Reflection Worksheet

Year 10

Half-Term 3

English, Maths, and Science

LIBERTY ACADEMY
CHURCH OF ENGLAND

People I Can Talk To

Wherever we are, it can be helpful to know who we can talk to. This might be helpful if we are worried about something, excited about something, feeling confused or even just want to chat. In the boxes below, draw a picture of yourself surrounded by people you can talk to at school.

This Is Me

Post-16 Transition Planning

How to Use This Worksheet

Planning for post-16 transition should begin in Year 9, enabling students to think about what their strengths and weaknesses are and what career paths they are interested in. This worksheet is designed to be a working document that can be added to throughout KS4, in preparation for leaving school.

Name:	**Date:**
My interests/passions/hobbies:	**My qualities:**
Careers that interest me:	**Things I don't like:**
Location:	**Colleges near me:**

Subject:	Predicted grade:	Potential options:	
		Highlight the appropriate level	
		Level 1	2 x GCSEs 1-3
		Level 2	3/4 x GCSEs 4-9
		Level 3	5 x GCSEs 4-9
		Apprenticeship	
		Preferred placement/options:	

Concerns about leaving school:

Action to be taken:

Employment	Yes/No/Partially
Have you received any career information, advice and guidance in the last year?	
Do you have an up to date vocational profile or CV?	
In the last year, have work tasters and/or work placements been offered in line with the interests and skills identified in the vocational profile?	
Is the curriculum supporting the development of skills that you will need in the workplace? Life skills, PSHE, etc.	
Independent Living	
Where do you see yourself living in the future and with whom?	
What would your parents like you to do after Year 11?	
Are you aware of the housing register?	
What are your parents or foster carers' expectations for you after college?	
Are you learning skills at school and at home that will help with living independently in the future?	
Community Inclusion	**Yes/No/Partially**
Do you have a circle of friends inside and outside of school?	
How are you forming friendships inside and outside of school?	
Are you aware of opportunities that are available in your local area? Clubs, teams, social events, etc.	

Have you ever volunteered to support an event/charity in your local area?	
Health	**Yes/No/Partially**
Are you registered with a local GP & Dentist?	
Are you aware that there is <u>support available</u> for after you leave school?	
Do you feel the curriculum supports you to have/lead a healthy lifestyle?	
Do you feel that you have support for your mental wellbeing?	

Job Interview Practice Questions

1. Tell me about yourself.
2. Describe your work experience.
3. Why do you want this job?
4. What are your strengths and weaknesses?
5. Have you ever had a problem with a coworker? How did you solve it?
6. Where do you see yourself in five years?
7. What did you do at your last job?
8. How do you work under pressure?
9. Why did you leave your last job?
10. What three words describe you?
11. How would you deal with a difficult customer?
12. Where did you hear about this business/company?
13. What makes a good employee?
14. What does being a hard worker mean to you?
15. Do you work better alone or with others?
16. Do you need any reasonable accommodations for this job?
17. Tell me about an achievement you are proud of.
18. Are you available to work during the week or weekend?
19. What do you like about this business/company?
20. Do you have any questions for me?

Yr 10 Science Instructions

In this booklet, you have been asked some Science questions. If you are struggling with the topics, you will find some Powerpoint slides with all the information and further questions for each topic after the test which opens this section of Science revision.

Human Biology

1 Which sentence describes respiration? ______

- **A** When your lungs take in and blow out air.
- **B** When your cells release energy using a chemical reaction.
- **C** When your heart pumps blood around your body.
- **D** When your lungs expand.

