into a gas.

All matter is made from elements – a substance which can not be …… into simpler parts. If two or more elements join together the resulting substance is called a compound. Compounds can not be divided into individual elements by solely …… means, they have to be separated by chemical means. A mixture consists of two or more compounds which are not …… and can be separated by physical means. A solution is a mixture of two or more liquids (a mixture of …… is also called a solution) or when a solid is dissolved in a liquid. In this case the solid is called the solute and the liquid is called …….

1. How many states of matter are there? What are they?

……

2. What are the properties of a solid?

……

3. Why does a solid change to a liquid?

……

4. What is the difference between a compound and a mixture?

……

5. What is a solution?

……

6. Is the solute the thing dissolved or the thing that dissolves?

……

The solubility of a substance is the amount of the substance that will dissolve, usually in water, at a particular temperature and is measured in the following units:

- g per 100g of water
- g per Kg of water
- Kg per Kg of water

The rate a solute dissolves in a solvent is affected by particle size, temperature and agitation. Usually, more solute will be dissolved at higher temperatures than lower temperatures. One of the exceptions to this is calcium sulphate where the amount of solute dissolved decreases above 40°C.

By raising the temperature we can make a supersaturated solution which contains solute dissolved at a higher level than the solubility limit. A supersaturated solution is more unstable than a normal solution as it contains too much of the solute.

Complete the table with the numbers given.

2.10	2040	370	2.03	354	366	2600	2.11

	10°C	**20°C**	**30°C**	**40°C**	**50°C**	**60°C**
Sodium Chloride		360	363			374
Calcium Sulphate	1.90	2.05			2.08	
Sugar	1910		2200	2380		2870

Now answer the questions.

Which of the three solutes has the highest solubility?

……

Is calcium sulphate more soluble at 30°C or 50°C?

……

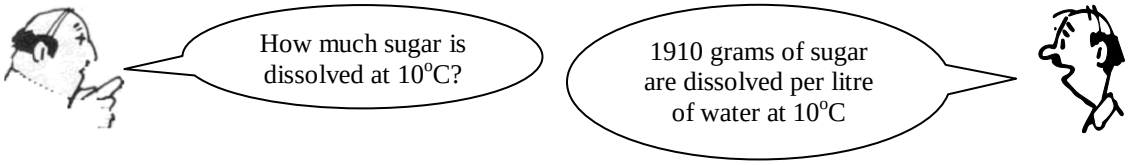
Is heat the only factor which affects the solubility of a substance?

……

What is a supersaturated solution?

……

Check your answers with a partner.



Superlatives

Look at the different types of power source. Write eight sentences to compare them.

jet engine	combustible engine	steam engine	electric motor

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……

When we use comparatives we compare one thing to another thing. Sometimes we want to say which thing is first and we use a superlative. Complete the sentences below with one of the power sources above and explain how we make superlative sentences.

1) …… is the most powerful.
2) …… is the cheapest.
3) …… is the most useful.
4) …… is the most sophisticated.
5) …… is the easiest to maintain.
6) …… is the most environmentally friendly.
7) …… is the most widely used.
8) …… is the most dangerous.

Correct the mistakes in the following sentences.

1) A jet engine is the most expensive than a steam engine.
2) An electric motor is the more cleaner than a combustible engine.
3) A steam engine is the older.
4) A combustible engine is more popular a steam engine.
5) A steam engine is the reliablest.

Temperature Measuring Devices (2)

Read the text below and put the words in the correct form – comparative or superlative – and complete the table. (🎧 7.1)

Liquid in gas thermometers are ……. (common) in industrial, medicinal and domestic usage. A good device is accurate to 0.1°C. The typical liquids used are mercury, alcohol and pentane. The table below shows their range.

Liquid	Range (in degrees centigrade)
…….	-80 to +70
…….	-35 to +510
…….	-200 to +30

Alcohol has …… (short) range and mercury has …… (long). Alcohol measures temperatures …… (low) mercury but …… (low) temperatures are measured using pentane. Mercury is used to measure …… (high) temperatures.

Liquid in gas thermometers …… (weak) necessary for industrial plant use so industrial thermometers use bulbs and stems made out of steel, which …… (strong) glass. These systems are completely filled with a liquid, gas or vaporizing liquid. Liquid filled thermometers …… (popular) gas or vaporizing alternatives because their range …… (long).

There are also solid expansion type thermometers. These work on the principle that different metals expand at different rates i.e. brass expands …… (quickly) invar. One example of solid expansion type thermometers is the bi-metal strip where brass and invar are bonded together and fixed at one end. When the brass …… (expand) the invar the strip bends, showing the temperature on a scale or triggering a switch.

Describing Objects - Materials

Complete the table and then write sentences to compare the materials

	Rigid	Expensive	Elastic	Flammable	Combustible
Glass					
Rubber					
Wood					
Steel					
Gold					

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

Describe objects in the room – use the words below and the example as a model:

	steel	cotton	
wood		rubber	glass
	oil	plastic	

Example - Tables are made from wood and steel.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

Which item in the room is made from the most different materials? ……...

Which item in the room is made from the least different materials? ……

Which material is the most ***versatile***? ……...

Which material is the most ***resilient***? ……...

Metals

The term ‘metallic’ describes any class of substances which are, in general: lustrous, malleable, fusible, ductile solids and, good conductors of heat and electricity. A material which has none of these properties is called ‘non-metallic’. There are two types of metallic substance, ferrous and non-ferrous (containing or not containing iron). Listen to the conversation and match the qualities of metals with the definitions below. (7.3)

Durability	**Conductivity**	**Hardness**	**Malleability**	**Lustre**
Ductility	**Fusible**	**Brittleness**	**Tensile strength**	

……	This refers to the ability to withstand abrasive ware, surface indentation or scratching.
……	This is the attribute of the metal to blend with another substance under the influence of heat.
……	This is the quality of the metal to shine or gloss and be polished.
……	This is the ability of the material to resist stretching and return to its original length once the load is removed.
……	This is the ability of the shape of the material to be altered in any direction by compressive forces such as hammering, pressing, rolling or bending without rupture. These materials are highly plastic.
……	This is the ability of the material to be stretched into long thin shapes reducing its cross sectional area. These materials must be highly plastic.
……	This is the opposite of toughness. This kind of material will crack or fail before it bends. It has little or no elastic deformation and is not ductile.
……	This refers to materials that have the ability to conduct heat or electricity.
……	This refers to the ability of the material to withstand the natural elements and its resistance to wear,

Decide what properties are required for the following jobs and which ones are inappropriate. Explain your answers.

1) Chains

……

……

……

……

2) Storage tanks

……

……

……

……

3) Heating elements

……

……

……

……

Look at the table which indicates some qualities of three different metals and complete the sentences below - put the adjectives in the correct form.

	Hardness	**Tensile Strength**	**Thermal Conductivity**	**Elasticity**
Zinc	✓	✓	✓✓	✓
Copper	✓✓	✓✓✓	✓✓✓	✓✓
Iron	✓✓✓	✓	✓	✓✓✓

1. Copper …… (be / hard) zinc.
2. Iron …… (be / hard)
3. Zinc and iron have similar tensile strengths but copper …… (have / high) tensile strength
4. Iron …… (have / thermal conductivity) copper.
5. Zinc …… (be / elastic) copper.

More or Less

Answer the questions below as quickly as possible. Check your answers with a partner. If you disagree, discuss your reasons.

1) Does Russian produce more or less oil than Saudi Arabia? more/less

2) Is diesel more or less flammable than petrol? more/less

3) Is gold more or less valuable than diamonds? more/less

4) Is offshore oil more or less difficult to extract than onshore oil? more/less

5) Are plastics more or less fragile than glass? more/less

6) Is fire more or less dangerous than electricity? more/less

7) Do oil workers get paid more or less than doctors in your country? more/less

8) Is English grammar more or less difficult than your language? more/less

9) Is natural gas more or less difficult to transport than crude oil? more/less

10) Does refining crude oil produce more or less asphalt than gasoline? more/less

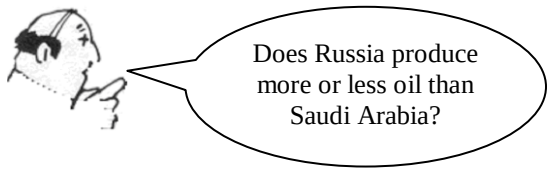
11) Does methane weigh more or less than propane? more/less

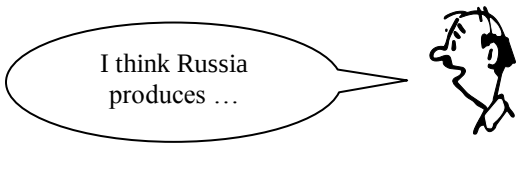
12) Is English more or less useful to study than Chinese? more/less

13) Does the USA use more or less oil than it produces? more/less

14) Is aviation fuel more or less expensive than gasoline? more/less

15) Is the oil industry more or less dangerous than construction? more/less





Oil Products

Read the text and complete the table.

Crude oil is a mixture of hundreds of different compounds and is practically useless when taken from the ground. It has to be refined to turn it into useable products. Three types of motor fuel are produced in oil refineries – petrol, diesel and LPG (Liquefied Petroleum Gas). Petrol and diesel are much more widely used than LPG although LPG is more versatile – it can be used in domestic heating systems and for camping gas. LPG also produces fewer emissions than either petrol or diesel fuels but it is not as popular. Fuel oil also comes from crude oil and is a heavy fuel used for ships and factories.

Most cars have petrol engines and larger vehicles (i.e. buses) tend to have diesel engines. Diesel engines operate at much higher pressures than petrol engines and therefore they have to be built more strongly. However, diesel engines are more efficient than petrol engines and are more economical – they can use up to 40% less fuel.

In addition to motor fuels important products refined from oil are lubricants. Lubricants are essential to ensure moving parts in a machine work smoothly and stop them overheating. Different lubricants are suitable for different jobs. Engine oil is less viscous than grease and is used to lubricate all the moving parts of an engine. Grease is much thicker and is used to protect sealed bearings. Multigrade lubricants can operate at different temperatures without being affected. Lubricants without a temperature sensitive polymer are more viscous at low temperatures than at high temperatures.

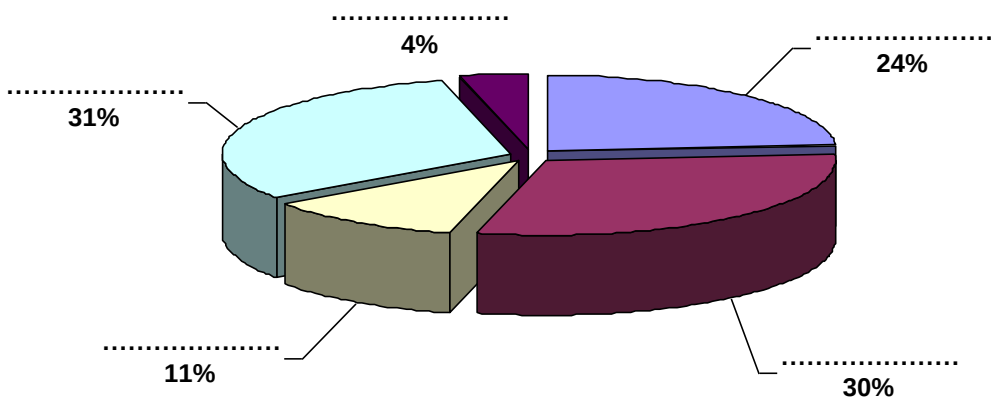
Oil Product	Uses	Properties
Petrol/Gasoline		
Diesel		
LPG		
Fuel oil		
Engine oil		
Grease		
Multigrade lubricants		

Refining Crude Oil

Oil has many functions. As well as producing fuel for road vehicles and aeroplanes oil is also used to produce a wide range of things from asphalt to surface roads to solvents and plastics. The pie chart below shows some products refined from crude oil. Read the bullet points below the chart and complete the labels with the products in the box. (🔊 7.3)

diesel	fuel oil	aviation fuel	asphalt	naphtha

Refined Products



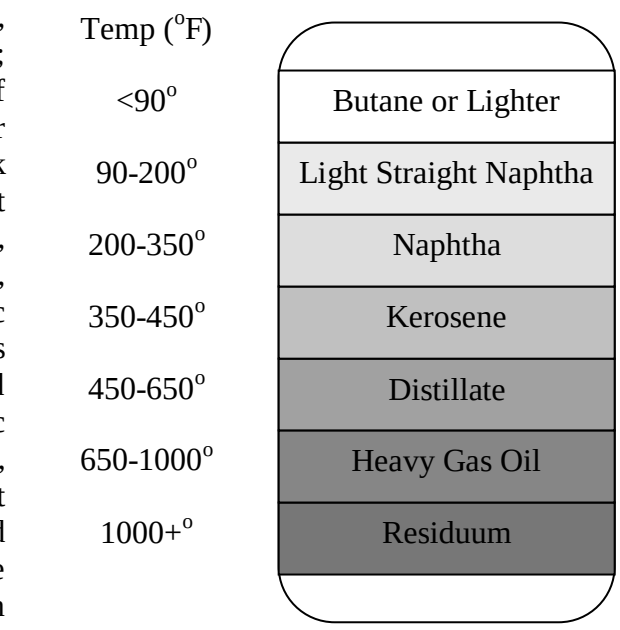
- There is only slightly less fuel oil produces than diesel.
- There is less asphalt produced than anything else.
- More naphtha is produced than aviation fuel.
- There is more naphtha produced than fuel oil.
- Refining produces more aviation fuel than asphalt.

Now work with a partner and think about the questions below. Share your ideas with the rest of the class.

1) Why is oil a valuable commodity?
2) What is the most important use of oil?
3) How is crude oil changed into different products?
4) Why do some countries export crude oil and not separate it into different products?
5) Are there better energy sources than oil?
6) What happens when oil reserves are exhausted?

Read the article below about crude oil and answer the questions that follow. Are the sentences true (T) or false (F)? Check your answers with a partner.

Crude oil is a mixture of water, impurities and aliphatic hydrocarbons; hydrocarbons which consist of hydrogen and carbon with no other elements. The carbon atoms link together to form chains of different lengths. The shortest of these, methane, consists of only one carbon molecule, and is the lightest aliphatic hydrocarbon. As more carbon atoms join the chain it gets longer and heavier. The first four aliphatic hydrocarbons, methane, ethane, propane and butane, are the shortest chains and therefore the lightest and they are the only hydrocarbons that are gases under normal pressure at room temperature. The longest chain is asphaltic bitumen, which is a solid used to surface roads. Naphtha is used to make solvents and fuels.



Longer chains of carbon atoms have higher boiling temperatures than shorter chains so the different hydrocarbons can be separated using fractional distillation. By carefully controlling the temperature during this process a wide range of hydrocarbons can be extracted from crude oil. The diagram above shows the temperatures at which different hydrocarbons are recovered from crude oil.

1) Butane is the lightest aliphatic hydrocarbon. T/F
2) Kerosene is separated from crude oil at a lower temperature than naphtha. T/F
3) Aliphatic hydrocarbons may contain oxygen. T/F
4) Propane is always a gas at room temperature. T/F
5) Heavy gas oil is the last product separated from crude oil through fractional distillation. T/F
6) Naphtha can be used to make aviation fuel. T/F
7) Crude oil only consists of aliphatic hydrocarbons. T/F

Expressing Similarities

Sometimes when we compare things we don't want to talk about how different they are but about how similar they are. Look at the example below.

Using **nouns**: Tank A **is the same** size **as** Tank B.

Using **adjectives**: Tank A **is as** big **as** Tank B.

Now, write sentences about the dimensions of the tanks. Write two sentences for each dimension, one using a noun, the other using an adjective.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

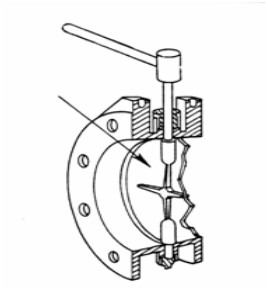
What do the following sentences mean? Circle the correct answer

not as big as -	*smaller*	*bigger*	*smaller or bigger*
not as small as -	*smaller*	*bigger*	*smaller or bigger*
not the same size as -	*smaller*	*bigger*	*smaller or bigger*

Choose the correct word in italics to complete the sentences

1) Brass is not as *dense / density* as iron
2) The main pipeline has a wider internal diameter *as / than* the relief pipe.
3) The relief pipe *is / is not* as wide as the main pipeline.
4) If the pressure *is / has* greater than the pre-set level the system shuts down.
5) The sump tank is not as *bigger / big* as the separated water tank.

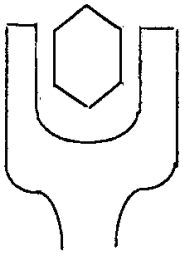
Now, compare the pictures below. Describe differences and similarities.



butterfly valve/pipeline

……
……
……
……

bolt / wrench



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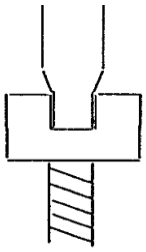
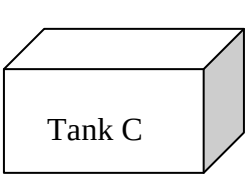
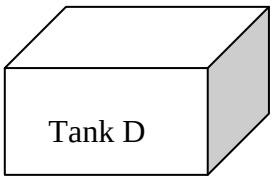


Screwdriver / screw

……
……
……
……

Now, describe the two tanks below.

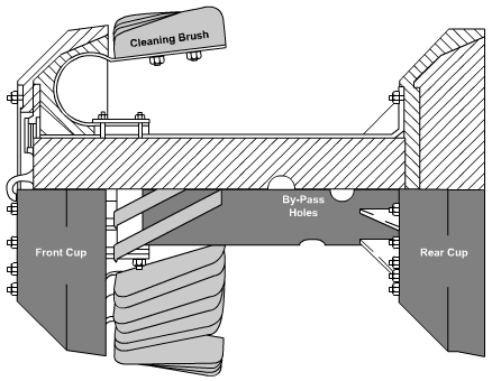




……
……
……
……

Pigging

The devices used to clear debris and excess liquid from the inside of pipelines are called 'pigs'. They are forced through the pipeline by the pressure of the flow. Several factors affect the force required to move the pig; elevation of the pipeline, friction and lubrication. A pig moves more easily through a crude oil pipeline than a dry gas pipeline due to better lubrication and greater flow pressure but crude oil pipelines also contain much more debris than gas pipelines.



The basic design of a pig is generally a steel body fitted with rubber or plastic cups at both ends. The cups are wider in diameter than the internal diameter of the pipeline to ensure a tight seal. Through use the cups can become worn and need to be replaced as pigs are less effective and allow more blow-by (fluid passing the pig) if the seal is not good.

The pig contains bypass holes which allow more fluid to flow past the pig, decreasing the speed. If all the bypass holes are plugged the pig moves more slowly as the pressure forcing it through the pipeline is lower than when some of the bypass holes are unplugged.

1. Does a crude oil or dry gas pipeline offer more resistance to pigs?

   ……

2. Are the cups fitted to pigs as wide as the internal dimension of the pipeline?

   ……

3. Does a pig move as quickly with bypass holes open?

   ……

4. What happens if the cups are damaged?

   ……

5. What advantages does a crude oil pipeline have for pigs?

   ……

Making Comparisons – Wordlist

abrasive
blend
bond
bulb
bypass
casing
combustible
corrosive
crack
debris
deformation
ductile
elevation
environmentally
ferrous
formation
friction
fusible
gloss
indentation
lubrication
lustrous
malleable
medicinal
plug
practical
reliable
resilient
resist
rupture
scratching
seal
sophisticated
traditional
useable
versatile
vibrate
viscous
withstand

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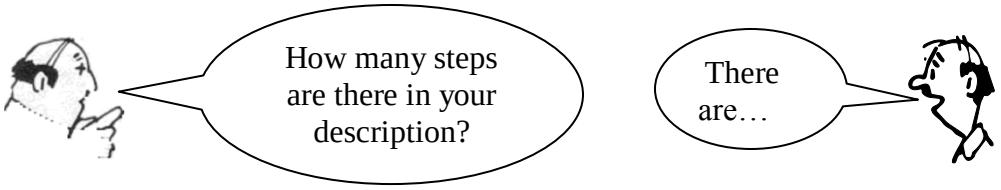
Unit 8

Describing Processes



Describing Processes - Unit Map

The aim of this unit is to provide the structures necessary to describe processes logically and coherently. By the end of the unit you will be able to:

- sequence events using linking words
- describe basic processes
- identify different word forms
- discuss oil separation
- describe past experiences
- describe unfinished states

I can	Difficult	Okay	Easy
use appropriate linking words to show the chronological relationship between events			
describe basic sequences			
explain the purpose of first aid and the process of artificial respiration			
explain how a thermostat works			
describe three means of oil and water separation			
identify the form of words and use the appropriate form in sentences			
use appropriate structures to describe past experiences			
describe the process of lockouts and tagouts			
describe ongoing actions/situations			

I understand	Difficult	Okay	Easy
the unit grammar: present perfect (general past)			
present perfect (ongoing situations)			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Sequencing

PPE consists of coveralls, safety glasses, safety boots, safety gloves, ear protectors and a hard hat. Put the following actions in order

put your arms in the coveralls	put on your safety boots	put your legs in the coveralls	put on your safety gloves
put on your ear protectors.	fasten the coveralls	put on your safety glasses	put on your hard hat

1st) ……

2nd) ……

3rd) ……

4th) ……

5th) ……

6th) ……

7th) ……

8th) ……

To make the order of actions clear we can use words in the box below

lastly	first	second	before	then	after	finally	next

Describe how to put on PPE using some of the words above.