[1 mark]

2 **a** Complete the word equation for aerobic respiration.

glucose + ______ ® water + ______ (+ energy)

[1 mark]

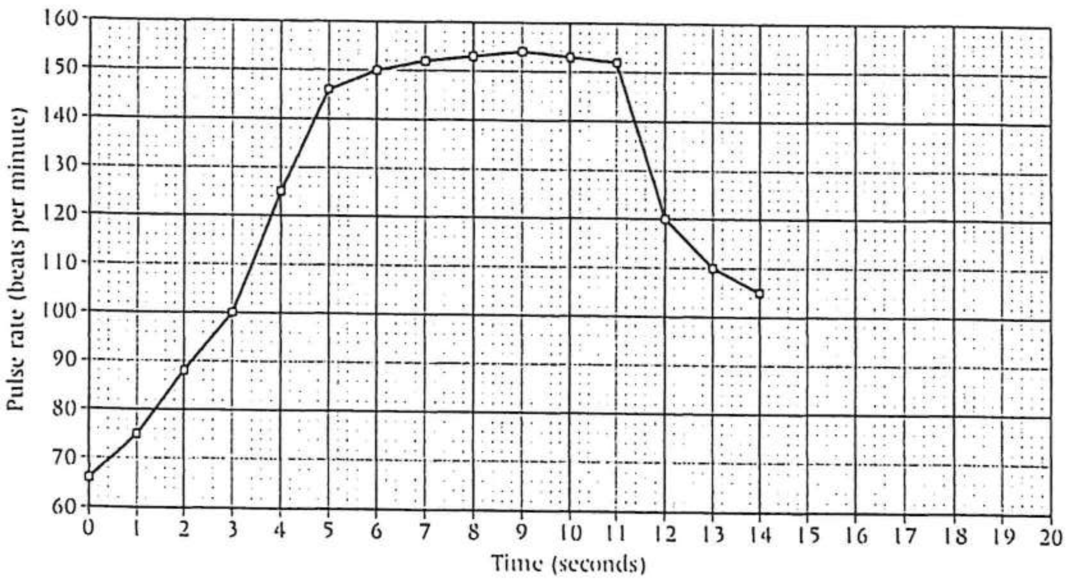
b Name one reactant and one product of respiration.

Reactant ______

Product ______

[1 mark]

3 The graph below shows how a runner's pulse rate changed during a short sprint.



a Which organ causes a pulse? ______

[1 mark]

b Between which two times was his pulse rate increasing most quickly?

______

[1 mark]

c How long did it take him to run the race? ______

[1 mark]

d Explain why his pulse rate went up during the race.

____

____

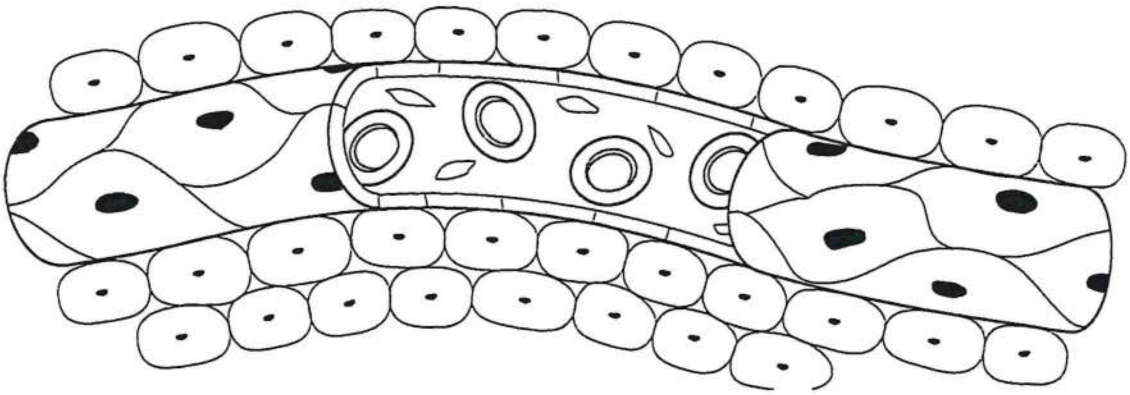
[2 marks]

e What happened to his breathing rate during the race?

____

[1 mark]

4 The diagram shows a capillary containing blood.



a On the diagram label a red blood cell and the plasma.

[1 mark]

b Which part of the blood carries the most carbon dioxide?

____

[1 mark]

c What is the name of the liquid that takes oxygen and glucose from the blood to other body cells?

____

[1 mark]

d Explain how the structure of the capillary wall helps to allow this liquid out of the blood.

____

____

[1 mark]

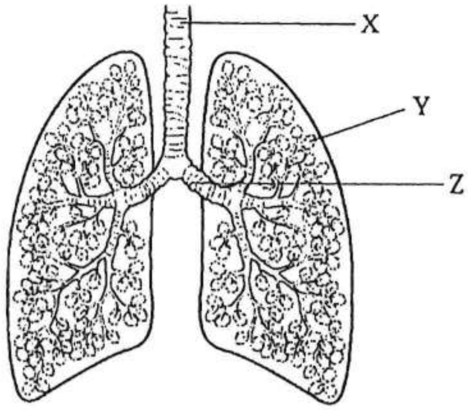
5 **a** Name the parts labelled X, Y and Z.

X ___________________

Y ___________________

Z ___________________

[3 marks]



b Gas exchange occurs in the alveoli of the lungs. What is meant by 'gas exchange'?

____

____

[2 marks]

c Give two features of alveoli that make them suitable for gas exchange.

i ___________________

ii ___________________

[2 marks]

6 Air contains a mixture of the following gases: nitrogen, oxygen, water vapour, carbon dioxide and noble gases.

a **i** What would you use to test a gas to see if it was carbon dioxide?

____

ii What would the result be if the gas was carbon dioxide?

____

[1 mark]

b **i** What would you use to test a gas to see if it was water vapour?

____

ii What would you see if it was water vapour?

____

[1 mark]

c Give three differences between the air you breathe in and the air you breathe out.

Breathed out air contains …

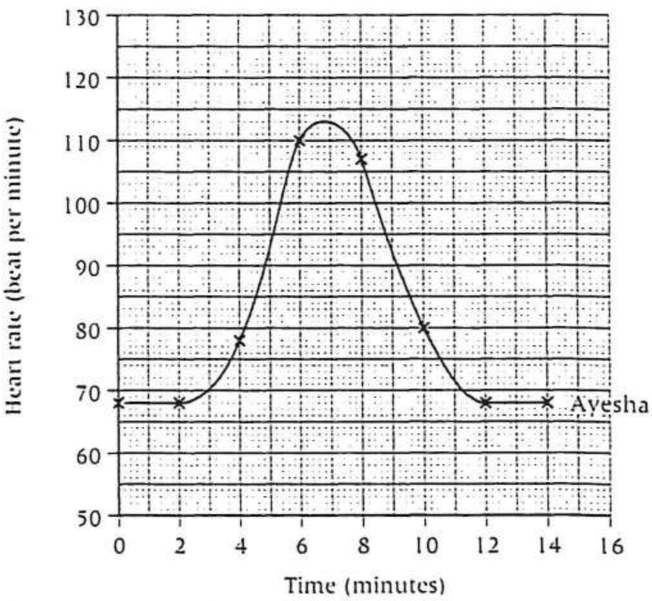
i ___________________

ii ___________________

iii ___________________

[3 marks]

1 Ayesha and her friend Jenny wanted to improve their fitness, so they decided to take up running. The graph shows how Ayesha's heart rate changed during a run.



a Plot Jenny's heart rate data for the same run and draw a smooth curve of best fit through the points.

[2 marks]

b For how many minutes were they running? ______________________

[1 mark]

c By how much did Ayesha's heart rate increase? ____________ beats per minute

[1 mark]

d i Who was the fitter, Ayesha or Jenny? ______________________

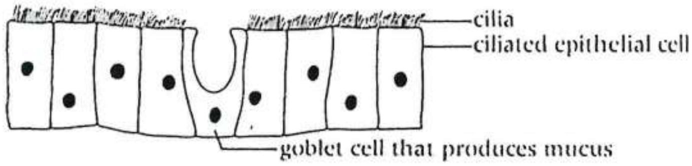
[1 mark]

ii Give a reason for your answer ______________________

[1 mark]

Time (minutes)	Jenny's heart rate (beats per minute)
0	70
2	70
4	94
6	120
8	118
10	89
12	74
14	70
16	70

2 The diagram shows the cells that line the windpipe.



a Smoking cigarettes causes the goblet cells to produce more mucus and damages the cilia. Explain the effects of these changes.