……

……

……

……

Now, describe how to take off PPE

……

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Before, While, During and After

Complete the sentences with the correct word – **before**, **while**, **during** or **after**. Sometimes more than one is possible. Check your answers with a partner and if you have different answers identify the differences in the situations.

1. Ensure the power is off …… starting work.
2. Watch the display …… adjusting the valve to reach the desired pressure.
3. Ensure all tools are put away safely …… finishing a job.
4. …… working in the workshop, wear PPE.
5. The work should be secured …… the process begins.
6. He completed the report …… his lunch break.
7. He went home …… his shift.
8. Alan tidied the workshop …… Bob completed the paperwork.
9. There were no incidents …… his shift.
10. …… driving to work Bob saw two accidents …… he arrived.

'Before', 'while', and 'after' refer to time and are followed by a noun or action (verb+ING). 'During' is usually only followed by a noun.

Look at the things that you may do in a typical morning and put them in chronological order. Add any extra information if you do different things.

listen to the radio	brush your teeth	eat breakfast	watch tv
have a shower	get up	shave	travel to work

Describe your routine to a partner. Write your partner's routine in the space below.

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Word Formation

Use a dictionary and put the words in the box in the correct column.

exposure	permeable	inhale	periodic
compressible	period	expose	injurious
injury	absorptive	compress	permeate
secrete	inhalation	secretion	absorb

Noun	Verb	Adjective

Now, use the words to complete the sentences below and then use two of the remaining words in sentences of your own.

1) Wear heavy duty safety gloves to protect hands from ……
2) Check the system on a …… basis, once every two weeks.
3) Bob went to hospital after …… to the poison gas.
4) The skin can …… some chemicals so wear protective clothing.
5) We find oil in …… rock.
6) Be careful with any …… from chemical containers.
7) One medical problem caused by fire can be smoke ……
8) If you …… a gas it could become liquid.
9) ……
10) ……

Basic Processes

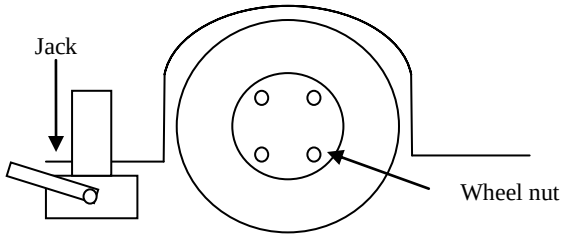
The paragraph below describes how to change a fuse in a plug. Complete the text with the words in the box in the correct form. (8.1)

loose	replace	then	insulate	tight
final	ensure	cover	voltage	secure

First, …… the device is power isolated. Use an …… screwdriver to remove the holding screws from the plug and remove the ……. Check that the screws holding the wires in place are ……. . …… the screws which hold the fuse in place and …… remove the fuse. …… it with a new fuse of the same …… and then …… the screws which hold it in place. Next, replace the cover and secure it with the holding screws. ……, check the device now works.

Now, read this description of how to change a tyre. Rewrite the description without any factual mistakes. Add any extra information you need. Compare your description with a partner's. (8.2)

First, use a saw to remove the wheel nuts and then use a jack the raise the car. Remove the wheel, tighten the wheel nuts, replace the wheel and remove the jack.



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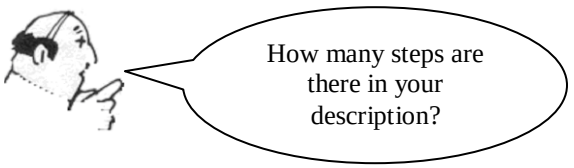
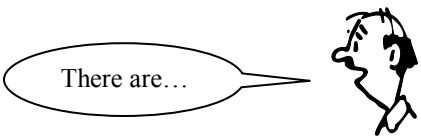




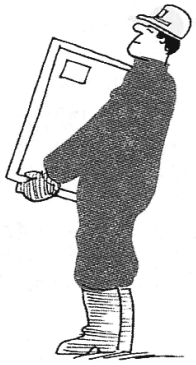
Safe Lifting Procedures

The diagrams below show correct lifting practises. Use the diagrams to write a complete description of safe lifting. Start with the initial assessment of the load and finish with setting the load down. Remember to add information about the position of the feet, hands, head and back.

1) 

2) 

3) 

4) 

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First Aid

Read the text below and put the actions in the box in the correct sequence.

First Aid is the first assistance or treatment given to a casualty for an injury or sudden illness before the arrival of an ambulance or qualified medical expert. It may involve improvising with facilities and materials available at the time. First Aid has three aims:

- To preserve life
- To prevent the condition worsening
- To promote recovery

In the management of a casualty a First Aider has several responsibilities;

- Assess the situation without endangering your own life
- Diagnose the problem (identify the disease or condition the casualty is suffering from
- Give immediate, appropriate and adequate treatment
- Arrange, without delay, for qualified medical staff to attend to the casualty

The responsibilities of the First Aider end when the medical services arrive. However, you should not leave the incident until you have made a full report.

Put these actions in the correct sequence to describe what to do if you see an accident

Report to the medical staff	Call for help	Provide medical help to the casualty
Examine the casualty	Check the area is safe	Leave the site of the incident

1st) …… 4th) ……

2nd) …… 5th) ……

3rd) …… 6th) ……

Are the following sentences true (T) or false (F)?

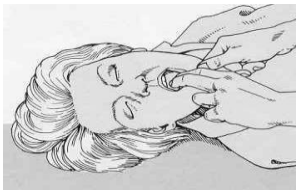
1) The aim of First Aid is to cure people. T/F
2) You should always use the same equipment while doing First Aid. T/F
3) The First Aider should help in every situation – even dangerous ones. T/F
4) The First Aider should help the doctor after they arrive. T/F
5) The Fist Aider can leave the incident before the ambulance arrives. T/F

ABC Rule

If the casualty is not breathing and if the heart is not beating it is essential that you maintain circulation and respiration until trained medical help arrives. This process follows the ABC rule.

A is for Airway – The throat can be blocked by the tongue or vomit or the position of the head. If the airway is blocked it is vital that you clear it so oxygen can reach the lungs. Look at the pictures below and describe the process of opening the airway. Use the words in the box.

kneel	lift	check	turn	hook



…… …… ……
…… …… ……
…… …… ……
…… …… ……

B is for Breathing – Breathing for a casualty is called Artificial Ventilation. The most effective method is to transfer your air to the casualty by blowing in the mouth. Sometimes this is not possible if the casualty has serious facial injuries, is face down or if there is evidence of a corrosive substance around the mouth. Put the steps below in the correct order.

seal your lips around the mouth	……	pinch the nose closed	……
open you mouth wide	……	take a deep breath	……
blow into the casualty's mouth	……	watch the casualties chest rise	……
watch the casualty's chest fall	……	remove your mouth	……

C is for Circulation – After the first two breaths check the casualty's pulse, either in the neck or wrist. If there is no pulse, start external chest compressions immediately. The ratio of compressions to breaths is 15:2. It is very important to place the hands in the correct position (two finger widths above the bottom of the junction of the ribs) and that the First Aider keep straight arms and apply the compressions regularly and smoothly.

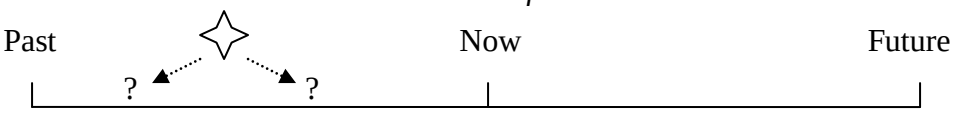
1) When should external compressions start? …….
2) Are the hands placed over the heart? ……..
3) Does the First Aider bend their elbows? …….
4) How often does the First Aider do compressions? …….

Describing Past Experiences

We can talk about past experiences using the present perfect and the past simple.

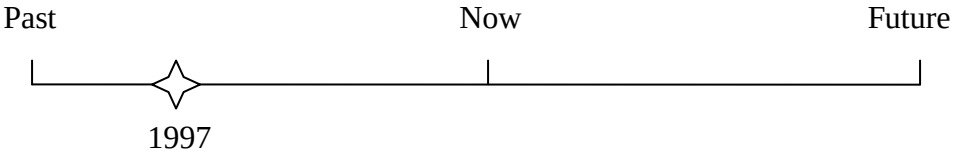
- The present perfect gives general information about the past. We do **NOT** know when the action happened.

I have studied first aid.



- The past simple gives information about a concrete time in the past.

*I studied first aid in **1997**.*



Complete the grammar guidelines below with

?	Have **Have/Has**	you **+ subject**	done **+ V3**	safety training before **…**	
+	I **Subject**	have **+ have/has**	done **+ V3**	first aid training **…**	
-	I **Subject**	have **+ have/has**	not **+ not**	done **+ V3**	first aid training …

Rewrite the sentences below without mistakes.

1) I have worked offshore in 2001. - ……
2) Yes, I have visited. - ……
3) Have you ever see an explosion? - ……
4) I have took a file from the warehouse. - ……
5) I have started my shift at 7:00am. - ……
6) I haven't work offshore. - ……
7) You have been abroad? - ……
8) I haven't never seen an accident. - ……

Complete the sentences by using one of the verbs in the box in the present perfect.

complete	not/use	study	do
not/receive	fly	open	work

1) …… Andrew …… the valve?
2) Alan …… a first aid course but he …… a certificate.
3) Frank …… offshore and he …… in a helicopter many times.
4) Tom …… a blowtorch before.
5) Have …… ever …… electronics?
6) Mike …… the incident report.

Put the verbs in the correct tense, present perfect or past simple, to complete the text. (8.3)

Alan: Can I ask you a few questions?

Bob: Sure.

Alan: Okay, first, …… (you/do) safety training before?

Bob: Yes, I ……

Alan: Good. When …… (you do) it?

Bob: I …… (do) it about three years ago now.

Alan: And what …… (you/study)?

Bob: We …… (study) fire protection and fire injury related first aid.

Alan: And …… (you think) the training was useful?

Bob: Yes, I ……

Alan: Okay. And …… (you/use) the training since then?

Bob: Yes, I …… Well, I …… (use) the fire safety but I …… (not/use) the first aid.

Alan: Why …… (you/use) the fire safety?

Bob: About six months ago there …… (be) a small fire in the warehouse and I …… (help) put it out.

Now, interview a partner and complete the table.

General information		**Specific Information**		
Have you ever …		**When …?**	**Where …?**	**…?**
… done safety training?	Yes / No			
… studied first aid?	Yes / No			
… seen an accident?	Yes / No			
… been injured at work?	Yes / No			
… worked offshore?	Yes / No			
… flown in a helicopter or plane?	Yes / No			
… studied English before?	Yes / No			
… ……?				

Tell the group about one of the things your partner has done. Give as much detail as possible.

Write a summary of what you have done in the last two weeks of your language training. Have you used English outside the training roon?

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‘Already’ and ‘Yet’

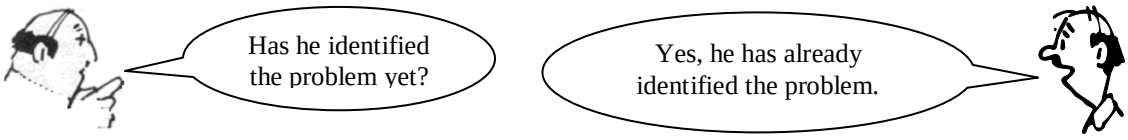
We can use the present perfect to describe progress in a job. We use ‘already’ in positive sentences to show something has happened before now. We use ‘yet’ in negative sentences and questions to show that something hasn’t happened before now.

- You have **already** started the ELS technical English course.
- You haven’t finished the ELS technical English course **yet.**

Listen to the cassette and complete Bob’s maintenance checklist. Check with a partner and then write sentences using ‘yet’ and ‘already’. (8.4)

Maintenance Checklist	
Identify the problem	✓
Choose the best solution	
Complete a risk assessment	
Inform people about the job	
Select the correct equipment	
Isolate the power	
Conduct the maintenance	
Test the system	
Inform people the job is complete	
Reconnect the power	

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……
9) ……
10) ……



Lockouts and Tagouts

Electricity can be very dangerous and can cause several types of injury, ranging from minor burns to death, depending on the voltage and duration of the shock. If a piece of equipment is undergoing maintenance or inspection it must be power isolated to protect personnel from injury. This is achieved using a system of lockouts and tags. Match the sentences in the steps outlined below and write a paragraph to describe the process of energy isolation.

Inform	the maintenance or inspection
Turn off	the main disconnect switch
Turn off	the isolation
Lock	the point of operation of the device
Apply	the main disconnect switch
Test	all parties of the work to be done
Conduct	the warning tag to the main disconnect switch

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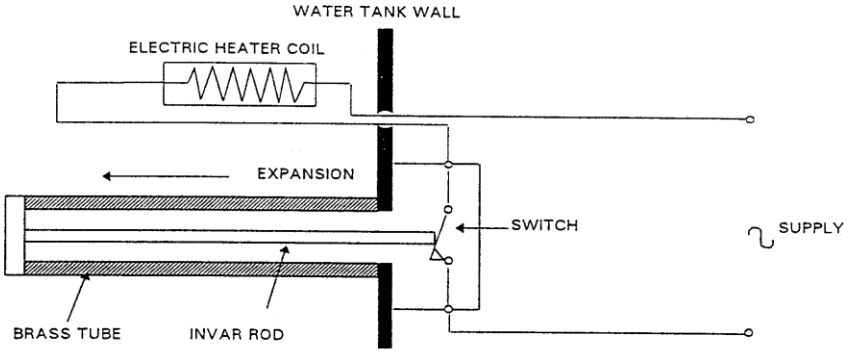
Now, choose the correct option in the description of how to remove lockouts.

… (1) … work on the system is completed inform … (2) … that power is about to be restored. Ensure the point of operation switch is in the off position so the system will not … (3) … when the power supply is re-established. … (4) … the locks and tags and move the disconnect switch to the ON position. … (5) …, move the point of operation switch into the on position.

1)	a. Before	b. During	c. After
2)	a. all affected personnel	b. the operator	c. the supervisor
3)	a. malfunction	b. overload	c. explode
4)	a. put on	b. remove	c. apply
5)	a. Finally	b. Next	c. First

Thermostats

Thermostats are a cheap method of regulating temperature. Although they are not very accurate they can maintain a constant temperature ± 3°C. Look at the diagram, read the description and answer the questions.



The diagram above shows a simple rod thermostat. The brass tube expands a lot as it gets hotter but invar expands very little. When the liquid is cool the brass does not expand so the switch is closed and the electric heater heats the water. When the water reaches the set temperature the brass tube expands to the point it pulls the invar rod away from the switch. This opens the switch and breaks the circuit and disconnects the electric heater. The electric heater will stay disconnected until the brass tube contracts enough to close the switch again. The set temperature can be adjusted by changing the tension of the spring which closes the switch.

1) Why are invar and brass used in the system?

   ……

   ……

2) How is the circuit broken?

   ……

   ……

3) How is the circuit made?

   ……

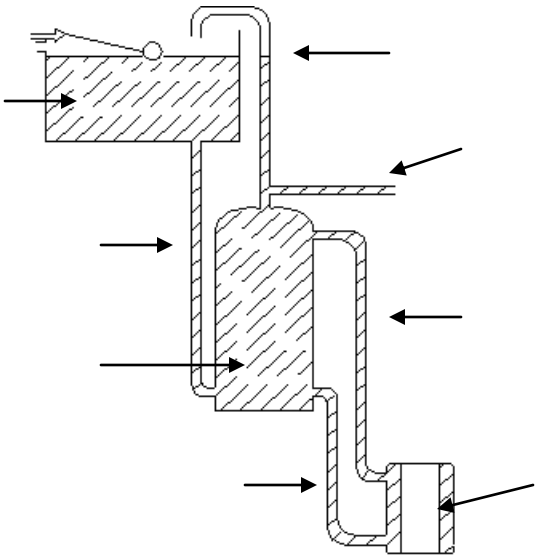
   ……

4) How is the set temperature adjusted?

   ……

   ……

Read the description of a domestic heating system and label the diagram.



A domestic hot water supply system consists of a boiler, a hot water storage tank and a cold water supply tank interconnected by pipes.

When the system is in operation, a convection current of hot water from the boiler rises up the flow pipe and cold water descends to the boiler through the return pipe B, where it is heated.

In this way, a circulation is set up with the result that the hot water storage tank gradually becomes filled with hot water from the top downwards. It is important to notice that the flow pipe A leaves the boiler at the top and enters the top of the hot tank, while the return pipe B connects the bottom of the hot tank to the bottom of the boiler. Hot water for use in the kitchen and bathroom is taken from pipe D leading from the top of the hot tank. When hot water is used, an equal volume of water from the cold supply tank enters the hot storage tank at the bottom through pipe C. The whole system is kept constantly full of water in this way and no air can enter the system. The water level in the cold tank is maintained by a supply from the mains which enters through a ball-cock.

An expansion pipe rises from the top of the hot tank and is bent twice at right angles so that its open end is above the cold tank. This is a safety precaution so that if the fire is allowed to burn so fiercely that the water boils, steam and hot water are discharged harmlessly into the cold tank and no damage results. The expansion pipe also permits the escape of dissolved air, which is liberated from the water when it is heated. This prevents troublesome air locks in the pipes.

Describe the progress of a water particle through the system

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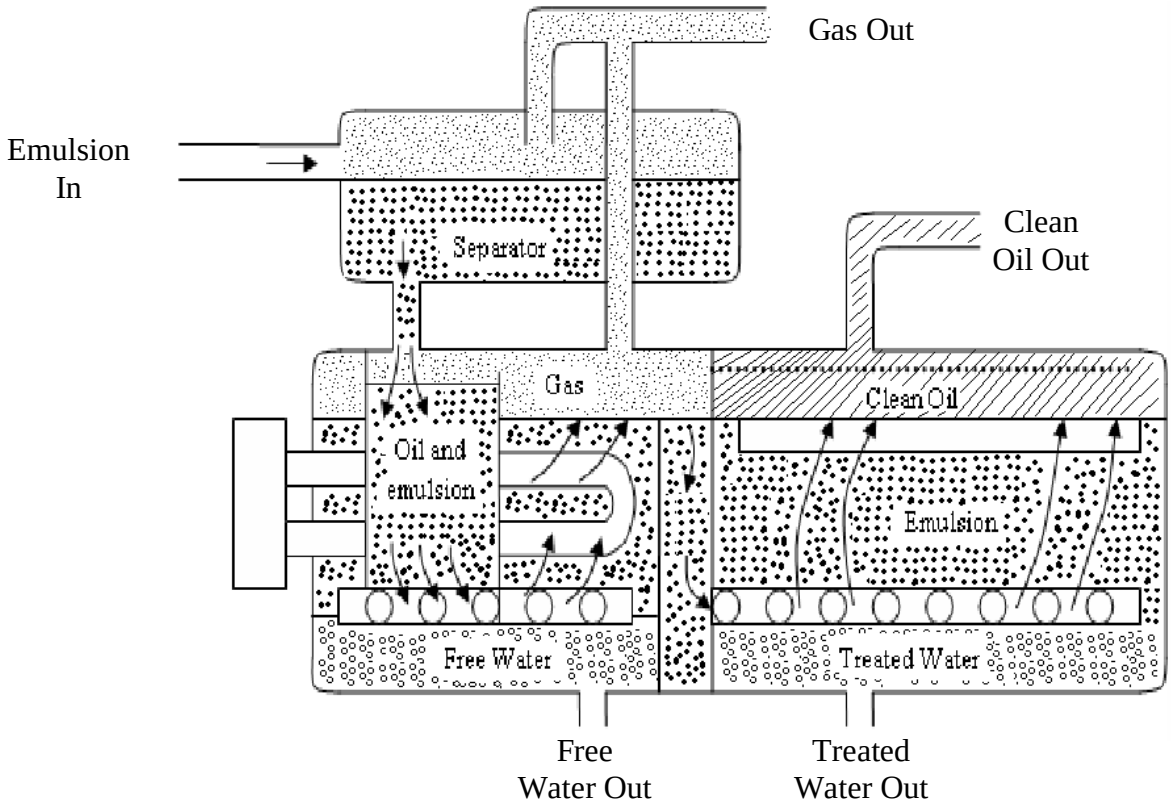
Oil/Water Separation

Crude oil taken from the ground is an emulsion (mixture) of oil, water and gas. The water and gas need to be separated from the oil. This can be done by using heat treatments, demulsifiers or centrifuges.

Heater Treaters

A heater treater works by changing the density and viscosity of emulsions. When the heat increases the viscosity of the oil gets lower which makes the water droplets move faster and coalesce (combine) more quickly. Look at the diagram and answer the questions that follow. Then, summarise the process of water separation using heat treatment. (📼 8.5)



1) What is the first thing removed from the emulsion? ……

2) Is water removed prior to heating? ……

3) Is gas only removed from the emulsion during the initial stage of treatment? ……

4) Which is heavier, oil or water? ……

……...

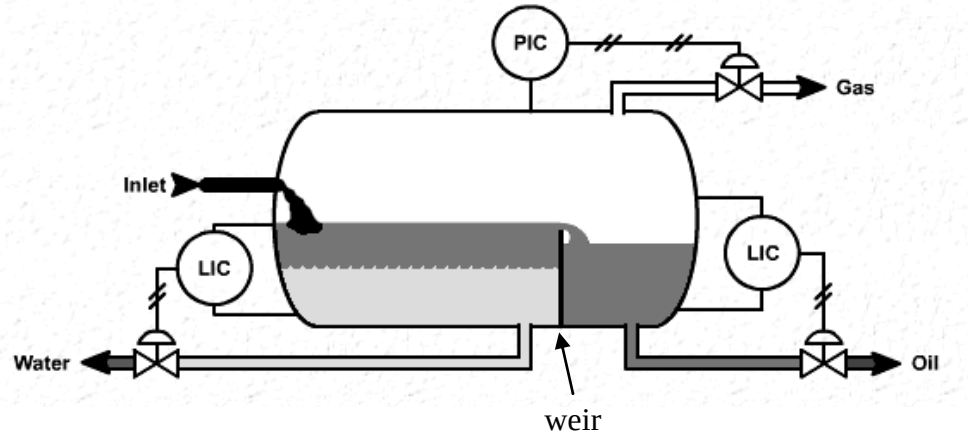
……

……

……....

Chemical Separators

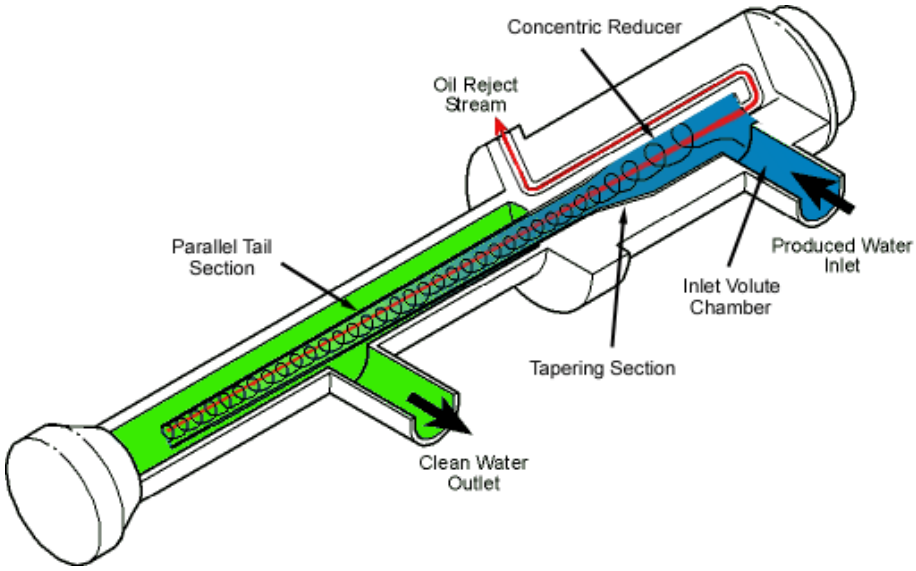
In a chemical separator a chemical demulsifying agent reacts with the oil and water and breaks down the emulsion. The diagram below shows a horizontal type production separator. Complete the text using the nouns in the box. (8.6)



gas	oil	water
chemical demulsifying agent		crude oil mixture

A production separator is designed to remove …… from ……. It works with the addition of a ……. The …… flows through the inlet valve and accumulates on the left hand side of the weir. As …… is denser than …… it sinks to the bottom of the tank and flows out of the …… release pipe. As …… is lighter than …… it floats on the surface of the …… and reaches a high enough level to cross the weir and flow through the …… release pipe. The pressure of the system is maintained by venting …… through the …… relief pipe and adjusting the release valves on the …… and …… pipes.

Look at the diagram of a hydrocyclone centrifuge below, typically used as the final stage of water separation when the liquid has already been treated by heat or with demulsifiers. Work with a partner to describe the equipment and explain how it works. Use the words in the box to help you. Present your explanation to the group.



force	heavier	outer wall	flow
reject	central core	base	dense

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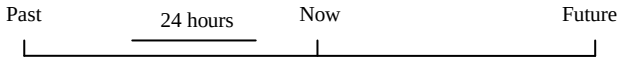
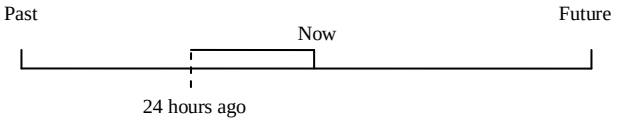
Ongoing Situations

We can also use the present perfect to describe a situation that started in the past and is still continuing now. It connects the past and the present. Match the sentences to the timelines.

The oil was in the demulsifier for 24 hours



The oil has been in the demulsifier for 24 hours.



Decide if you have to use 'for' or 'since' with the time phrases below and then complete the grammar rule which follows.

.....	ages	.....	three years	.....	I started work
.....	forty minutes	.....	March	.....	about an hour
.....	I was born	.....	two months	.....	two months ago
.....	last year	.....	1993	.....	the company began

- We use '……' when we want to talk about periods of time.
- We use '……' when we want to say when the action started.

Now, interview a partner and record their answers using full sentences.

1) How long have you lived in your present home?

   ……

2) How long have you worked for your company?

   ……

3) How long have you had the pen you are using now?

   ……

4) How long have you worked in the oil industry?

   ……

5) How long have you studied English?

   ……

Describing Processes – Wordlist

absorb
accumulate
adequate
after
agent
ball-cock
before
blow
centrifuge
chronological
circulation
coalesce
compression
conduct
core
corrosive
demulsifier
descend
desired
diagnose
discharge
during
emulsion
endanger
hydrocyclone
insulated
interconnected
jack
junction
load (n)
permeable
preserve
promote
re-establish
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respiration
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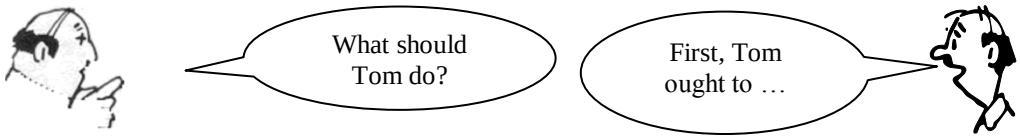
Unit 9

Expressing Possibility



Expressing Possibility – Unit Map

The aim of this unit is to provide the structures necessary to discuss real and unreal situations and to use the language of hypothesising. By the end of the unit you will be able to:

- use appropriate modal verbs to express obligation or advice.
- talk about present and future possibilities.
- use appropriate language to talk about hypothetical and unreal situations.
- use modal verbs in the active or passive voice

I can	Difficult	Okay	Easy
Express obligation			
Give advice			
Express possibility			
Discuss hypothetical situations			
Troubleshoot problems with equipment			
Discuss slip hazards			
take part in tool box talks			

I understand	Difficult	Okay	Easy
the unit grammar: Modal verbs for advice			
2^{nd} Conditional			
the unit vocabulary (see word list)			

If there is anything you are not sure of ask you trainer to revise the material.

Obligation and Advice

In an earlier chapter we looked at 'can' to express **ability**.

- You **can** cut an electric cable with a pair of scissors.

However, sometimes we need to show **obligation** or give **advice**. We use 'must' to show obligation and 'should' to give advice.

- You **mustn't** cut an electric cable with a pair of scissors. You **should** use insulated wire cutters.

Rewrite the sentences with the appropriate expression.

9. You can turn a bolt with pliers.

   ……

   ……

10. You can chip away metal with a screwdriver.

    ……

    ……

11. You can sharpen tools with a file.

    ……

    ……

Now, use should(n't) or must(n't) to complete the following sentences. Compare your answers with a partner. Do you have the same answers? (🔊 9.1)

1. You …… wear a seatbelt when driving.
2. You …… wear a seatbelt when you are a passenger.
3. You …… drink alcohol the night before work.
4. You …… drink alcohol the night before a helicopter flight.
5. You …… complete incident reports with a red pen.
6. You …… study more about your discipline at home.
7. You …… always obey the speed limit.
8. You …… only do a job if you are competent.
9. You …… wear PPE in the workshop.
10. You …… ask a question if you don't understand something.

Expressing Obligation

Complete the sentences with one of the nouns in the box.

grinder	screwdriver	computer	blow torch

- You must wear safety gloves when using a …… .
- You have to wear safety gloves when using a …… .
- You mustn't use safety gloves when using a …… .
- You don't have to use safety gloves when using a …… .

Both 'have to' and 'must' express obligation, but what is the difference? Look at the two sentences below.

"You must stop smoking." – wife to husband
"You have to stop smoking." – doctor to patient

In general English terms 'must' expresses a personal obligation (it is important to the speaker) and 'have to' expresses a general obligation. Because it is personal 'must' is usually believed to be stronger than 'have to' but both indicate a 100% obligation.

The important difference is in the negative form. Look at the following sentences and answer the questions.

- "You mustn't start the job before you do a risk assessment."
  Can I start the job before I do a risk assessment? ……
  Do I have a choice? ……

- "You don't have to start the job before lunch."
  Can I start the job before lunch? ……
  Do I have a choice? ……

Choose the best modal verb in the sentences below.

1. You **mustn't / don't have to** wear PPE at home.
2. You **mustn't / don't have to** distract a driver when they are driving.
3. You **mustn't / don't have to** evacuate the building during a fire alarm test.
4. You **mustn't / don't have to** lie about an accident to protect a colleague.
5. You **mustn't / don't have to** ignore safety signs.
6. You **mustn't / don't have to** use another language during English classes.
7. You **mustn't / don't have to** copy in a test.

An obligation is something that is necessary. An obligation can be either positive or negative.

Necessary	Unnecessary
must have to need to mustn't	needn't don't have to don't need to

When we want to give advice, however, we use 'should' or 'ought to'. Both expressions mean that it is a good idea to do something.

What advice would you give someone in the following situations? Discuss you answers with a partner

Tom: "I saw a colleague taking some tools home from the workshop."

……

……

……

Mike: "I am very tired by the end of my 12-hour shift."

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……

……

Paul: "I think there are too many safety rules in my job."

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……

……

Neil: "I am bored in my position."

……

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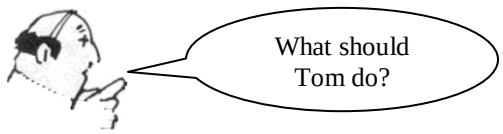
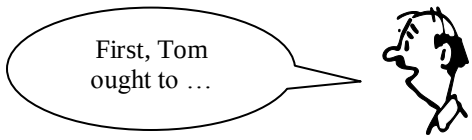




Troubleshooting

If a piece of equipment isn't working you need to identify the cause of the problem. To do this we need to look at the **symptoms**.

Look at the symptoms below: what *might* / *may* / *could* be the cause. Suggest two alternative causes for each.

1. A tank is overflowing.
   - ……
   - ……
2. A light is not working.
   - ……
   - ……
3. Water is not flowing from the tap.
   - ……
   - ……
4. An operator has a headache.
   - ……
   - ……
5. The pressure in the pipeline is too high.
   - ……
   - ……

When you are looking for the cause of a problem it is important to consider **all** the evidence and to avoid making **assumptions**. You must also be able to identify what is **relevant** and what is **irrelevant**. For the problem below decide which information is relevant (**R**) and which information is irrelevant (**I**). Then, using all the evidence, suggest an explanation for the problem.

Problem: There is no power in Bob's office.

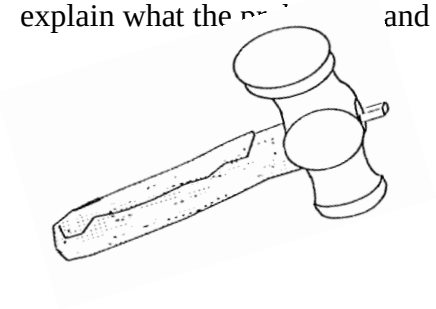
It is April 14th.	……	The other buildings have power.	……
It is 14:30.	……	There is a smell of smoke.	……
Bob is a smoker.	……	It is raining.	……
Bob has a new computer.	……	Bob was late for work.	……
It was Bob's birthday yesterday.	……	No alarms are sounding.	……

……

……

……

It is also very important to be able to anticipate problems. Look at the pictures below and explain what the problem is and what **may / might / could** happen if the tools are used.



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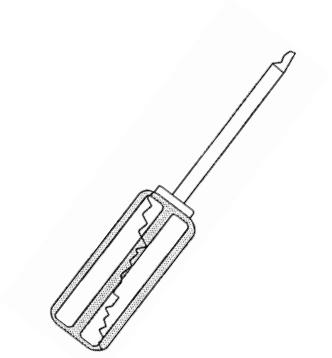

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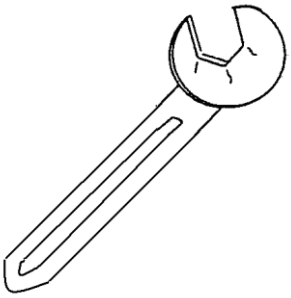

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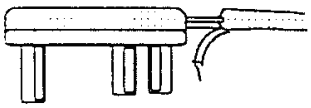

……
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……
……
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What should be done with faulty tools?

……

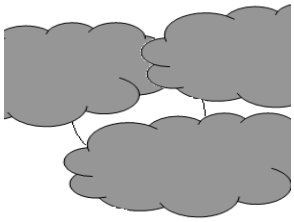
……

Making Predictions

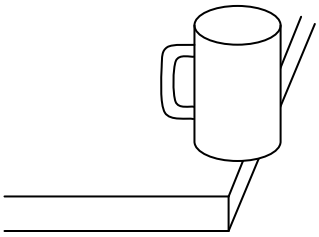
When we want to make predictions about the future we can use 'will' or 'going to'. The difference is the level of certainty. If we say 'will' we *think* something will happen. If we say 'going to' we are *sure* something will happen.

Look at the pictures and predict what is going to happen.

1)



2)



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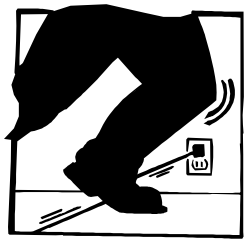


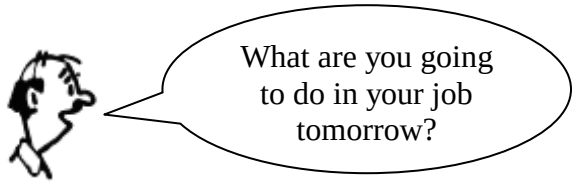
1) ……

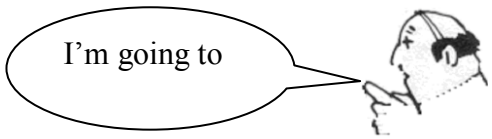
2) ……

3) ……

Interview a partner about the future and record their answers in the table below. Remember to use 'going to' for certain predictions and 'will' for unsure predictions.

	tomorrow	next week	next year	in ten years
your job?				
your family?				
the price of oil?				
……?				





Modal Matching

Write the answers to the questions as full sentences in the space below, using passive modals.

What shouldn't be used when driving?	Checking fire-fighting equipment
What must be used when working on-site?	A full investigation
What could an injury be caused by?	Full PPE
What could an HSE officer be responsible for?	Using faulty equipment
What has to be completed after an incident?	A mobile telephone
What might be caused by fire?	A technical writer
What job may a qualified engineer have?	Serious personal injury

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……

Rewrite the sentences with the words in the correct order

a) drop / loss / may / caused / in / by / be / pressure / of / temperature / a / a

……

b) heat / affected / in / metals / ways / by / be / can / different / different

……

c) site / faulty / not / on / when / should / equipment / be / working / used

……

d) followed / all / must / safety / times / be / regulations / at

……

e) job / you / appropriate / always / for / tool / should / use / the / the /

……

Filters and Strainers

Choose the best modal verb to complete the text and then listen and check. (🎧 9.2)

One problem for pipelines is solids in liquids. These solid particles **should / might / must** be carried in the liquid or **need to / might not / could** be formed within the pipeline and be the result of corrosion of the pipe wall. Solid particles **must / can / should** cause excessive wear or equipment malfunction and so they **have to / should / may** be removed to protect equipment and extend the working life of parts.

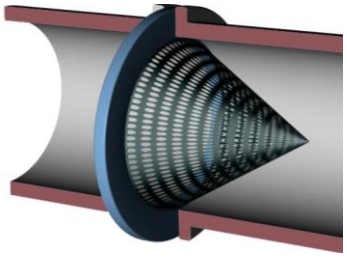


fig 1. Cone filter

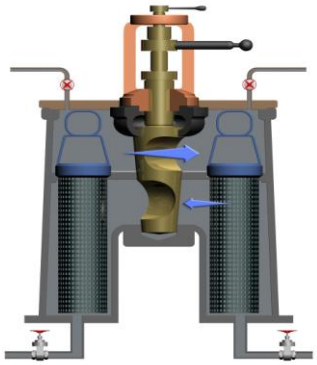


fig 2: Duplex filter

Solid particles **should / can / must** be removed by strainers and filters. Strainers are normally a metal screen which **need to / could / can** catch large, coarse particles. but they **mustn't / can't / shouldn't** trap smaller particles. Filters are finer so they **might / can / have to /** catch smaller particles.

Some filters **should / may / can** be fitted within pipelines and **have to / may / should** only be accessed for cleaning by breaking the pipeline (see fig. 1).

Other filter systems, for example duplex filters (see fig.2), contain more than one filter so when one filter is offline for cleaning the flow **must / can / might** be directed to the other filter.

When filters are new the flow rate **shouldn't / couldn't / mustn't** be affected much but when filters get older solid particles build up which means not as much liquid **should / might / can** pass through so the flow rate is lowered.

1) What is the difference between filters and strainers?

   ……

2) What is the disadvantage of a cone filter?

   ……

3) What happens to the flow rate as filters get older? Why?

   ……

Talking About Objects (2)

You **can use** modal verbs in **active** sentences.
Modal verbs **can be** used in **passive** sentences.

Complete the following sentences with an appropriate passive modal verb.

must / complete	should / use	can / cause
should / replace	can / drain	must / monitor

1. Separated water …… through valve A.
2. An incident report …… after an accident.
3. The pressure …… carefully.
4. Insulated tools …… when working with electricity.
5. Faulty seals …… as soon as possible.
6. Accidents …… by horseplay.

Look through earlier units in this course. Find four examples of active modal sentences (A) and four examples of passive modal sentences (P). Write them below and compare your sentences with a partner.

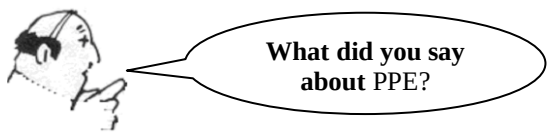
Unit	Example Sentence	A/P
……	……	……
……	……	…….
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Now, complete the following sentences in a logical way. Use either active or passive sentences

PPE	should	…….
	shouldn't	…….
	must	…….
	mustn't	…….
	can	…….
	can't	…….
	may	…….
	might	…….
	might not	…….

First Aid	should	…….
	shouldn't	…….
	must	…….
	mustn't	…….
	can	…….
	can't	…….
	may	…….
	might	…….
	might not	…….

Compare your ideas with a partner.



Slip Hazards

There are different types of slip hazards. Work with a partner and give suggestions for how to deal with the following hazards.

Hazard	Your Solutions	a-j
Spillage of wet or dry substances		
Trailing cables		
Miscellaneous rubbish e.g. plastic bags		
Rugs/mats		
Lighting		
Slippery surfaces		
Change from wet to dry surface		
Change of level		
Slopes		
Steam or smoke obscuring view		

Share your ideas with the group. Were your suggestions different?

Now, match the texts below to the slip hazards above and write the correct letter in the column provided in the table

a. Equipment should be positioned to avoid cables crossing pedestrian routes and cable covers should be used to securely fix to surfaces and access restricted to prevent contact. If possible cordless tools should be used.

b. This should be avoided if possible. If it can not be avoided you should improve lighting and add high visible tread indicators (i.e. white/reflective edge to step).

c. You should ensure mats are securely fixed and do not have curling edges.

d. It is a good idea to improve visibility, provide hand rails and use floor markings.

e. You should try to improve lighting levels and placement of light fittings to ensure more even lighting of all floor areas.

f. Suitable footwear should be provided and employees should be warned of risks by using signs. Doormats should be located where these changes are likely.

g. This should be eliminated or controlled by redirecting it away from risk areas and by improving ventilation. Employees must also be warned of it.

h. Areas have to be kept clear and rubbish should be removed as soon as possible to avoid it building up.

i. The cause should be assessed and treated accordingly; for example, always keep surfaces dry if wet causes the problem. In certain situations you may have to treat them chemically and use appropriate cleaning methods

j. These should be cleaned up immediately; if a liquid is greasy, make sure a suitable cleaning agent is used. You should use appropriate barriers to tell people the floor is still wet and arrange alternative bypass routes.