____

____

[2 marks]

b Cigarette smoke contains many harmful chemicals. Describe one harmful effect of each of the following chemicals:

i Tar __________________________________

ii Nicotine __________________________________

[2 marks]

3 **a** Alcohol is a drug. Which statement explains why alcohol is a drug?
Tick the correct box.

It is a chemical. ☐ It dissolves in water. ☐

It boils at 78 °C. ☐ It affects the nervous system. ☐

[1 mark]

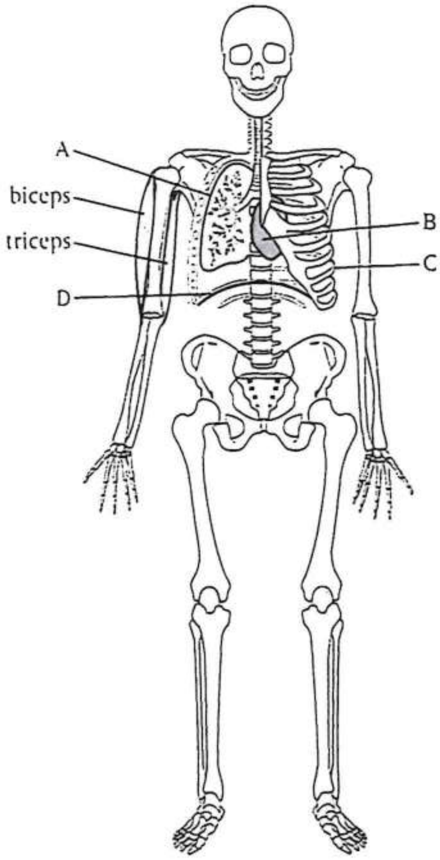
b What effect can drinking alcohol during pregnancy have on the developing baby?

____

[1 mark]

4 Look at the drawing.

a What are the parts labelled **A–D**?



A is ______________________________

B is ______________________________

C is ______________________________

D is ______________________________

[2 marks]

b What mineral is needed for healthy bones and teeth?

____

[1 mark]

c What does part **B** do?

____

____

____

[1 mark]

d The shape of part **D** changes to help someone breathe in. How does it change?

____

[1 mark]

e The biceps and triceps are muscles in the upper arm. To move the lower arm up, what happens to the muscles? Tick the two correct boxes.

☐ The biceps contracts. ☐ The biceps relaxes.

☐ The triceps contracts. ☐ The triceps relaxes.

[1 mark]

f What are pairs of muscles like this called? ______________________________

[1 mark]

5 Caffeine is a widely used recreational drug.

a Give one way in which people take caffeine.

____

[1 mark]

b What is meant by the term 'recreational drug'?

____

____

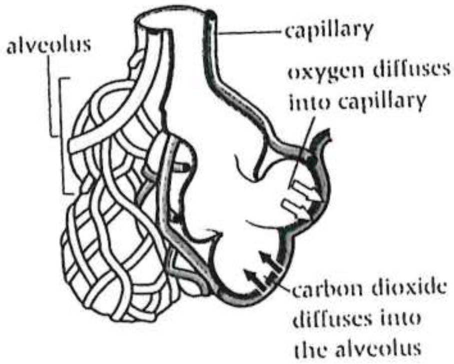
[1 mark]

c Give one effect that caffeine has on the body.

____

[1 mark]

6 The drawing shows an air sac.



a How does oxygen get into the blood?