Talking Hypothetically

Match the sentences and write them next to the appropriate context below.

If Mark **presses** that button	the plant **will shut down**.
If David **pressed** that button	we **would have to** reassess the site for digging.
If it **rains**	the plant **would shut down**.
If it **rained**	there **would be** an accident.
If Tim **makes** a mistake	we **will have to** reassess the site for digging.
If Simon **made** a mistake	there **will be** an accident.

1) It is summer - ……
   ……
2) It is winter - ……...
   ……
3) Mark is an operator - …….
   ……
4) David is a roustabout - ……..
   ……
5) Tim is bad at his job - ……...
   ……
6) Simon is good at his job - …….
   ……

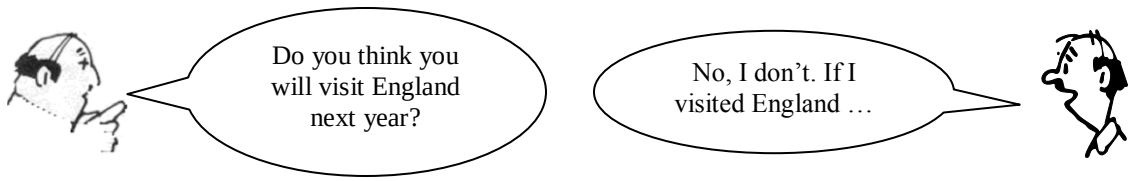
Now, look at the examples and complete the grammar rules with the words provided.

unreal	very low possibility	real	past	future	future	present	impossible

First Conditional	We use 'if' and a …… tense, + 'will' and to talk about …… situations in the …… . This sentence describes a **possible** situation.
Second Conditional	We use 'if and a …… tense, + 'would' to talk about …… situations in the **present** or …… . This sentence describes a …… or …… situation.

Complete the sentences below by putting the verbs in the correct form. Complete the last three sentences using your own ideas. Identify if the situation is real (possible) or unreal (very low possibility or impossible).

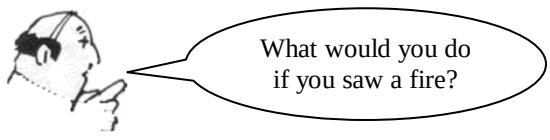
1. If I …… (visit) England next year I …… (go) on the London Eye. real / unreal
2. If I …… (have) an exam next week I …… (study) hard this weekend. real / unreal
3. I …… (work) in telecommunications if I …… (not / work) in the oil industry real / unreal
4. If our lesson …… (finish) on time I …… (get) home at the usual time. real / unreal
5. If I …… (do) the self study set I …… (make) good progress. real / unreal
6. We …… (not / use) this material if ELS …… (not / provide) our training real / unreal
7. I …… (earn) more money if I …… (work) offshore. real / unreal
8. I …… (be) successful if …… …… real / unreal
9. If I …… (lose) my job ……... …… real / unreal
10. If I …… (have) time this weekend I … …… real / unreal

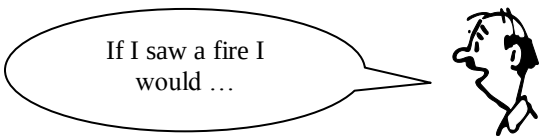


The second conditional ('if' clauses using a past tense and 'would') is very useful for talking about hypothetical situations in the **present** or **future**. Interview a partner and complete the questionnaire.

What would you do if …	
… you saw a fire?	…… ……
… you were always late for work?	…… ……
… you saw someone driving unsafely?	…… ……
… you needed some money quickly?	…… ……

What would happen if …	
… a driver fell asleep at the wheel	…… ……
… all the oil reserves finished?	…… ……
… there were a leak in a gas plant?	…… ……
… somebody worked offshore without proper training?	…… ……





Driving Safety

What do the following words mean?

Pedestrian - ……

ABS - ……

Roadworthy - ……

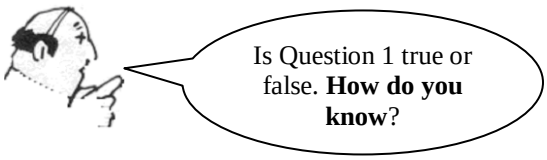
Listen and read the text and answer the True / False questions that follow. Discuss your answers with a partner. (9.3)

A driver has certain responsibilities to ensure his own safety, the safety of the vehicle, the safety of any passengers, pedestrians and other road users.

Larger vehicles have more safety regulations because they carry more people. In addition to the minimum requirements of all road ready vehicles larger vehicles should also be fitted with airbags, ABS, side impact bars and air conditioning. Regardless of size all vehicles must be fitted with a first-ad kit, fire extinguisher and a warning triangle for use in an emergency.

Before using any vehicle the driver must check it is roadworthy and fit for purpose. These checks include relevant documentation e.g. registration certificate, insurance certificate. If possible the driver should also examine the maintenance record of the vehicle.

1. It is mandatory to have insurance to drive T/F
2. It is mandatory to have the maintenance record of the vehicle to drive T/F
3. All vehicles must have side impact bars T/F
4. The driver must check if the vehicle is appropriate for the job. T/F
5. It is mandatory to have air conditioning in larger vehicles. T/F
6. The driver shouldn't worry about other vehicles on the road. T/F
7. Smaller vehicles do not require a first aid kit. T/F
8. All vehicles should carry a first-aid kit. T/F



Tool Box Talks

The previous text is an example of a tool box talk. The purpose of a toolbox talk is to ensure everybody knows what the job is, what procedures should be followed, what equipment should be used and what the dangers might be. Look at the outline for a tool box talk below and answer the questions that follow.

Remind your crew that there are several types of fire extinguisher and that they should be used for different types of fires. Technicians must be able to identify what type of extinguisher should be used on different types of fires.

One basic type of extinguisher contains water.

- These should be used on fires of wood, paper, cloth and rubbish.
- They should not be used on burning liquids like gasoline. The burning liquid will float on the water and the fire could spread.
- They should also not be used on live electrical equipment because water is a good conductor of electricity and the fire-fighter could get an electric shock.

The other common types of extinguishers contain carbon dioxide or dry chemicals.

- These are usually mounted on or beside machinery, equipment and containers of flammable liquid.
- Carbon dioxide and dry chemicals cut off the air supply necessary for a fire and smother it.

Be sure someone has gone to call the immediate supervisor even before you try to put out the fire.

1) What is the topic of the tool box talk?

   ……

2) What is the purpose of the tool box talk?

   ……

3) What is the most important information in the talk?

   ……

4) Does the talk contain enough information?

   ……

Now, work with a partner and prepare a tool box talk on one of the following areas.

Working with electricity	Working at heights	Using power tools

Technical Expressions

Use the expressions in the box below to complete the sentences

interface with	connected to	observed on
associated with	known as	subjected to

1) The results of the test can be …… the computer monitor.
2) The training centre in Sangachal is …… the CTTC.
3) The TV must be …… the power supply by an electric cable.
4) If water is …… heat, it boils.
5) The Nobel brothers are …… the early oil industry in Azerbaijan.
6) An Apple computer can not …… a Windows programme.

Now match the 'Tech Terms' on the left its 'Plain English' synonym.

Tech talk	Plain English
As	Give
Via	Change
Constructed	Developed
Convert	Need
Adapted	Work
Utilize	While
Require	Made
Transmit	Use
Provide	Send
Operate	By

Re-write the following sentences, using tech talk

1) The signal should be sent to the receiver by radio.

   ……

2) The digital recorder should give more accurate results, if needed.

   ……

3) The machine uses electrical energy that can be changed into mechanical energy.

   ……

4) The machine was made so it could work 24 hours a day.

   ……

Expressing Possibility – wordlist

advice
anticipate
assumption
cloth
discipline
duplex
faulty
filter
horseplay
interfaced
irrelevant
obligation
overflow
pedestrian
roadworthy
reassess
relevant
strainer
troubleshooting

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Module 3 Review

GRAMMAR BOX – Comparatives
Comparatives are used to compare two or more objects. Comparative adjectives are formed in the following way: for one syllable adjectives add '–er', for longer adjectives use 'more', for short adjectives ending in 'y' add '-ier'.

A kilometer is **shorter** than a mile.
An electric drill is **more powerful** than a hand drill.
Lead is **heavier** than gold.

Comparatives are used after a verb (often 'to be') and 'than' is used before the second object. Irregular adjectives are 'good ⇨ better', 'bad⇨ worse' and 'far ⇨ further'.

Complete the comparative sentences using the adjectives in the box.

combustible	viscous	easy/compress	strong	dangerous

1) Oil ……..…… water.
2) Gases …… liquids.
3) Petrol …….. diesel.
4) Offshore drilling …… onshore drilling.
5) Steel …… plastic.

Now, write sentences to compare different products which can be refined from crude oil Use a range of different adjectives.

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……
7) ……
8) ……
9) ……
10) ……

Share your sentences with the group. Who has made the most interesting comparisons?

GRAMMAR BOX - Superlatives
A comparative sentence compares two or more things. A superlative sentence gives information about one object that is part of a larger group. It describes how the object is special in some way. It is formed like comparatives using '-est', 'iest' and 'most'

Methane is **the lightest** hydrocarbon.
Hydrogen is **the smallest** element.
The Antarctic is **the most difficult** place to search for oil.

We use 'the' before superlatives. Irregular adjectives are 'good ⇨ best', 'bad ⇨ worst' and 'far ⇨ furthest'.

Now, work with a partner and write a superlative quiz for the other members of the group i.e. 'What is the largest oil field in Algeria?' Make sure you know the correct answers to the questions before you start the quiz.

1) Question: ……?
   Answer: ……
2) Question: ……?
   Answer: ……
3) Question: ……?
   Answer: ……
4) Question: ……?
   Answer: ……
5) Question: ……?
   Answer: ……
6) Question: ……?
   Answer: ……
7) Question: ……?
   Answer: ……
8) Question: ……?
   Answer: ……

GRAMMAR BOX – Present Perfect – unknown past
The present perfect can be used to describe a non-specific time in the past. It is formed using have/has and the past participle form of the verb. Time is NOT important.

Claire **has worked** a two on two off rotation.
I **haven't flown** in a helicopter.
Have you **worked** shifts before?

Complete the interview using the verbs in the box in the correct tense.

become	work (x2)	find	have
miss	change	be	get

Ben: …… you …… previous experience in the oil industry?

Ellen: Yes. I …… onshore and offshore as an operator.

Ben: When …… you …… offshore?

Ellen: That …… from 1999 to 2002. In 2002 I started working onshore.

Ben: Why …… you …… from offshore to onshore?

Ellen: A better position …… available onshore.

Ben: And …… you …… working offshore?

Ellen: I …… the people but not the rotation. I sometimes …… it difficult to work six weeks.

Ben: And …… you ……plans to change your position again?

Ellen: Not at the moment.

Now, use the nouns in the box as prompts and interview a partner using present perfect questions for general information about the past and the past simple for details.

doctor	maintenance	Europe	valve	derrick tower	circular saw

1) ……
2) ……
3) ……
4) ……
5) ……
6) ……

GRAMMAR BOX – Present Perfect – unfinished past
The present perfect is also used to describe an unfinished action, something which started

in the past and continues *now*. In this kind of sentence we use 'for' and since' and time IS important.

I **have studied** English with LS for eight months.
Bob **hasn't been** to work since Tuesday because he is ill.
How long **have** you **worked** in the oil industry?

Complete the present perfect sentences using the words given and 'for' or 'since'. You will have to ask your colleagues for some of the answers. For the last question ask someone you haven't asked already a question of your choice.

1) you/work/company

……

2) your family/live/apartment

……

3) you/know/ LS trainer

……

4) the person to your left/study/English

……

5) the person to your right/know/best friend

……

6) be/in training room

……

7) study/present perfect

……

8) your country/produce/oil

……

9) you company/operate

……

10) your LS trainer/live/your country

……

11) ……?

……

GRAMMAR BOX – Second Conditional
The second conditional is an 'if' clause which talks about the present or future. It describes unreal situations: very low possibility or impossible. It is formed using 'if' and

the past tense in one clause and 'would' and the infinitive in the other clause.

If there **were** no oil in Algeria oil companies **wouldn't operate** there.
What **would** you **do if** you **saw** an explosion?

The second conditional does NOT talk about the past.

Discuss the following ideas with your partner. Do you agree with them? If not, what do you think.

1) Nobody would study English if computers only used Japanese.
2) It would be good if we knew when oil reserves were going to finish.
3) Life would be easier if we didn't have the internet.
4) There would be no wars if everyone spoke the same language.
5) If oil were discovered on the moon I would work there.

GRAMMAR BOX – Modal Verbs
Modal verbs are used in the following way:

	advice	possibility	obligation	ability
can		✓		✓
could		✓		✓
have to			✓	
may		✓		
might		✓		
must			✓	
need to			✓	
ought to	✓			
should	✓			

Modal verbs are followed by the infinitive of the verb.

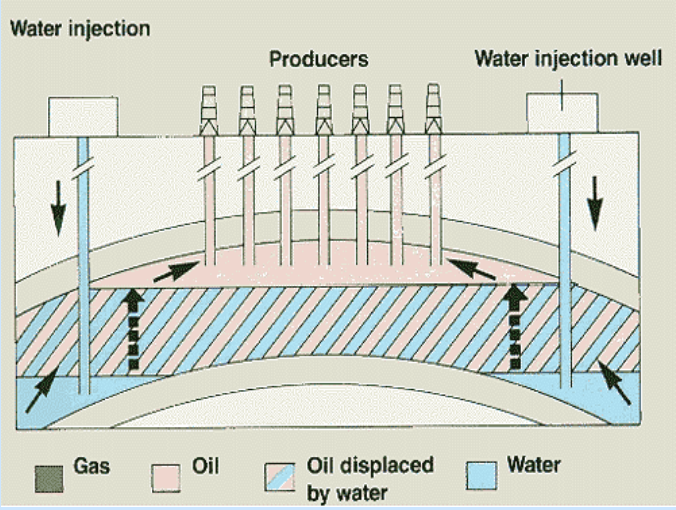
Use the modal verbs in the table above and the verbs given to complete the following sentences – the sentences can be positive or negative.

1) You …… at home
2) You …… at work
3) You …… in an airplane (smoke)
4) You ……

Read the text about and then answer the questions.

Water Injection

As a well gets older the pressure decreases and it becomes more difficult to pump oil efficiently. The recovery of oil can be enhanced using water injection. By forcing water below the accumulation through the injection wells, usually located at the periphery of the field (see diagram below), the crude oil is pushed towards the producing wells near the centre. Using water injection can improve oil recovery from 15% to 50%



As well as maintaining pressure for crude oil recovery water injection should also keep oil below its bubble point, the point when gas can escape from the crude oil in great quantities and is produced more than oil.

Before water is injected into the well it must be treated to remove oxygen, solids and bacteria that might cause wear or corrosion and damage equipment.. Seawater is used on offshore platforms as a source of water. Because seawater contains a high level of sodium chloride it also needs to be desalinated because untreated seawater can be highly corrosive.

1) What is the purpose of water injection?

   ……

2) What could happen if untreated seawater were injected into wells?

   ……

3) What would happen if water were injected down wells near the centre of the accumulation?

   ……

4) How much might water injection improve oil recovery by?

   ……

5) If there were low well pressure what would happen to gas?

   ……

Grammar Review

The following are some of the grammar points were covered over the course:

- Present Simple
- Present Simple Passive
- Zero Conditional
- 1st Conditional
- Relative Clauses
- Modal Verbs
- Passive Modal Verbs
- Imperative
- Infinitive of Purpose

Look at the sentences below and match each sentence to a grammar point.

a) The alarm will sound if the engine gets too hot.

.....

b) Complete safety clothing must be worn on site.

.....

c) The overarm is connected to the shaft by bolt B.

.....

d) Wear a hard hat.

.....

e) The liquid flows through the tube into container A.

.....

f) The furnace, which can reach a heat of 2000°C, is behind us.

.....

g) If the temperature exceeds 150°C the liquid boils.

.....

h) The fan is used to lower the engine temperature.

.....

i) The factory can produce 1200 items per day.

.....

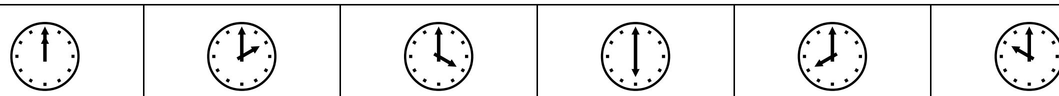
Now, complete the table.

Grammar Point	Usage
Infinitive of Purpose	is used to show ***why*** we do something e.g. 'I went the office ***to do*** some work.'
Present Simple	
Present Simple Passive	
Zero Conditional	
1st Conditional	
Relative Clauses	
Modal Verbs	
Passive Modal Verbs	
Imperative	

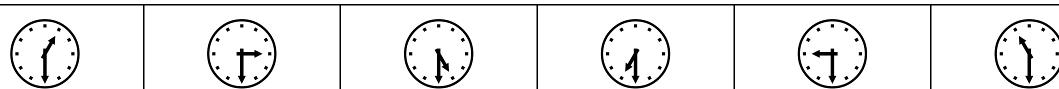
Pairwork Activities

Student A

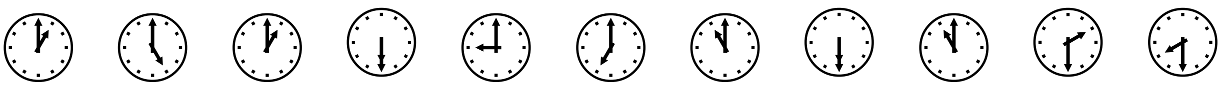
The times below match a letter. Your partner has different information to you. Use **your partner's** information to find the names of the **jobs** below.



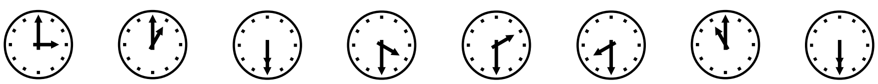
P	T	U	E	L	O



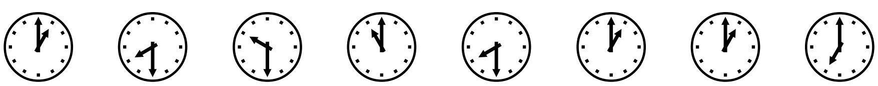
A	N	I	S	M	R



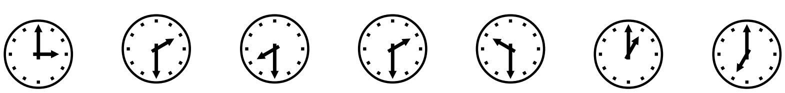
…… …… …… …… …… …… …… …… …… …… ……



…… …… …… …… …… …… …… ……



…… …… …… …… …… …… …… ……



…… …… …… …… …… …… ……

What letter is at one o'clock?

'E' is at one o'clock?

The Periodic Table

The table below gives information about the first 18 elements in the period table. Work with a partner to complete the information. Use the questions given.

1 **H** Hydrogen ……											2 **He** …… 4.002602
3 …… Lithium 6.941	4 **Be** Beryllium ……			5 **B** …… 10.811	6 …… Carbon 12.0107	7 **N** Nitrogen ……	8 **O** …… 15.9994	9 …… Fluorine 18.9984032	10 …… …… 20.1797		
11 …… Sodium 22.989770	12 …… Magnesium ……			13 **Al** …… 26.981538	14 **Si** …… ……	15 …… Phosphorus 30.973761	16 …… …… ……	17 …… …… ……	18 **Ar** Argon 39.948		

21 **Sc** Scandium 44.955910	22 **Ti** …… 47.867	23 **V** Vanadium ……	24 …… Chromium 51.9961	25 …… …… 54.938049	26 **Fe** Iron 55.8457	27 …… …… ……	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc ……

What is the atomic weight of …?

What is the symbol for …?

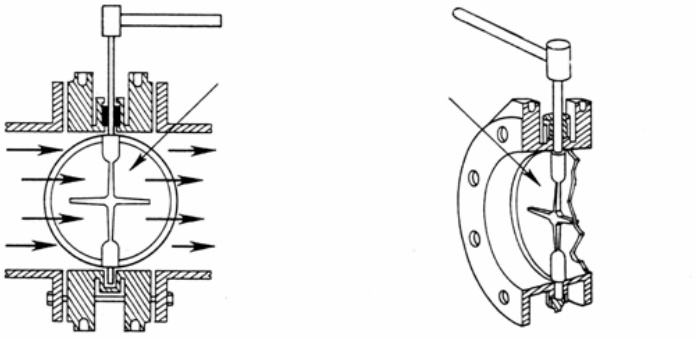
What element has the atomic number …?

What does …stand for?

Shutoff Valves

Valve A - Butterfly Valves

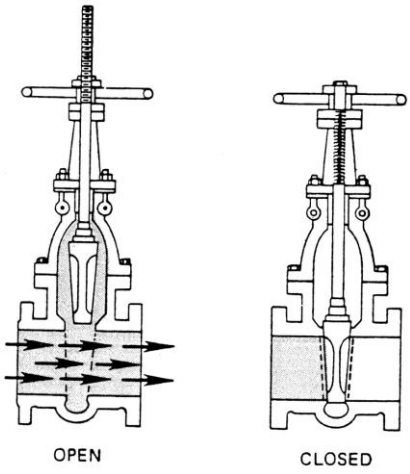
Butterfly valves are used in low-pressure pipelines (gas or oil). The valve consists of a circular flap or disc the same diameter as the internal diameter of the pipeline. The disc can pivot through 90^{o} in the pipeline. When the disc is parallel to the flow it is fully open and the flow is uninterrupted. When the disc is at a right angle to the flow it is fully shut. It is controlled by a handle and can be set anywhere between fully open and fully shut. It isn't suitable for high pressure liquid pipelines as the flow of oil can close the valve.



Opened Closed

Valve B - Rising Stem Gate Valve

A tapered plug, which has a full bore opening, rotates inside a tapered casing. The valve can be operated from fully open to fully closed by a 90° rotation of the handle. To prevent the plug from seizing, the casing can be coated with a low friction plastic such as Teflon, or it can be fitted with lubrication channels along which grease can be injected. This type of valve offer low resistance to the flow when fully open and is quick to open or close. However, it is not suitable for flow regulation and may become stuck if the lubricant fails.



Work with a partner who has information about some different valves and answer the following questions.

1. Which two types of check valve are described?

   ……

2. In valve 1, what is the disc attached to?

   ……

3. What happens if downstream pressure is higher than upstream pressure?

   ……

4. Can these valves be installed vertically?

   ……

5. Is liquid allowed to flow in two directions through the valve?

   ……

6. In valve 2, when might fluid flow back?

   ……

7. What is the purpose of valve 2?

   ……

8. Why does the ball fall back into the seat?

   ……

9. What stops the ball going upstream?

   ……

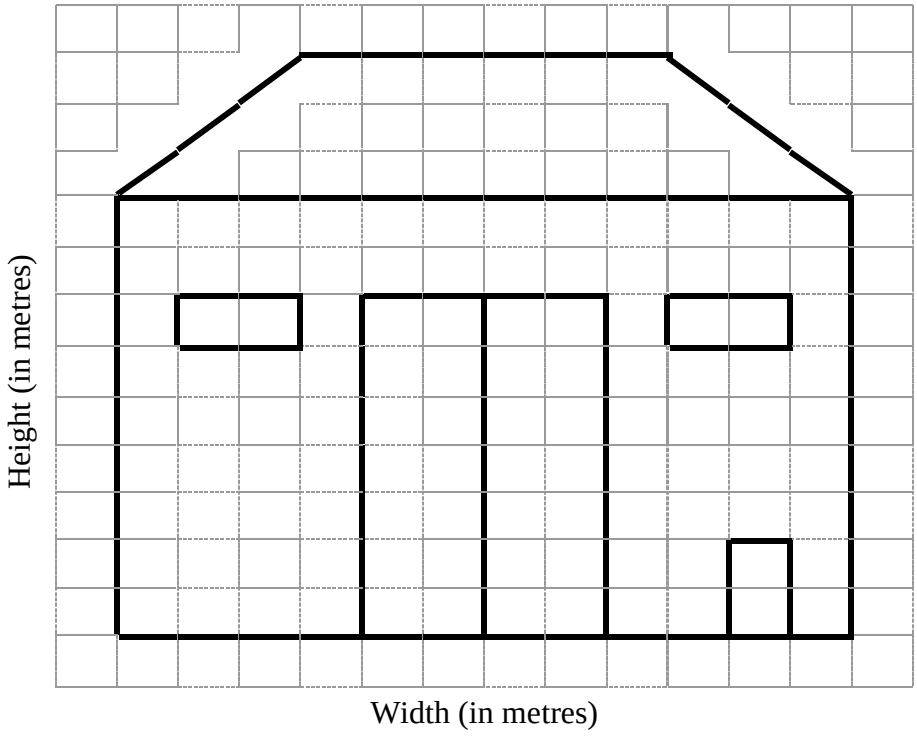
10. What problem can solid particles cause?

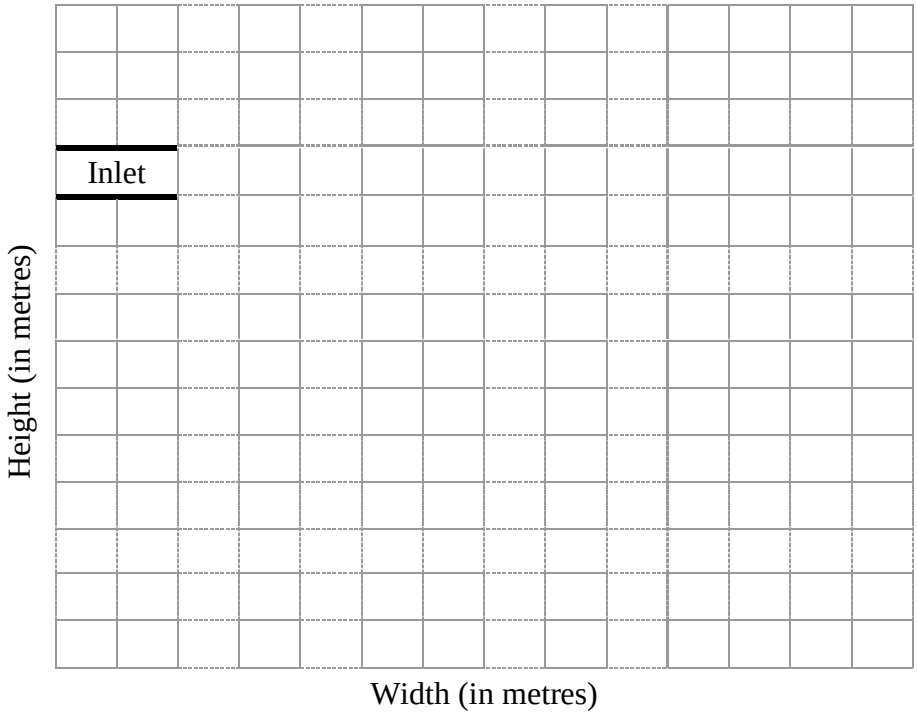
    ……

Now, ask your partner for a physical description of one of the valves and draw it in the box below. Label the diagram.

Describing Plans

The diagram below shows the front of a warehouse. Describe it to you partner and then draw your partner's diagram in the second grid.





Lubrication

Lubrication is vital – it reduces the friction between moving parts so they can work smoothly which reduces wear. There are different grades of lubricant for different purposes. Work with a partner and complete the information.

Lubricant	Advantages	Disadvantages
Grease	• Suitable for high temperatures • Seals out contaminants • Use in difficult to access areas • Easier to retain than oil	• …… • …… • …… • ……
Oil	• …… • …… • …… • ……	• Can catch fire • Can be contaminated by water • Often need filters and coolers • Not suitable for high temperature

One of the most important factors to decide which oil to use is temperature. There are three important temperatures that need to be considered.

1. **Flash point:** ……..
2. ……**:** This is a slightly higher temperature which means enough gas will be released to create continuous burning.
3. **Pour point:** ……...

Now, answer the questions.

a. Which lubricant is suitable for the wheel bearings of a car? Why?

……

b. How can temperature affect oil?

……

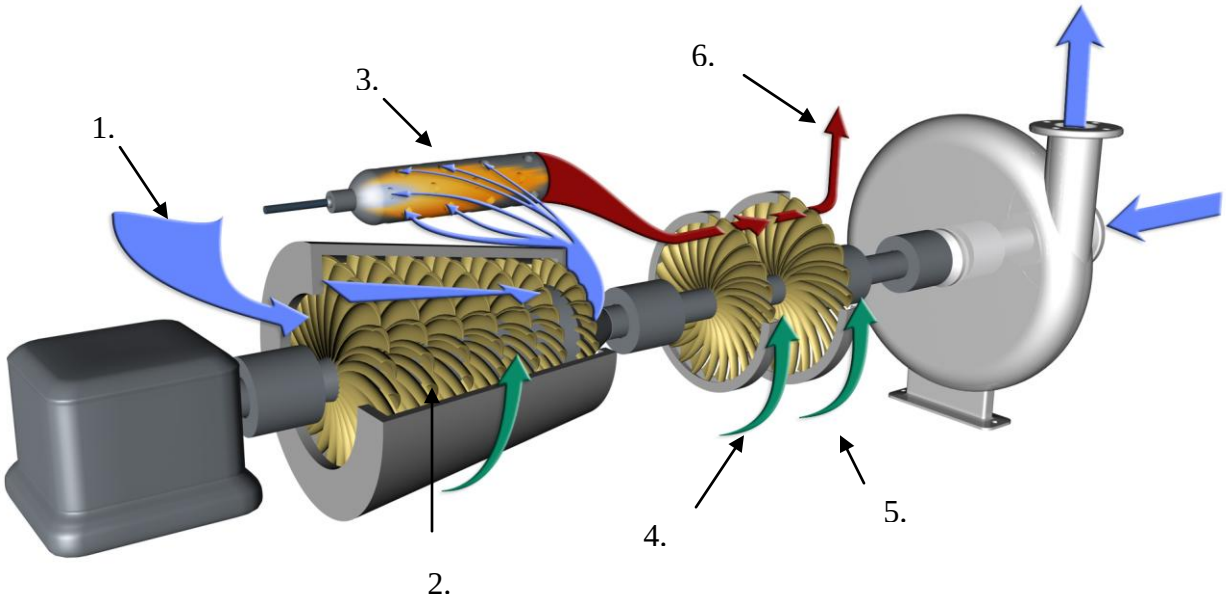
c. Why are lubricants important?

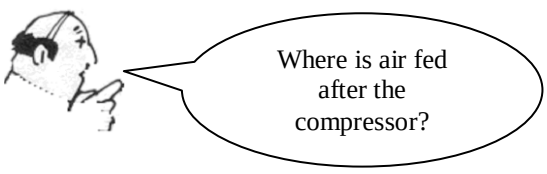
……

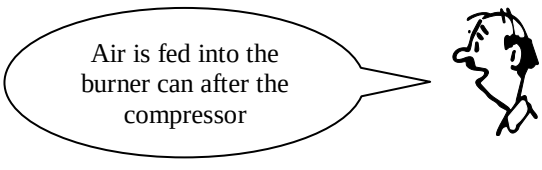
Gas Turbine

Work with a partner to complete the principle of operation for a gas turbine text and label the diagram with the words in **bold**.

1. Air is sucked into the ……..
2. The air gets hot due to compression.
3. Compressed air is fed from the **compressor** into the …….. Fuel gas is mixed with the compressed air. Igniters at the end of the burners can ignite the fuel/air mixture. The other burner cans are connected by tubes that allow the flame to reach all of the cans. Once the burners are lighted, the igniters are no longer needed.The hot, pressurized gas has passed through a transition piece from each burner can. The transition pieces form a ring of nozzles in front of the turbine stator blades.
4. Stator blades direct the flow of hot, pressurised gas onto the **compressor turbine disc**. The **turbine disc** rotates from the force of the gas. The **turbine disc** is on the same **shaft** as the ……., so the ……. rotates also. This ensures a continuous flow of compressed air into the engine.
5. After passing through the **compressor turbine disc**, the hot gas strikes the …….. The **load turbine** rotates the **load rotor shaft**. The **load rotor shaft** is connected by a ……to a **pump**.
6. The hot gas has done its work and leaves the engine through the exhaust stack.







Heat

Heat is a form of energy and can be transmitted in three ways: conduction, convection and radiation. Work with a partner to complete the information below.

Conduction:

……
……
……

Convection:
This takes place in liquids and gases and is caused by hot liquids or gases rising upwards as their heat energy makes them less dense. They are replaced by cooler liquids or gases.

Radiation:

……
……
……

Different substances have different properties in relation to heat and subjecting a substance to heat can be a way to test its purity. Impurities lower the freezing (melting) point of a substance and raise its boiling point.

Boiling Point:
The boiling point of a substance is a constant temperature when the liquid reaches its maximum temperature and increasing atoms are released at vapour. The boiling point is affected by pressure with higher pressures leading to a higher boiling point and vice versa. It is only once all the liquid has changed to vapour that further temperature increase can take place, resulting in superheated vapour.

Specific Heat Capacity:

……

Sensible Heat:
Causes a rise in temperature

Latent Heat:

……

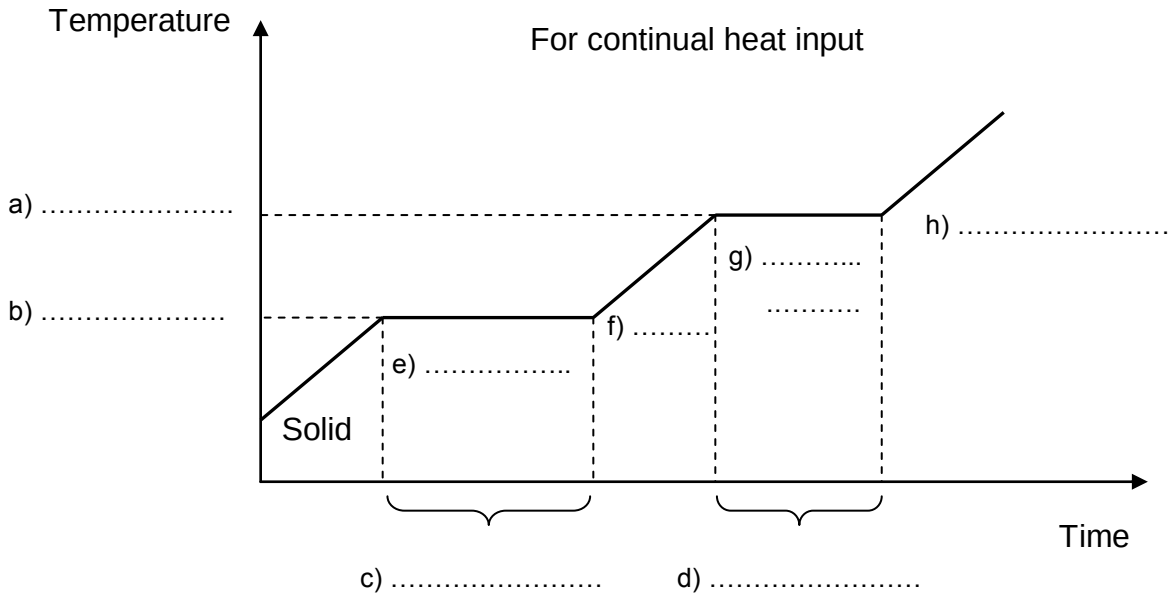
Latent Heat of Fusion:
This is the amount of heat needed to change a solid to a liquid

Specific Heat of Evaporation:

……
……

Now, work with your partner and label the diagram with the terms in the box. Then answer the questions that follow.

Boiling Point	Solid and Liquid	Superheated vapour	Liquid
Latent heat of fusion	latent heat of vaporisation	Melting Point	Liquid and vapour



1) What happens to the temperature of a liquid when it reaches boiling point?

   .....

2) What affects the temperature at which a liquid boils?

   .....

3) What is the opposite of a good conductor of heat? Give two examples.

   .....

4) In terms of transfer of heat, what is the difference between black and white?

   .....

5) Why do warm liquid or gas particles rise?

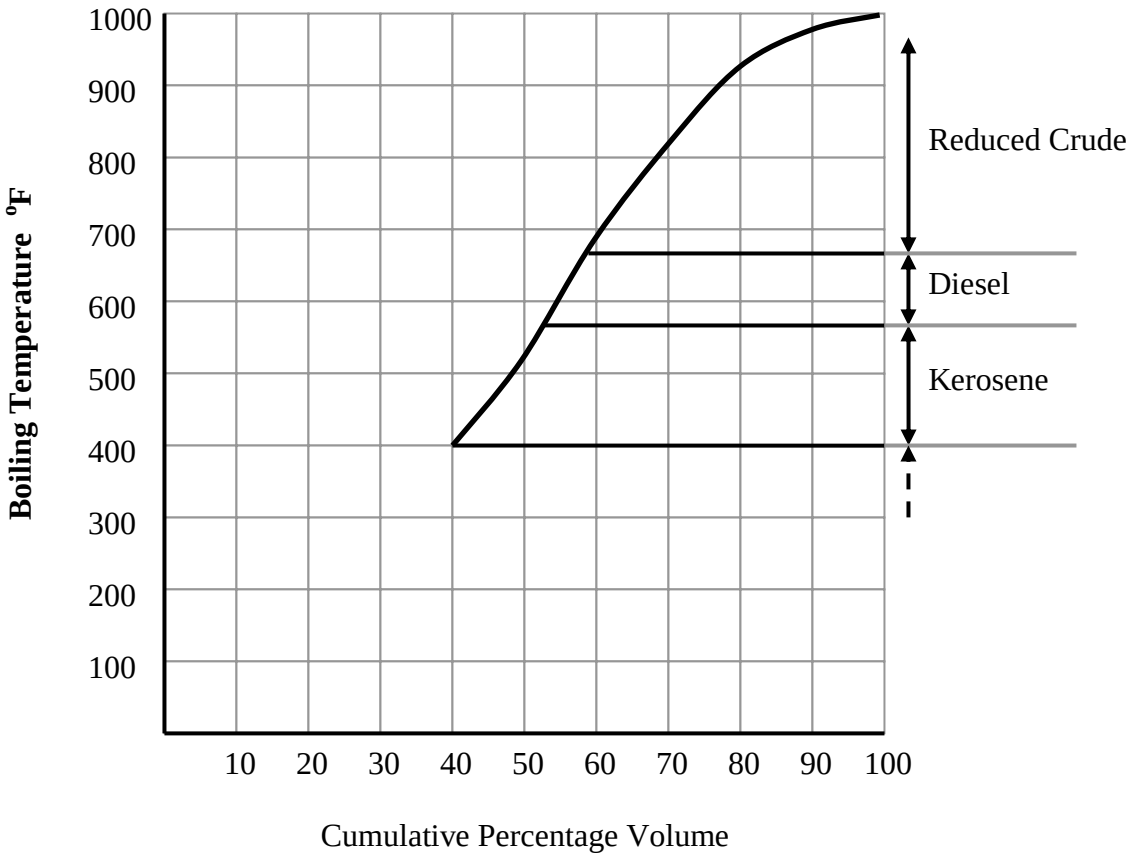
   .....

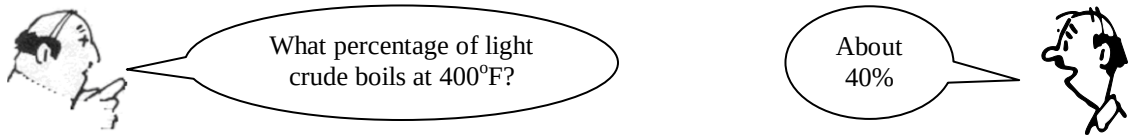
6) How do impurities affect the point a liquid becomes a gas?

   .....

Fractional Distillation

Work with a partner to complete the graph below which shows the boiling temperatures for different hydrocarbons in light crude.