____

[1 mark]

b How is oxygen carried by the blood? ______________________

____

[1 mark]

c What are the pockets that an air sac is divided into called?

____

[1 mark]

Chemical Reactions 2

1 a Complete the following table to summarise the properties of metals and non-metals.

[3 marks]

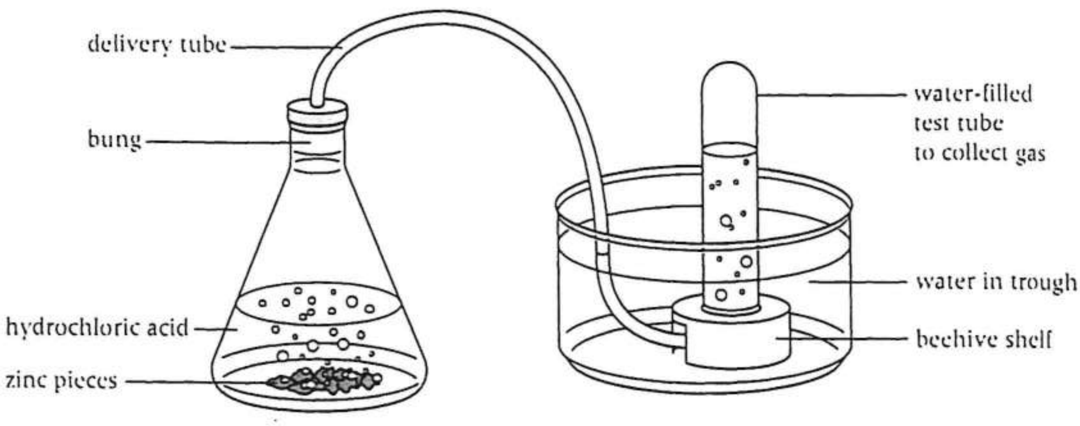
Property	Metals ...	Non-metals ...
State at room temperature	are usually solids	
Melting and boiling points	often have high melting and boiling points	often have low melting and boiling points
Conduction of heat and electricity		are poor conductors (good insulators)
Flexibility	are rigid when thick, and bendy when thin	
Malleability	can be hammered into shape	cannot be hammered into shape
Sound when hit	can make a ringing sound	do not make a ringing sound
Magnetism	iron, nickel and cobalt are magnetic	are not magnetic
Oxides are acids or bases	react with oxygen to form bases	react with oxygen to form acids

b The properties of metals make them suitable for different uses. For each of the following uses of metals, give two reasons why the metal is suitable for its use.

Metal	Use	Why this metal is used
copper	house electrical wiring	i ____________ ii ____________
gold	making jewellery	i ____________ ii ____________

[4 marks]

2 Ann placed a piece of zinc metal into some dilute hydrochloric acid. She collected the gas produced using the apparatus shown below.



a Ann thought the gas was hydrogen. How would she test the gas to see if it was hydrogen?

____

____

[1 mark]

b Predict the name of the **compound** formed when a reaction takes place between the following metals and acids.

zinc + dilute sulphuric acid ______________________

zinc + dilute nitric acid ______________________

magnesium + dilute hydrochloric acid ______________________

magnesium + dilute sulphuric acid ______________________

[2 marks]

3 Vijay added some calcium carbonate powder (crushed limestone) to some dilute hydrochloric acid in a conical flask.

a A reaction took place. How could he tell?

____

[1 mark]

b Complete the word equation for this reaction between calcium carbonate and hydrochloric acid:

calcium carbonate + hydrochloric acid __________ + __________ +

____

[2 marks]

4 How would you test a sample of gas to see if it contained carbon dioxide?

____

____

[1 mark]

5 a What name is given to the reaction between an acid and an alkali?

____

[1 mark]

b Complete the following general word equation for the reaction between an acid and an alkali:

acid + alkali ______________ + ______________

[1 mark]

c Sodium chloride is a product of this type of reaction. What is it commonly used for?