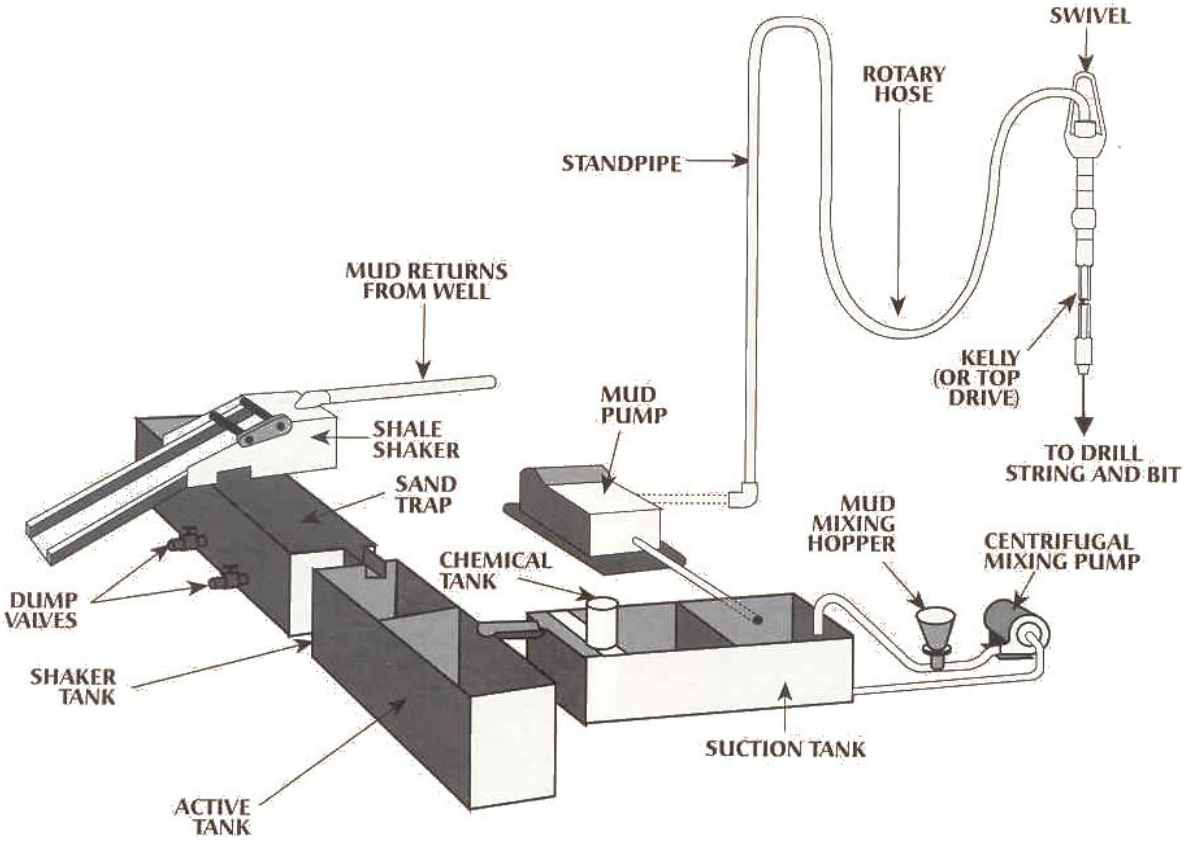


Now, look at the information on the following page and discuss the questions below with a partner.

1) What processes do lubricating oils go through?
2) Which products go through two separate fractionating processes?
3) How many stages are there in the refining of paraffin wax?
4) Which products go through a second condenser?
5) Choose three end products and describe how they are refined from crude oil. Present your ideas to the group.

Drilling Mud Circulating System

Drilling mud is a mixture of water, clays, minerals and chemicals. It is used to remove cuttings from the bottom of the well to ensure the bit drills into uncut formation and doesn't redrill old cuttings.

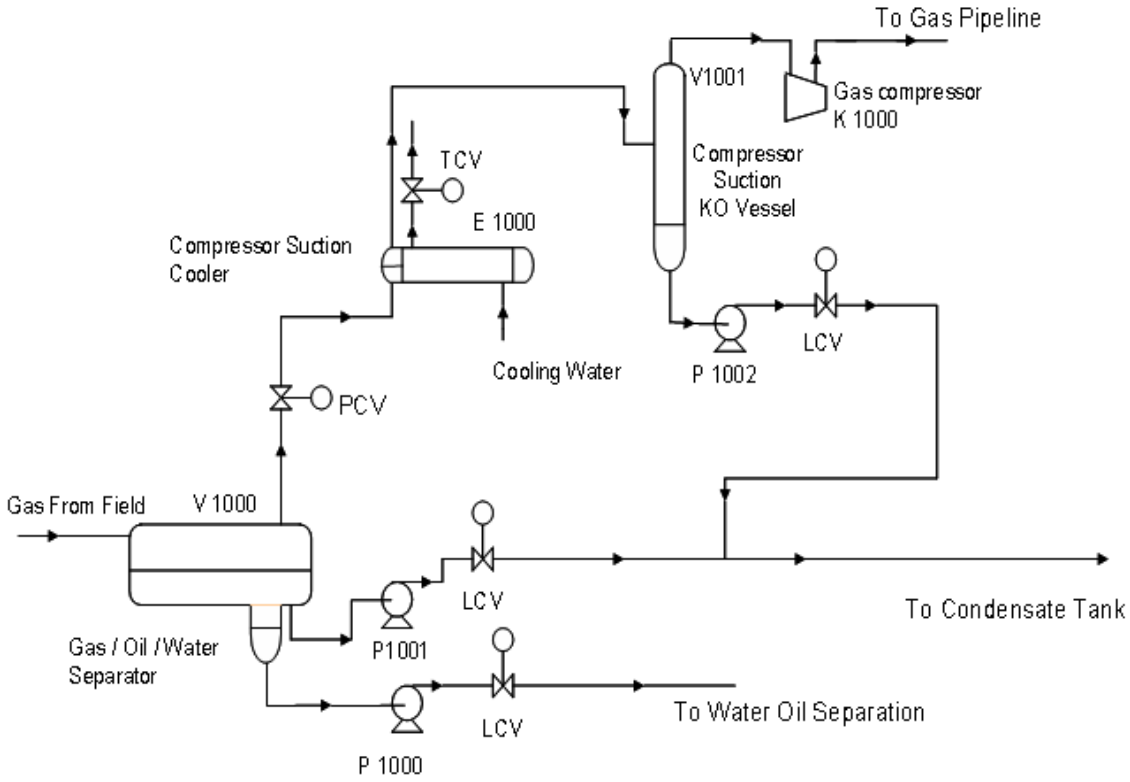


Match the pieces of equipment to the function

The shale shaker	forces the drilling mud through the drill string to the drill bit
The chemical tank	treats the drilling mud
The mud pump	prepares the drilling mud
The mud mixing hopper	removes large solid cuttings from the drilling mud

Work with a partner and prepare a presentation on how the mud circulating system works. Describe the flow of the drilling mud through the system. Use the information given and your own knowledge.

After Separation



Work with a partner to describe the system shown in the diagram above.

……

……

……

……

……

……

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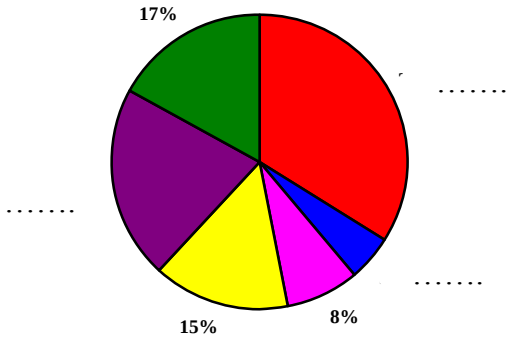
……

……

Discussing Accidents

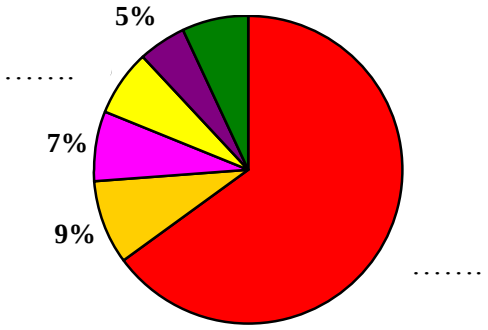
Work with a partner to complete the pie-charts.

Types of accidents that caused injury



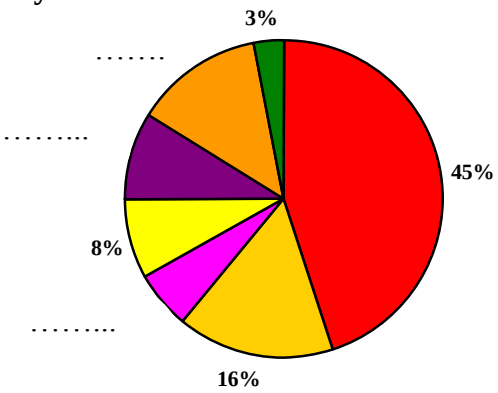
- Handling .....
- Machinery .....
- Falls 8%
- Struck by 15%
- Trips .....
- Others 17%

Type of injury caused



- Sprain/Strain .....
- Superficial 9%
- Contusion 7%
- Laceration .....
- Fractures 5%
- Others 7%

Site of Injury



- Back 45%
- Finger or Thumb 16%
- Hand .....
- Rest or Torso 8%
- Lower Limb .....
- Arm .....
- Other 3%

What percentage of accidents did falls cause?

Falls caused 8% of accidents.

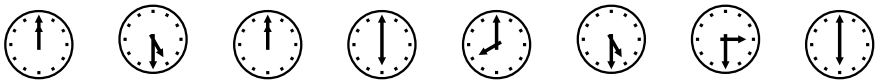
Pairwork Activities

Student B

The times below match a letter. Your partner has different information to you. Use **your partner's** information to find the names of the **places** below.

					
E	M	L	R	T	I

					
W	A	H	C	N	G



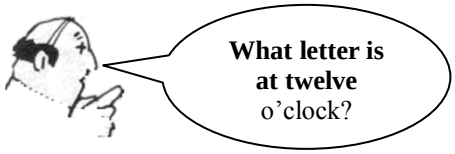
…… …… …… …… …… …… …… ……

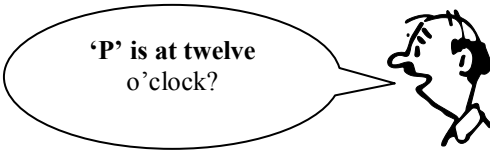
…… …… …… …… …… …… …… …… …… …… ……

…… …… …… …… …… …… …… …… …… …… ……

- **F**

…… …… …… …… …… …… ……





The Periodic Table

The table below gives information about the first 18 elements in the period table. Work with a partner to complete the information. Use the questions given.

1 …… …… 1.00794											2 **He** Helium ……
3 **Li** Lithium ……	4 …… …… 9.012182			5 **B** Boron ……	6 **C** Carbon ……	7 …… Nitrogen 14.00674	8 **O** Oxygen ……	9 **F** Fluorine ……	10 **Ne** Neon ……
11 **Na** Sodium ……	12 **Mg** Magnesium 24.3050			13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus ……	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 …… …… 39.948

21 …… …… ……	22 **Ti** Titanium 47.867	23 …… …… 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 …… …… ……	27 **Co** Cobalt 58.933200	28 …… …… ……	29 …… …… ……	30 …… …… 65.39

What is the atomic weight of …?

What is the symbol for …?

What element has the atomic number …?

What does …stand for?

Check Valves

Valve 1 - Swing Check Valves

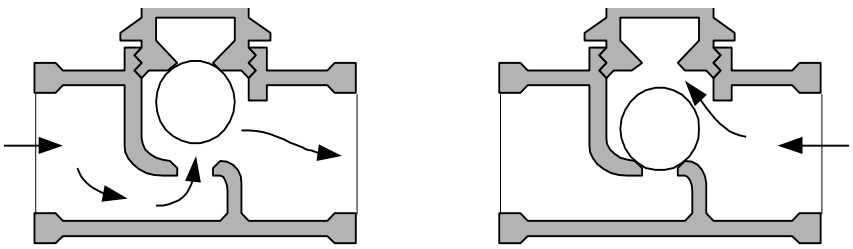
In this type of valve the opening element is a disc attached to a hinged arm. Upstream pressure causes the hinged disc to rise, opening the valve. Higher downstream pressure causes the valve to close. Swing check valves can be installed vertically or horizontally. Gravity closes the valve if flow stops.

The pressure of liquid or gas flowing through the valve holds the disc open, allowing full flow. If flow stops, or the pressure downstream of the valve becomes higher than the pressure upstream, the hinged arm swings down. The disc covers the passage and seals the valve. The higher downstream pressure press against the disc to keep it tightly closed. None of the liquid or gas that has already passed through the valve is allowed to flow back through the valve.

Valve 2 - Ball Type Non-Return Valve

This type of valve is used in pipelines to prevent fluid back flowing, which can occur when a pump is switched off. In this type of valve the ball lifts from its seat under the influence of the upward flowing fluid. If the flow stops or reverses, the ball falls back onto the valve seat, sealing off the flow. Ball valves can operate in a vertical or horizontal position, the sealing ball falling back into the seat by gravity. There is usually a restrictive device that prevents the ball from being carried away upstream by the fluid.

The seats may crack or wear, in which case substantial leaking could occur if the flow reverses and it is difficult to ensure a tight closure of these valves in slurry lines, as the closing pressure is limited to the upstream fluid pressure acting on the flap or ball. Even small amounts of solids on the seat will prevent a tight shut-off.



Work with a partner who has information about some different valves and answer the following questions.

1. Which two types of shutoff valve are described?

   ……

2. What kind of pressure is valve A suitable for?

   ……

3. What can happen if the valve is used at a different pressure?

   ……

4. How many degrees can the disc pivot?

   ……

5. What happens when the disc is at a right angle to the flow?

   ……

6. What controls the disc?

   ……

7. What stops valve B from seizing?

   ……

8. What are the advantages of valve B?

   ……

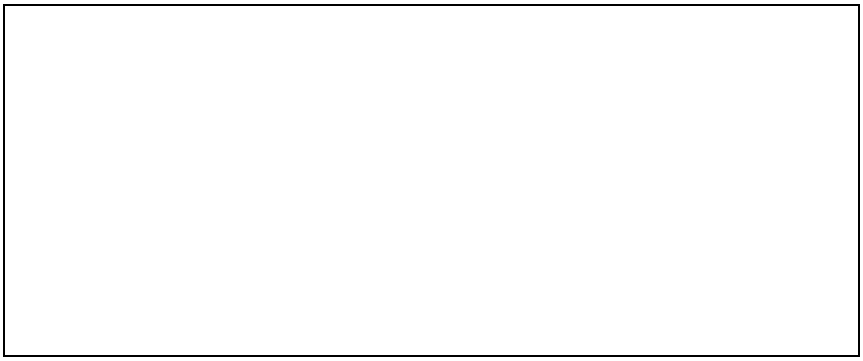
9. What happens if the lubricant fails?

   ……

10. When is this type of valve not suitable?

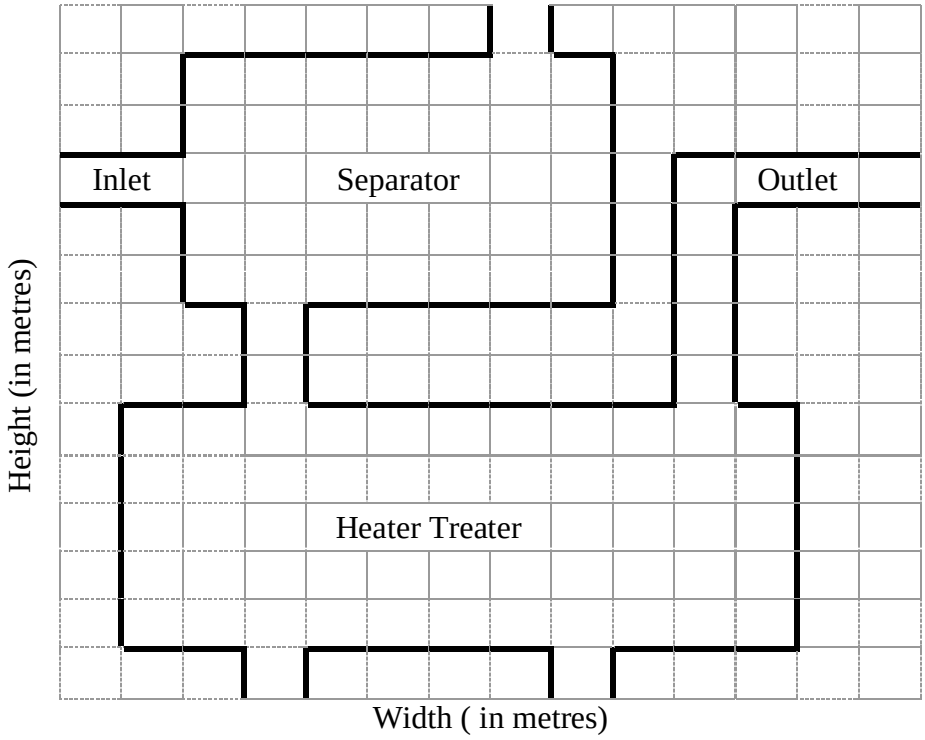
    ……

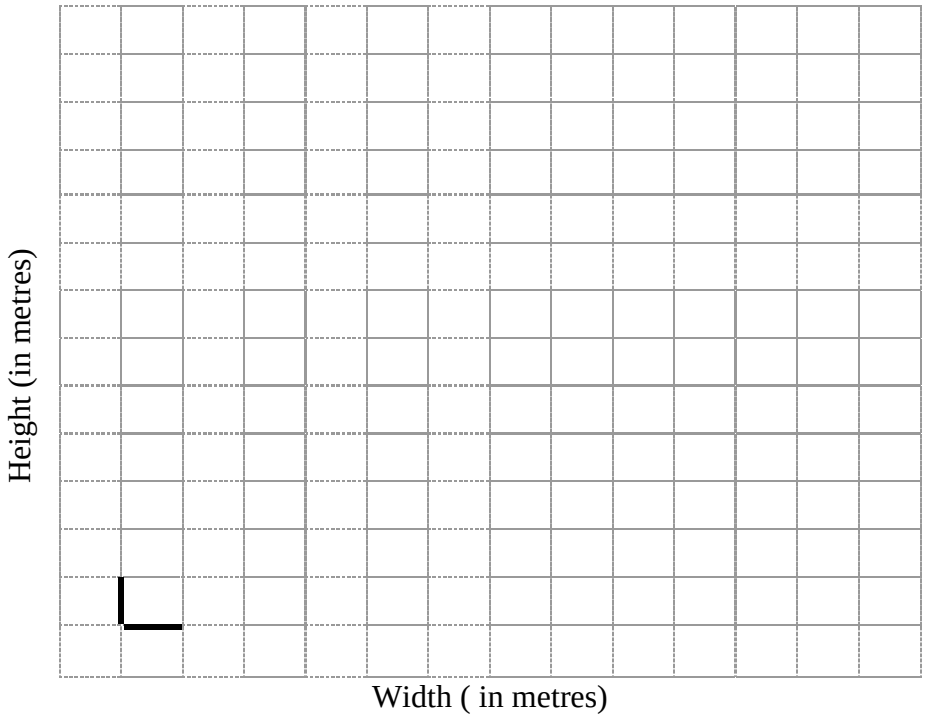
Now, ask your partner for a physical description of one of the valves and draw it in the box below. Label the diagram.



Describing Plans

The diagram below shows a separator and heater treater. Describe it to you partner and then draw your partner's diagram in the second grid.





Lubrication

Lubrication is vital – it reduces the friction between moving parts so they can work smoothly which reduces wear. There are different grades of lubricant for different purposes. Work with a partner and complete the information.

Lubricant	Advantages	Disadvantages
Grease	• …… • …… • …… • ……	• Doesn't flow • Hard to replace • Difficult to check amount • Picks up abrasive particles
Oil	• Can be cooled • Can be replaced easily • Can be recirculated • Can pass through small openings	• …… • …… • …… • ……

One of the most important factors to decide which oil to use is temperature. There are three important temperatures that need to be considered.

1. ……**:** This is the temperature when the gas released from the oil will ignite if exposed to a flame.
2. **Fire point:** ……
3. ……**:** This is the lowest temperature at which the oil will flow freely.

Now, answer the questions.

a. Which lubricant is suitable for the wheel bearings of a car? Why?

……

b. How can temperature affect oil?

……

c. Why are lubricants important?

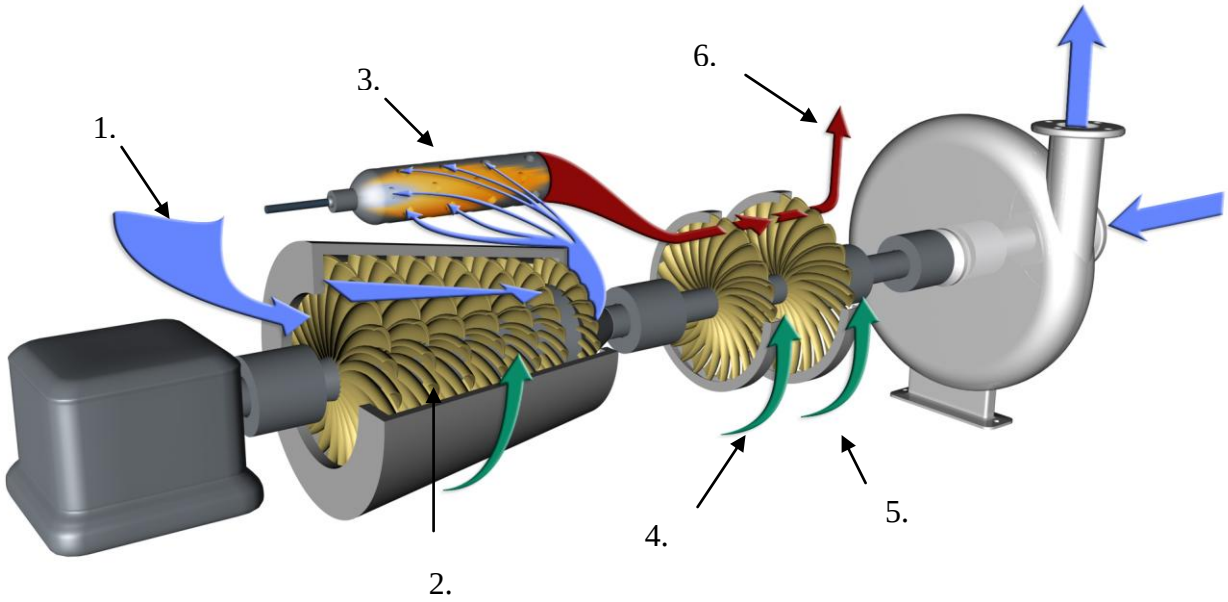
……

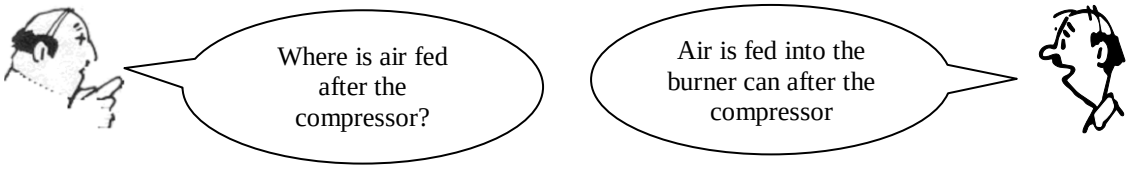
Gas Turbine

Work with a partner to complete the principle of operation for a gas turbine text and label the diagram with the words in **bold**.

7. Air is sucked into the **compressor**.
8. The air gets hot due to compression.
9. Compressed air is fed from the **compressor** into the **burner can**. Fuel gas is mixed with the compressed air. Igniters at the end of the burners can ignite the fuel/air mixture. The other burner cans are connected by tubes that allow the flame to reach all of the cans. Once the burners are lighted, the igniters are no longer needed.The hot, pressurized gas has passed through a transition piece from each burner can. The transition pieces form a ring of nozzles in front of the turbine stator blades.
10. Stator blades direct the flow of hot, pressurised gas onto the …….. The ……. rotates from the force of the gas. The **turbine disc** is on the same **shaft** as the **compressor**, so the **compressor** rotates also. This ensures a continuous flow of compressed air into the engine.
11. After passing through the **compressor turbine disc**, the hot gas strikes the **load turbine rotor disc**. The **load turbine** rotates the …….. The **load rotor shaft** is connected by a **load coupling** to a ……..
12. The hot gas has done its work and leaves the engine through the ……..

…





Heat

Heat is a form of energy and can be transmitted in three ways: conduction, convection and radiation. Work with a partner to complete the information below.

Conduction:
When atoms are heated they vibrate more which affects the neighbouring atoms so the heat is passed through the material. Most metals are good conductors of heat while materials like cork, paper, asbestos and fibreglass are known as insulators (poor conductors of heat).

Convection:
……
……

Radiation:
Radiant heat can travel through a vacuum and is created by infra red radiation (heat waves) emitted from radiating bodies. Reflective and white objects do not absorb radiant heat as readily as rough or black surfaces.

Different substances have different properties in relation to heat and subjecting a substance to heat can be a way to test its purity. Impurities lower the freezing (melting) point of a substance and raise its boiling point.

Boiling Point:
……
……
……
……
……

Specific Heat Capacity:
This is the amount of energy needed to raise the temperature of an object by one degree.

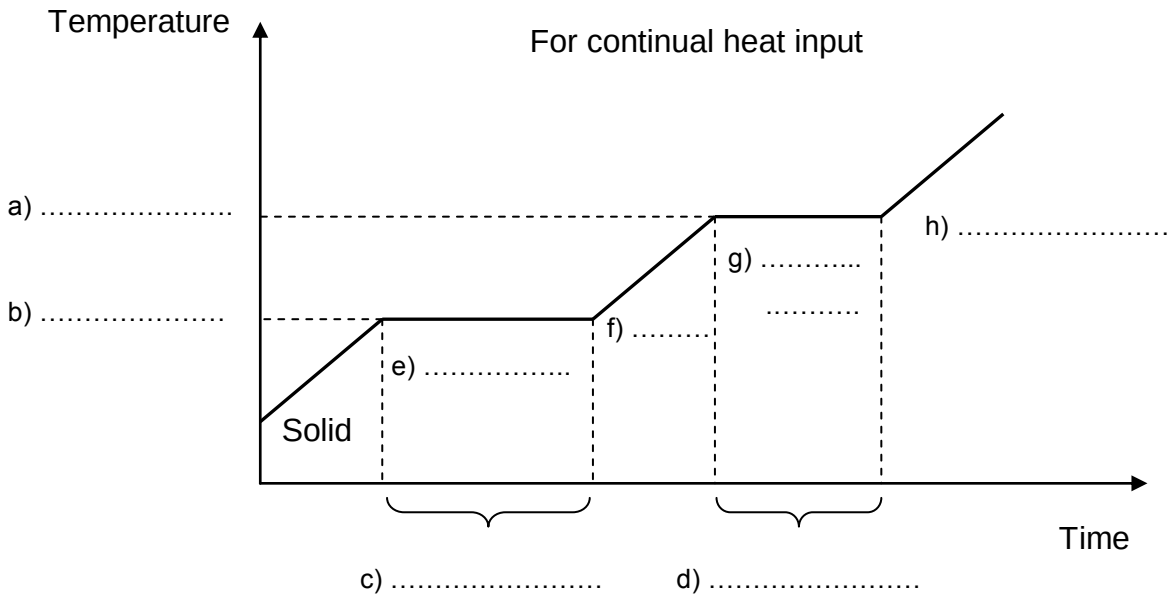
Sensible Heat:
……

Latent Heat:
This is the amount of heat required to change the state of an object i.e liquid to gas

Latent Heat of Fusion:
……

Specific Heat of Evaporation:
This is the amount of heat (at a constant temperature and pressure) needed to convert 1Kg of a liquid to a gas.
Now, work with your partner and label the diagram with the terms in the box. Then answer the questions that follow.

Boiling Point	Solid and Liquid	Superheated vapour	Liquid
Latent heat of fusion	latent heat of vaporisation	Melting Point	Liquid and vapour



1) What happens to the temperature of a liquid when it reaches boiling point?

   .....

2) What affects the temperature at which a liquid boils?

   .....

3) What is the opposite of a good conductor of heat? Give two examples.

   .....

4) In terms of transfer of heat, what is the difference between black and white?

   .....

5) Why do warm liquid or gas particles rise?

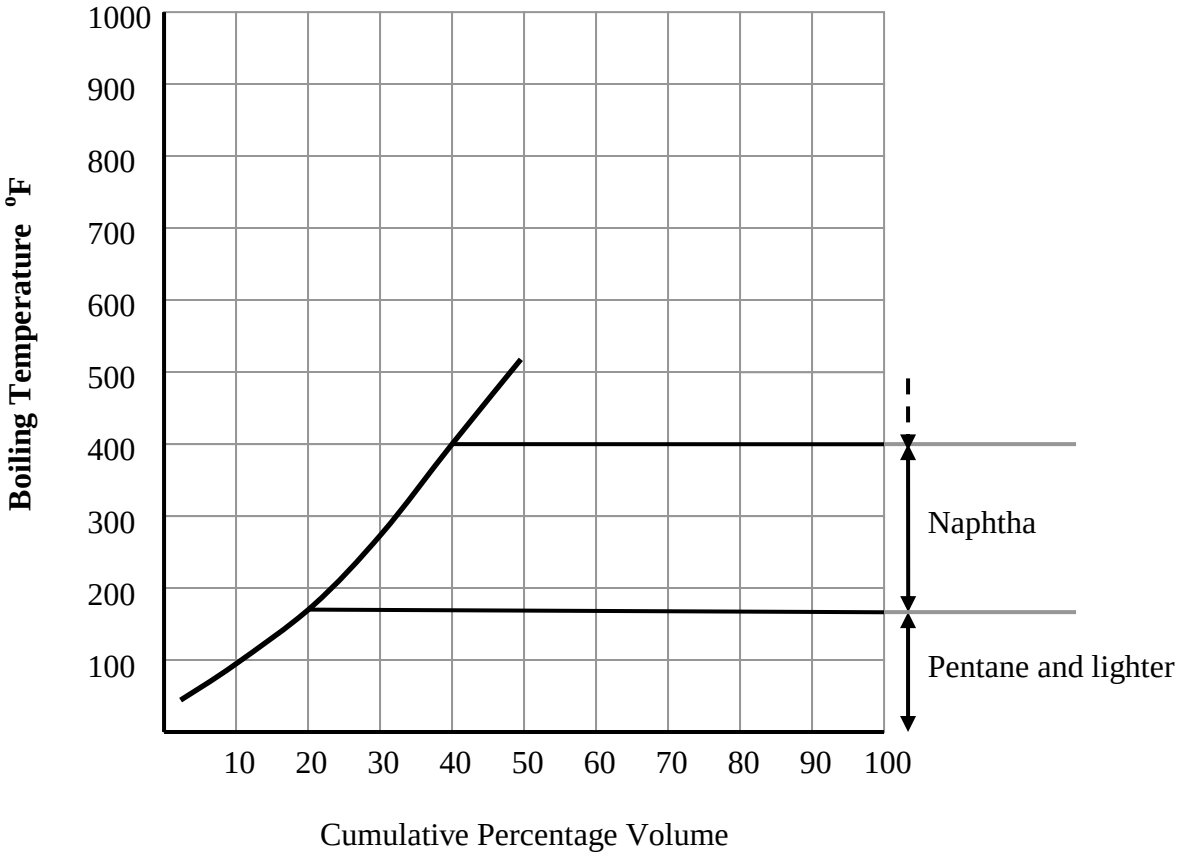
   .....

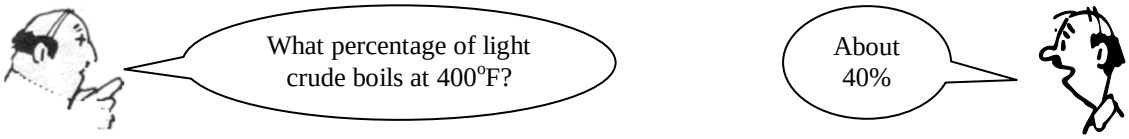
6) How do impurities affect the point a liquid becomes a gas?

   .....

Fractional Distillation

Work with a partner to complete the graph below which shows the boiling temperatures for different hydrocarbons in light crude.



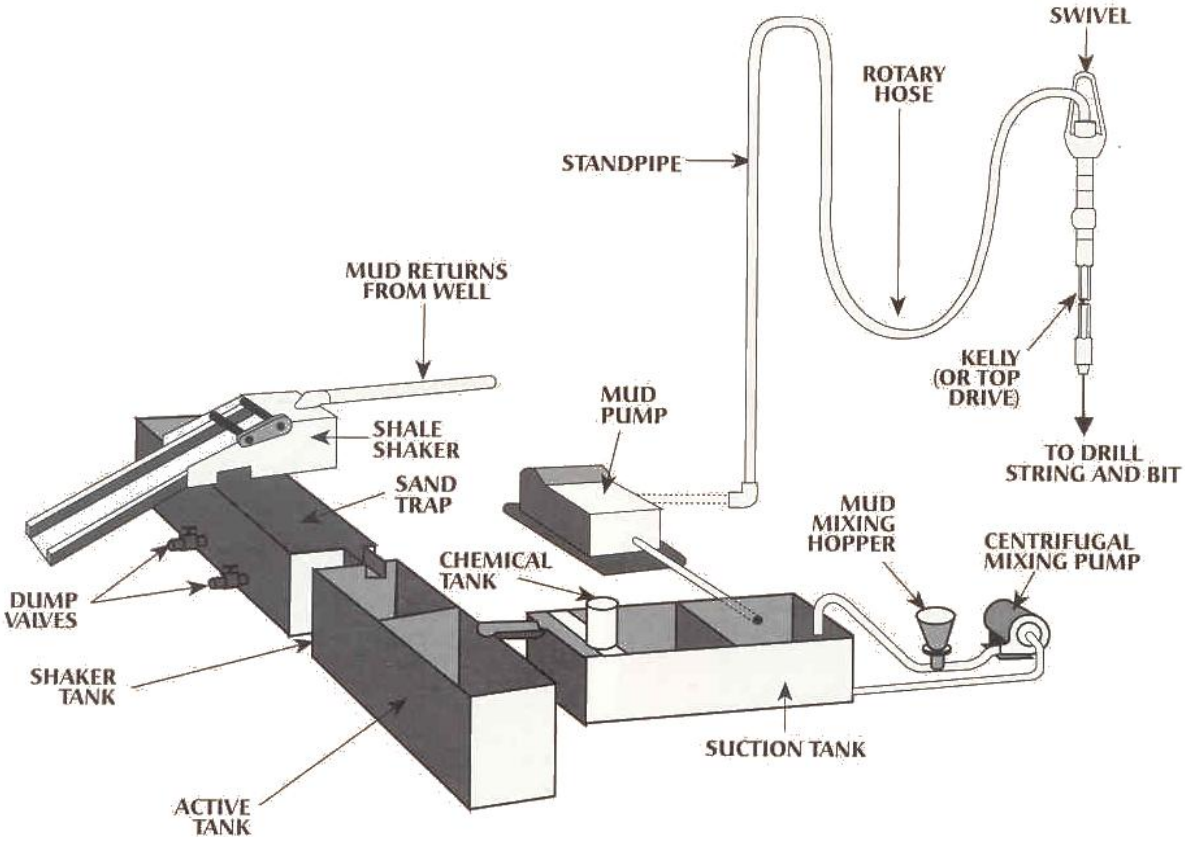


Now, look at the information on the following page and discuss the questions below with a partner.

1) What processes do lubricating oils go through?
2) Which products go through two separate fractionating processes?
3) How many stages are there in the refining of paraffin wax?
4) Which products go through a second condenser?
5) Choose three end products and describe how they are refined from crude oil. Present your ideas to the group.

Drilling Mud Circulating System

Drilling mud is a mixture of water, clays, minerals and chemicals. It is used to remove cuttings from the bottom of the well to ensure the bit drills into uncut formation and doesn't redrill old cuttings.

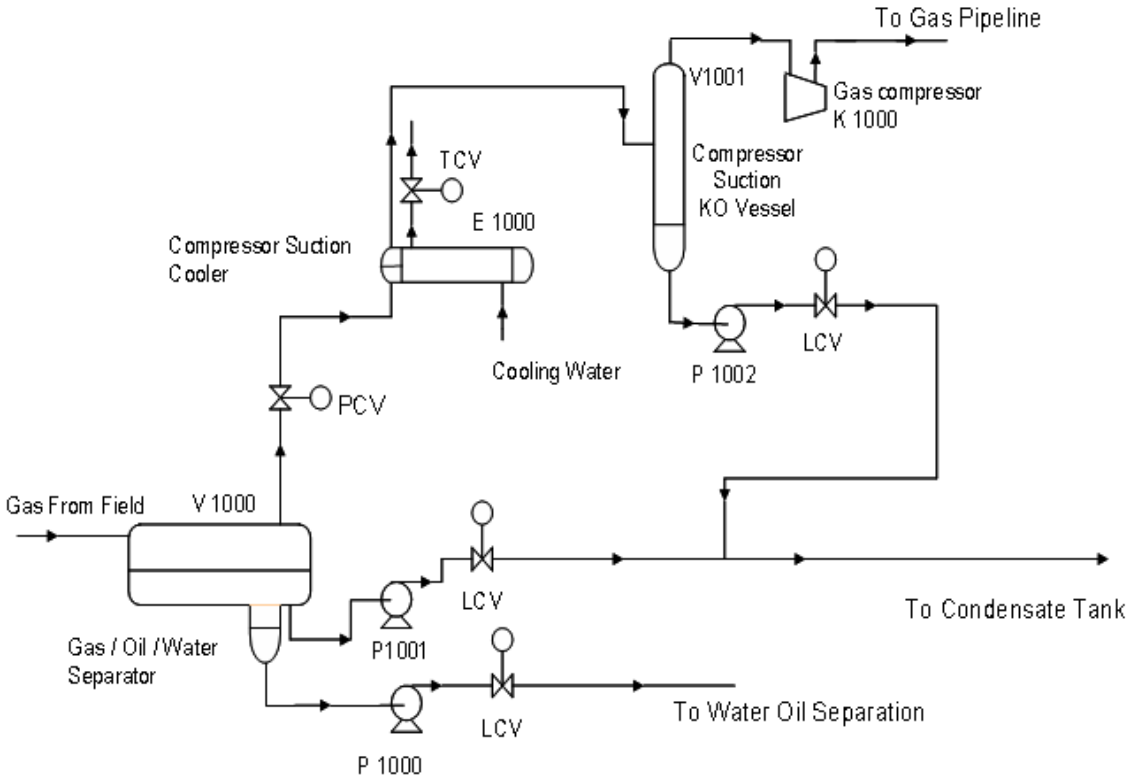


Match the pieces of equipment to the function

The centrifugal pump	carries the drilling mud to the drill string
The sand trap	powers the drill bit
The rotary hose	removes the smaller solid particles from the drilling mud
The kelly drive	catches small particles of cuttings

Work with a partner and prepare a presentation on how the mud circulating system works. Describe the flow of the drilling mud through the system. Use the information given and your own knowledge.

After Separation



Work with a partner to describe the system shown in the diagram above.

……

……

……

……

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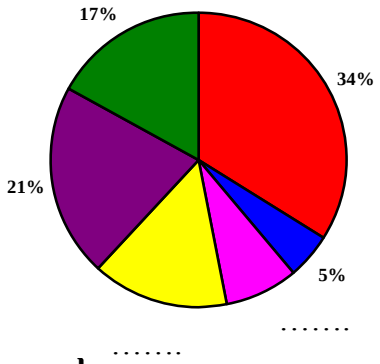
……

Discussing Accidents

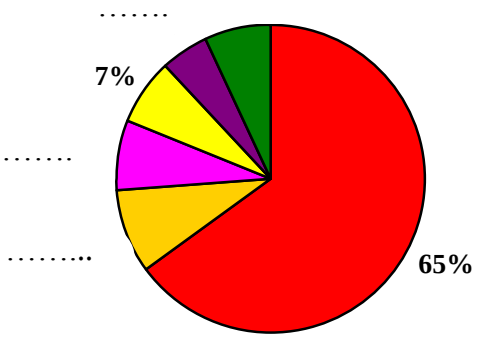
Work with a partner to complete the pie-charts.

Types of accidents that caused injury



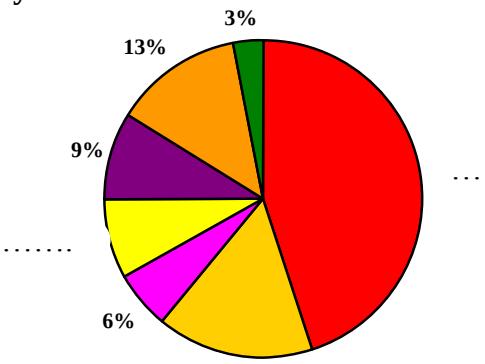
- Handling 34%
- Machinery 5%
- Falls .....
- Struck by .....
- Trips 21%
- Others 17%

Type of injury caused



- Sprain/Strain 65%
- Superficial .....
- Contusion .....
- Laceration 7%
- Fractures .....
- Others 7%

Site of Injury



- Back .....
- Finger or Thumb .....
- Hand 6%
- Rest or Torso .....
- Lower Limb 9%
- Arm 13%
- Other 3%

What percentage of accidents did falls cause?

Falls caused 8% of accidents.

Tapescripts

Unit 1 – Training Skills

1.1

My name is Alan. I am 46 years old. I am a technical trainer. I am married. My wife's name is Anna. We have two children. My son is 22 and my daughter is 19. They are students. I am from Scotland. Anna is not from Scotland. She is from England. Are you married?

1.2

My name is Bob. I am 32 years old. I am married. My wife's name is Helen. We have a son. His name is Mike. He is 9 years old. I am not a technical trainer, I am a technical trainee.

1.3

Bob: Hi, Dave.
Dave: Good morning Bob. How are you?
Bob: Very well, thanks. And you?
Dave: I'm very well, thanks.
Bob: Do you know Mike?
Dave: No, I don't.
Bob: Dave, this is Mike. Mike, this is Dave.
Mike: Pleased to meet you.
Dave: Pleased to meet you too.

1.4

a) Could you speak more slowly, please?
b) Could you speak more clearly, please?
c) Could you speak more clearly, please?
d) Could you repeat that please?
e) Sorry, I don't understand.
f) What does 'extinguish' mean?
g) How do you spell 'extinguish?'
h) Sorry, I don't know.

1.5

Bob is a mechanical engineer. He finished university in the summer but he doesn't have a job. He has a theoretical understanding of mechanics and he can identify all the instrumentation and equipment used in mechanical engineering but he has very little practical experience.

1.6

Q. What is your name?
A. My name is Bob.
Q. How old are you?
A. I'm 32 years old.
Q. Are you married?
A. Yes, I'm married.
Q. What is your wife's name?
A. Her name is Helen.
Q. Do you have any children?
A. Yes, we have two children.
Q. What are their names?
A. Their names are Paul and Emma.
Q. Where do you live?
A. We live in Aberdeen.
Q. What is your job?
A. I'm a trainee operator.
Q. How are you?
A. I'm very well, thanks.