____

[1 mark]

Plants and photosynthesis

What is photosynthesis?
- Plants make their own food (for energy) in a process called **photosynthesis**.
- Photosynthesis helps keep:
    - levels of oxygen high;
    - levels of carbon dioxide low.

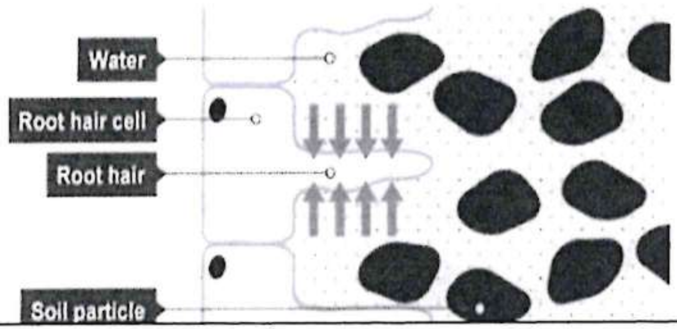
- Photosynthesis takes place in **chloroplasts** in the cells.
- Chloroplasts contain **chlorophyll**.
- **Chlorophyll** absorbs the light energy for photosynthesis

The equation for photosynthesis is:

carbon dioxide + water → glucose + oxygen

These are the things that plants need for photosynthesis:
- **carbon dioxide** – absorbed through their leaves;
- **Water** - from the ground through their roots;
- **light** (a source of energy) - from the Sun.

These are the things that plants make by photosynthesis:
- **Oxygen** - released into the air from the leaves;
- **Glucose**:
    - turned into **starch** and plant oils, used as an energy store;
    - This energy is released by **respiration**;
    - Used to make **cellulose** for cell walls.



Water is absorbed into the roots by a process called **osmosis**, which does not use energy.
Minerals are absorbed into the roots by a process called **active transport,** which uses energy.

Adaptation	Function
Thin	Short distance for carbon dioxide to diffuse into the leaf
Waxy Layer	Prevents water loss by **evaporation**
Palisade cells	Contain a lot of **chloroplasts** to absorb light
Chloroplasts contain chlorophyll	Absorbs light
Stomata	Allows carbon dioxide to diffuse into the leaf (and oxygen to diffuse out)
Guard cells	Open/close stomata depending on conditions
Network of tubes (xylem & phloem)	Transports water (xylem) and food (phloem)

Water
- Water is absorbed through the roots, by **osmosis;**
- It is transported through tubes **(xylem)** to the leaf;
- The roots contain cells called a **root hair cells.**
    - They increase the **surface area;**
    - They have **thin walls.** This lets water pass into them easily.
- Root cells do not contain chloroplasts.

Carbon dioxide
- Enters leaf by **diffusion** through the **stomata**.
- **Guard cells** control the size of the stomata
- Stomata closes in **hot**, **windy** or **dry** conditions.
- Spongy layer has gaps between cells;
    - Allows carbon dioxide to **diffuse** to other cells in the leaf;
    - Allows oxygen produced in photosynthesis diffuse out of the leaf.

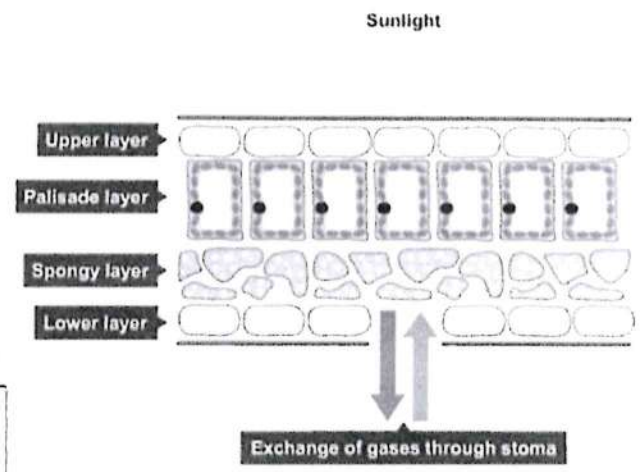
Respiration v photosynthesis
Photosynthesis:

carbon dioxide + water → glucose + oxygen

Aerobic respiration is:

glucose + oxygen → carbon dioxide + water

The equation for photosynthesis is the **opposite** of the equation for aerobic respiration.
- **Photosynthesis**:
    - **produces** glucose and oxygen;
    - **uses** carbon dioxide and water;
- **Respiration**:
    - **produces** carbon dioxide and water;
    - **uses** glucose and oxygen;