1.7

A derrickmonkey works at the top of the derrick.
Divers work underwater.
A doodlebugger works on the seismic crew.
Drillers operate the drilling machinery.
A floorman handles the bottom of the drill stem.
A jughustler uses geophones in the seismic crew.
A metallurgist studies rocks to find oil deposits.
Motormen control the drilling engine.
A mudman maintains the mud systems.
A roughneck assists the driller.
Roustabouts do routine cleaning and maintenance.

Unit 2 – Numbers and Measurement

2.1

q) 1
r) 12 123
s) 1,234
t) 12,345
u) 123,456
v) 1,234,567
w) 12,345,678
x) 123,456,789
y) 1,234,567,890
z) 1.23456789
aa) 123.456789
bb) 12,345.7689
cc) ½
dd) ¼
ee) ⅓

2.2

Q: Tell me about your typical day.
A: Well, I wake up at 6:30 every morning because I start work at 8:00. The bus collects me at 7:15 and we get to the terminal just before 8:00, usually around 7: 55. We break for lunch at 12:15 and start the afternoon shift at 13:15. We finish at 16:50 because the bus collects us at 17:00. It takes longer to get into the city because of traffic so I usually get home around 18:10. I'm very tired during the week and go to bed early, probably around 22:15. At the weekend I might not go to bed until 1:30 or something like that.

2.3
Slips, trips or falls – 36%
Driving related – 25%
Using faulty equipment – 12%
Not using appropriate PPE – 11%
Using the wrong equipment – 9%
Falling objects – 7%

2.4
Human movement
crawl – walk - jog – run – sprint
Water
drop – puddle – pond – lake – sea –ocean
Distance
– millimeter – centimeter – inch – foot – meter - kilometer - mile
Time
second – minute – hour - day – week – –fortnight - month – season– year – decade century– millennium

2.5
Q. Do you have all the answers?
A. I think so, yes.
Q. Okay, so, how loud is a chainsaw?
A. A chainsaw is 120 decibels.
Q. And how loud is a moon rocket at 300m.
A. A moon rocket very loud. It's 200 decibels.
Q. How loud is speech at 1m?
A. Speech at 1m is 60 decibels.
Q. And how loud is a noisy factory?
A. A noisy factory is 100 decibels.
Q. So how loud is a quiet office?
A. A quiet office is 40 decibels.
Q. And the last one. How loud is an ice-cream van at 3m?
A. An ice-cream van at 3m is 80 decibels.

2.6
1) The piece of pipe is 3.75 meters long.
2) The operating temperature is 10°C to 45°C.
3) The terminal just over fourteen and half miles from the nearest city.
4) The system becomes unstable if the pressure exceeds 15 bar.
5) If the length of the tank is 2 meters and the height and width are 1 meter then the volume of the tank is 2 cubic metres.
6) You don't want the power to exceed 250v.
7) For suitable lighting you need a 100w bulb.
8) At full power the rotor turns at 1600rpm.
9) When empty the barrel weights about 2 kg.
10) It can withstand pressures of up to 1250 psi

Unit 3 – Describing Equipment
3.1
You use a grinder to sharpen other tools.
You use a screwdriver to tighten a screw.
You use calipers to measure internal or external dimensions.
You use a file to finish the surface of a piece of metal.
You use a hammer to connect two pieces of wood with a nail.
You use a saw to cut a piece of wood or metal.
You use a spanner to slacken a bolt.
You use a pipe wrench to rotate a pipe.
You use a drill to make a hole in a piece of wood or metal.
You use a chisel to chip away metal.
You use a vice to hold a piece of wood or metal securely in place.
You use pliers to grip small objects.

3.2
Right, I like to keep my workshop tidy. It makes it easy to find something and I know I can work safely.
First of all, in the cupboard I keep everything I need for drilling, including the drill. That means the screwdrivers and all my screws are in there as well . I keep the drill on the bottom shelf and everything else on the top.
The bench vice is fitted on the right hand side, beneath the shelves. One the bottom shelf I keep my hammer and nails and the top shelf I use for bolts and pliers and things like that. I try to keep the saw safe so it hangs from a nail under the cupboard.

3.3
This is an electric drill. It has a power cord, a trigger, a motor, a chuck and a bit. The power cord supplies power to the motor. The chuck holds the bit in place. The trigger controls the motor. The plug connects the power cord to the power supply.

3.4
This is a pipe wrench. It is used for heavy duty work. It has a handle, one adjusting nut, a fixed jaw and a moveable jaw. The adjusting nut is behind the moveable jaw and adjusts the position of the moveable jaw.

This is an off-hand grinder. It is used to recondition tools like screwdrivers and chisels. It has a column, two grinding wheels, safety screens, rests, a control switch and a quenching tank. The control

switch on the front of the column operates the grinding wheels. The rests below the wheels hold the work in place and the screens protect the user from debris. The quenching tank on the front of the column is used to cool the work.

3.5
This is a filled system thermometer. It consists of a bulb, a capillary tube, a bourdon tube, a pointer and a scale. This type of system is completely filled with liquid, usually mercury. When the mercury in the bulb expands it goes through the capillary tube and into the bourdon spiral. The spiral uncurls and this movement is transmitted into the movement of the pointer. The pointer indicates the temperature on the scale.

3.6
One method to measure the level of a liquid in a tank is with a float system. A wire connects a float to a counter-weight through a system of pulleys. A pointer on counterweight indicates the level on a scale. As the level of the liquid decreases the float gets lower and the counterweight is pulled higher. As the level of the liquid increases the float gets higher and the counterweight is lowered. The change in level is shown by the pointer.

3.7
Reciprocating Pumps
In this type of pump the pumping action is produced by the to and fro (reciprocating) movement of a piston or plunger within a cylinder. The liquid is drawn into the cylinder through one or more suction valves and then is forced out through one or more discharge valves by direct contact with the piston or plunger.

Single-Acting Pump
When the plunger moves from right to left the liquid is drawn into the cylinder through the suction ball check. When the plunger reverses and moves from left to right, the liquid is forced out through the discharge ball check. The discharge ball check is forced open by the pressure of the liquid and, at the same time, the suction ball check is forced closed. The movement of the plunger in the cylinder in one direction is called the stroke of the plunger.
The distance the plunger moves in and out of the cylinder is called the length of the stroke. Only one side of the plunger takes part in the pumping action and water is discharged only during one out of every two strokes. For these reasons the pump is called single acting.

Unit 4 – Giving Instructions
4.1
1) Cut a piece of paper three inches by four inches
2) Draw a horizontal line across the piece of paper one inch from the top
3) Draw two vertical lines to divide the bottom part of the paper into three equal parts
4) Carefully tear up the vertical lines
5) Stop when you reach the horizontal line
6) Fold the left leg of the paper up towards you
7) Fold the right leg of the paper up away from you
8) Put the paperclip on the bottom of the middle leg
9) Stand up
10) Hold the piece of paper by the top above your head
11) Drop it

4.2
B: I want to drill a hole but I need some help.
T: Okay. What do you want to know?
B: What do I do first?
T: First, measure the work and then mark the hole.
B: No problem. What next?
T: Okay, next attach the drill bit and then tighten the chuck.
B: What do I do after that?
T: After that connect the drill to the power and place the bit over the mark. When you're ready start the drill and drill the hole.
B: What do I do when I finish the hole?
T: First you stop the drill and secondly, remove the bit from the hole and then disconnect the drill from the power. Finally you loosen the chuck and remove the drill bit.
B: Thanks a lot, that's a great help.
T: My pleasure.

4.3
Ahmed wants to be an production engineer. He has a degree and at the moment he is doing a training course. On the course they are studying all the aspects of his speciality and are practising in the workshop and on site. He enjoys the training that happens on site because then he sees how things work in action and not just in theory. This week they are studying pigging. He knows some things already but is finding the course useful, especially when their trainer explains about the different types of pig and what they do.

4.4
Today we have a few problems caused by the weather. It's a fine day and the sun is shining with an air temperature of about 22oC but there are high winds and that makes the scaffolding we want to do too dangerous.

Unit 5 – Describing Systems
5.1
This is a pressure measurement system. It consists of a monitoring device, a generator, a back-up generator, a relay, an alarm, a control panel and a visual display unit. The monitoring device measures the pressure in the pipeline and relays the information via the relay to the visual display unit. If the pressure reaches a pre-set low low level the alarm sounds and alerts the operator. The operator can then use the control panel to initiate an emergency shutdown. Power is provided to the system by a generator. There is a back-up generator which comes online in the event of a failure in the primary generator or when the primary generator is undergoing maintenance.

5.2
If the primary system fails the back-up system comes on-line.
If rubber is cooled to -200^{o}C it becomes brittle and breaks
If safety measures are followed accidents should be avoided
If the switch is in the off position the lights are red
If the temperature rises to over 400^{o}C there may be an explosion
If the alarm sounds evacuate the building
5.3
The PR monitoring systems are used to monitor pressure. The PR427 series are suitable for measuring high pressures. When the pressure reaches a pre-set high high level the alarm PR427-A alerts the operator. PR427-C automatically closes valves PV576A/B. This leads to a reduction in the flow and lowers the pressure. The PR427-C has a back-up system PR427-C2. PR427-C2 initiates if PR427C malfunctions. The operator also has emergency override PRO993 if both PR427-C systems fail.

Unit 6 – Safety
6.1
Alan slipped on a puddle of water on the ground. He hit his head on the edge of a workbench and suffered a severe laceration to the head. He also broke his right wrist and his right thumb. He sprained his back and sustained major bruising on the right side of his face and his right arm.

6.2
Okay gents, those of you in the workshop need minimum PPE – overalls, boots, safety glasses and hard hats and safety gloves. Because we're doing some soldering you need your face masks. Those of you going on the site visit only need overalls, boots and hard hats. It is quite loud near some of the machinery so you need your ear protectors as well.

6.3
Let's look at the second situation. There are quite a few hazards here. The first hazard is the trailing cable which is a trip hazard. There's also the puddle of water near the water dispenser. This could cause a fall. An additional problem is the second table. The legs at the front don't look fully secured. The table might collapse if the computer is placed on it. Now, is there anything I missed?

6.4

D: There was a problem with the flow rate yesterday.
T: What did you do when you heard the alarm?
D: I checked the control panel. The flow rate was too high so the alarm sounded
T: Did you try to increase the flow?
D: I fully opened all the valves but it didn't solve the problem.
T: So what happened next? Did you shut the system down?
D: No, I didn't shut it down. I called the pump station and they increased the pressure. The alarm stopped when the flow rate reached normal levels.

6.5
The STOP system is based on the following idea. Everyone is responsible for safety and all injuries can be eliminated if safe procedures are reinforced. STOP report cards can be positive or negative because people who work safely should be told. The key to reducing incidents and injuries is to observe people, talking with them to encourage safe work practices and therefore modify their behaviour to eliminate unsafe acts and behaviours.

6.6
A technician observed a piece of wood with nails sticking out in front of the equipment lockup. He first bent the nails over with a hammer, and then put the wood in

garbage container. I congratulated him on his action.

A man wore a ring in the workshop. I noticed and told him it is prohibited to be in the workshop with a ring and that it was hazardous to him. He listened to me and took off the ring and said he would not wear it again at work.

I noticed a broken mirror frame in the bathroom which was in danger of falling. I informed administration and the company repaired the frame.

The light in a classroom was malfunctioning before lunch. The light switched on and off several times and I thought it was a short circuit and a fire hazard. I notified the administration and they immediately sent a worker to repair the light.

Unit 7 – Making Comparisons

7.1

Liquid in gas thermometers are the most common in industrial, medicinal and domestic usage. A good device is accurate to 0.1^{o}C. The typical liquids used are mercury, alcohol and pentane. The table below shows their range.
Alcohol has the shortest range and mercury has the longest. Alcohol measures temperatures lower than mercury but the lowest temperatures are measured using pentane. Mercury is used to measure the highest temperatures.
Liquid in gas thermometers are weaker than necessary for industrial plant use so industrial thermometers use bulbs and stems made out of steel, which is stronger than glass. These systems are completely filled with a liquid, gas or vaporizing liquid. Liquid filled thermometers are more popular than gas or vaporizing alternatives because their range is the longest.
There are also solid expansion type thermometers. These work on the principle that different metals expand at different rates i.e. brass expands more quickly than invar. One example of solid expansion type thermometers is the bi-metal strip where brass and invar are bonded together and fixed at one end. When the brass expands more than the invar the strip bends, showing the temperature on a scale or triggering a switch.

7.2

Solids have a definite volume and shape as the molecules are held together by strong forces. Liquids have a definite volume but the forces holding the molecules together are weaker than the forces in solids and so liquids do not have a definite shape. The forces holding molecules together in gases are even weaker than the forces in liquids and so gases have no definite volume or shape. Matter can change from one state to another by giving the molecules more energy and making them vibrate more than normal. This energy is usually provided in the form of heat. As the temperature gets higher a substance will change from a solid to a liquid and, finally, into a gas. All matter is made from elements – a substance which can not be split into simpler parts. If two or more elements join together the resulting substance is called a compound. Compounds can not be divided into individual elements by solely physical means, they have to be separated by chemical means. A mixture consists of two or more compounds which are not joined chemically and can be separated by physical means. A solution is a mixture of two or more liquids (a mixture of gases is also called a solution) or when a solid is dissolved in a liquid. In this case the solid is called the solute and the liquid is called the solvent.

7.3

A: I don't understand the meaning of some of these words.
B: Which words don't you understand?
A: Well, I know durability means the metal can withstand natural elements and is resistant to wear and that conductivity means the metal can conduct heat or electricity. That's no problem. Hardness describes the ability to withstand abrasive wear and things like scratching. But what does lustre mean?
B: Lustre means the metal can be polished and has a gloss.
A: Oh, okay. So lustre describes a shiny metal.
B: Exactly.
A: And I think I understand malleability but what's the difference between malleability and ductility.
B: They are quite similar in meaning, A malleable metal is a metal that can be shaped by a compressive force, something like hammering or rolling, without breaking, A ductile metal is a metal that can be stretched into a long shape.
A: So you can press a malleable metal to make

something like a pot and stretch a ductile metal to make something like wire?
B: That's right, yes.
A: That's clear. So is brittleness the opposite of those?
B: You can say that. A brittle metal is not at all elastic and it will break before it bends. If a metal is brittle it is not tough. Do you know what fusible means?
A: Fusible means the metal can be heated and blended with another metal. So the only thing I don't understand now is tensile strength.
B: Tensile strength is like the opposite of ductility. It means a metal can not be stretched and if it is then it returns to its original length. So is everything clear now?
A: Absolutely. Thanks a lot.

7.3
Naphtha - 24%
Fuel Oil – 30%
Aviation Fuel – 11%
Diesel – 31%
Asphalt – 4%

Unit 8 – Describing Processes
8.1
First, ensure the device is power isolated. Use an insulated screwdriver to remove the holding screws from the plug and remove the cover. Check that the screws holding the wires in place are secure. Loosen the screws which hold the fuse in place and then remove the fuse. Replace it with a new fuse of the same voltage and then tighten the screws which hold it in place. Next, replace the cover and secure it with the holding screws. Finally, check the device now works.

8.2
First, use a wrench to loosen the wheel nuts and then use a jack to raise the car. Remove the wheel nuts and then remove the wheel. Put the new wheel in place, replace the wheel nuts and then lower the car. Finally, tighten the wheel nuts

8.3
A: Can I ask you a few questions?
B: Sure.
A: Okay, first, have you done safety training before?
B: Yes, I have.
A: Good. When did you do it?
B: I did it about three years ago now.
A: And what did you study?
B: We studied fire protection and fire injury related first aid.
A: And did you think the training was useful?
B: Yes, I did.
A: Okay. And have you used the training since then?
B: Yes, I have. Well, I have used the fire safety but I haven't used the first aid.
A: Why did you use the fire safety?
B: About six months ago there was a small fire in the warehouse and I helped put it out.

8.4
Okay, this is the current status on the maintenance of the main gas turbine. We've already identified the problem and chosen the best solution. The risk assessment has been carried out and we've already informed people about the work. We've also chosen the appropriate equipment and we've already power isolated the equipment. We're doing the actual maintenance now. When we have finished we will do a test on the system. Because we haven't finished the job we haven't informed people or reconnected the power yet.

8.5
The emulsion enters the separator and gas is vented through a pipe at the top of the tank. The emulsion then enters the heater treater where the emulsion is heated and free water is released and gas is released. The free water is drained through the bottom of the tank. As the heating continues treated water is produced which is drained from the bottom of the tank. Clean oil then flows from the top of the tank

8.6
A production separator is designed to remove water from crude oil mixture. It works with the addition of a chemical demulsifying agent. The crude flows through the inlet valve and accumulates on the left hand side of the weir. As water is denser than oil it sinks to the bottom of the tank and flows out of the water release pipe. As oil is lighter than gas it floats on the surface of the crude and reaches a high enough level to cross the weir and flow through the oil release pipe. The pressure of the system is maintained by venting gas through the gas relief pipe and adjusting the release valves on the water and oil pipes.

Unit 9 – Expressing Possibility

9.1

11. You must wear a seatbelt when driving.
12. You must wear a seatbelt when you are a passenger.
13. You shouldn't drink alcohol the night before work.
14. You mustn't drink alcohol the night before a helicopter flight.
15. You shouldn't complete incident reports with a red pen.
16. You should study more about your discipline at home.
17. You must always obey the speed limit.
18. You must only do a job if you are competent.
19. You must wear PPE in the workshop.
20. You must ask a question if you don't understand something.

9.2

A driver has certain responsibilities to ensure his own safety, the safety of the vehicle, the safety of any passengers, pedestrians and other road users.
Larger vehicles have more safety regulations because they carry more people. In addition to the minimum requirements of all road ready vehicles larger vehicles should also be fitted with airbags, ABS, side impact bars and air conditioning. Regardless of size all vehicles must be fitted with a first-ad kit, fire extinguisher and a warning triangle for use in an emergency.
Before using any vehicle the driver must check it is roadworthy and fit for purpose. These checks include relevant documentation e.g. registration certificate, insurance certificate. If possible the driver should also examine the maintenance record of the vehicle.

9.3

One problem for pipelines is solids in liquids. These solid particles might be carried in the liquid or could be formed within the pipeline and be the result of corrosion of the pipe wall. Solid particles can cause excessive wear or equipment malfunction and so they have to be removed to protect equipment and extend the working life of parts.

Solid particles can be removed by strainers and filters. Strainers are normally a metal screen which can catch large, coarse particles. but they can't trap smaller particles. Filters are finer so they can catch smaller particles.

Some filters can be fitted within pipelines and may only be accessed for cleaning by breaking the pipeline (see fig. 1). Other filter systems, for example duplex filters (see fig.2), contain more than one filter so when one filter is offline for cleaning the flow can be directed to the other filter.

When filters are new the flow rate shouldn't be affected much but when filters get older solid particles build up which means not as much liquid can pass through so the flow rate is lowered.

Irregular Verbs

INFINITIVE	PAST SIMPLE	PAST PARTICIPLE
be	was/were	been
beat	beat	beaten
become	became	become
begin	began	begun
bet	bet	bet
bite	bit	bitten
blow	blew	blown
break	broke	broken
bring	brought	brought
build	built	built
buy	bought	bought
catch	caught	caught
choose	chose	chosen
come	came	come
cost	cost	cost
cut	cut	cut
dig	dug	dug
do	did	done
draw	drew	drawn
drink	drank	drank
drive	drove	driven
eat	ate	eaten
fall	fell	fallen
feed	fed	fed
feel	felt	felt
find	found	found
fly	flew	flown
forget	forgot	forgotten
forgive	forgave	forgiven
get	got	got/gotten
give	gave	given
go	went	been/gone
grown	grew	grown
have	had	had
hear	heard	heard
hide	hid	hidden
hit	hit	hit
hold	held	held
hurt	hurt	hurt
keep	kept	kept
know	knew	known
lead	led	led

INFINITIVE	PAST SIMPLE	PAST PARTICIPLE
leave	left	left
lend	lent	lent
let	let	let
light	lit	lit
lose	lost	lost
make	made	made
mean	meant	meant
meet	met	met
pay	paid	paid
put	put	put
read	read	read
ride	rode	ridden
ring	rang	rung
say	said	said
see	saw	seen
sell	sold	sold
send	sent	sent
set	set	set
shoot	shot	shot
show	showed	shown
shut	shut	shut
sing	sang	sung
sit	sat	sat
sleep	slept	slept
speak	spoke	spoken
spend	spent	spent
spread	spread	spread
stand	stood	stood
steal	stole	stolen
stick	stuck	stuck
swear	swore	sworn
swim	swam	swum
take	took	taken
teach	taught	taught
tell	told	told
think	thought	thought
throw	threw	thrown
understand	understood	understood
wake	woke	woken
wear	wore	worn
win	won	won
write	wrote	written

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This foundation course is suitable for elementary to low intermediate students and will enable trainees to:

- Understand the language of safety
- Describe equipment
- Give and receive instructions
- Describe systems
- Describe processes
- Make comparisons
- Express possibilities

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