A cross-section through a leaf showing its main parts

1. What 4 things do plants need to carry out photosynthesis?

2. What are the products of photosynthesis?

3. Which tissue does most photosynthesis take place in?

4. Which tissue is responsible for carrying water around the plant?

5. What can the sugar made in photosynthesis be used for? (3 things)

6. How have carbon dioxide levels changed since the Earth was first formed?

7. What 3 conditions affect the rate of photosynthesis?

8. Give two reasons that carbon dioxide levels are now increasing.

9. How are leaves adapted to absorb sunlight?

10. Why do plants take in oxygen in the dark?

1. Why are plants known as 'producers'?

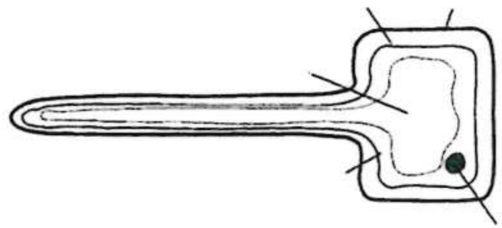
....

....

2. Below are the conditions needed for virtually all animal life on the Earth. Describe the role of plants in providing these conditions. Use the equation for photosynthesis to help you.

Condition for animal life	How plants contribute to this
Low levels of carbon dioxide	
Oxygen needed for respiration	
Availability of food	

Label the root hair cell below.



Explain how root hair cells help a plant absorb water more easily

An **Organelle** is a specific part within a living cell that serves a function e.g. nucleus.

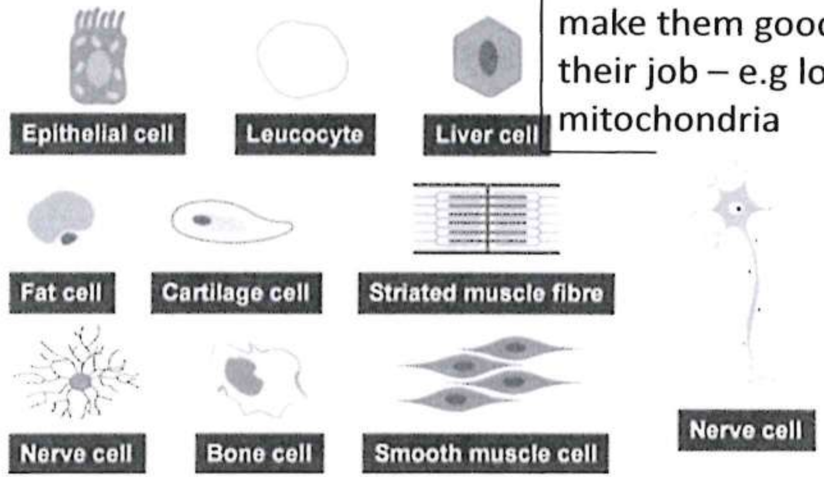
Cells, tissues and organs.

Specialised cells have special features that make them good at their job – e.g lots of mitochondria

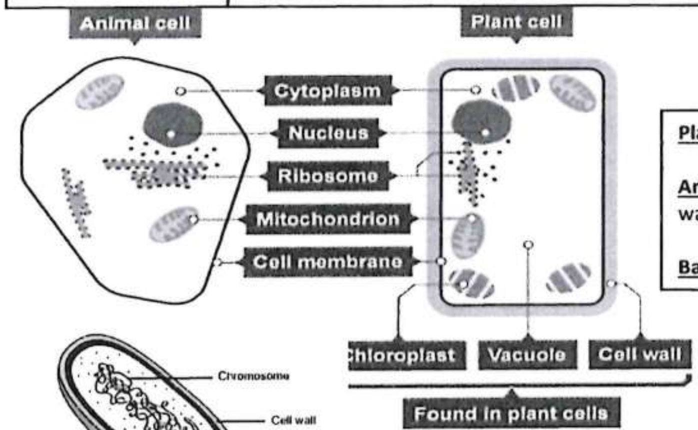
Organelle	Function
Nucleus	*Contains genetic material which controls the cell's activities*
Cell Membrane	*Controls the movement of substances in and out of the cell*
Cytoplasm	*Where most of the chemical reactions happen*
Mitochondria	*Where most energy is released in respiration*
Ribosome	*Where protein synthesis happens*
Cell Wall	*Strengthens the cell and supports the plant*
Chloroplast	*Absorb light energy for photosynthesis (contains **chlorophyll**)*
Vacuole	*Filled with cell sap to help keep the cell turgid to provide support.*

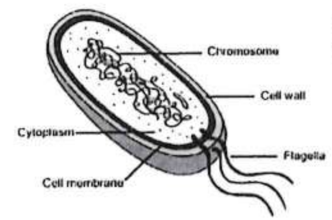
Movement
Respiration
Sensitivity

Growth
Reproduction
Excretion
Nutrition



Cell → Tissue → Organ → Organ system → Organism





Bacterial cell

<u>**Plant cells**</u> contain **all** of the above organelles.

<u>**Animal cells**</u> contain all of them **apart from** cell wall, chloroplasts and large, permanent vacuole.

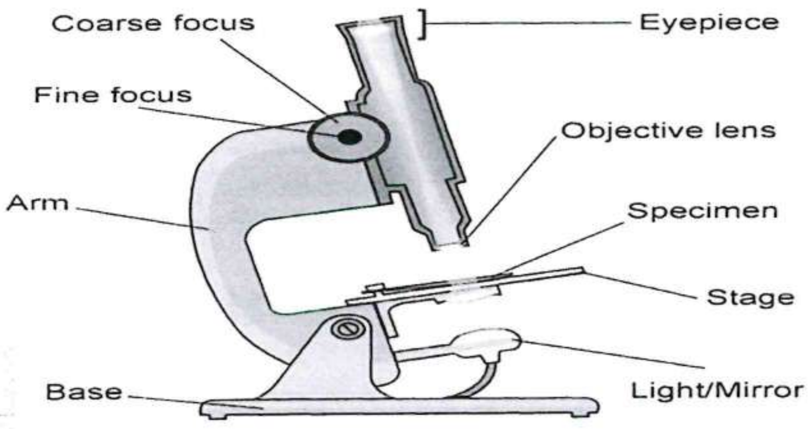
<u>**Bacterial cells**</u> don't have a nucleus

Unicellular organisms are made of one cell (e.g. amoeba)

Multicellular organisms are made of many cells (e.g. human)

Cell	The building blocks of life, all living things are made up of cells.
Tissue	A group of the **same type of cell** working together to do a particular job. E.g.. Lots of muscle cells make up a muscle tissue!
Organ	Made from a group of **different types** of tissue, which all work together to do a particular job. E.g.. The heart
Organ System	Made from a group of different organs, which all work together to do a particular job within the organism. Eg circulatory system.
Organism	A living thing – this can be plants, animals or microorganisms!

How can we take a closer look inside cells?



Magnification

Using a microscope:

1. Stain the sample to make objects easier to see
2. Put the slide on the stage
3. Start with the LOWEST magnification
4. Use the coarse focus to find cells
5. Increase the magnification
6. Use the fine focus to see them clearly

$$\text{Actual size} = \frac{\text{Image size}}{\text{Magnification}}$$

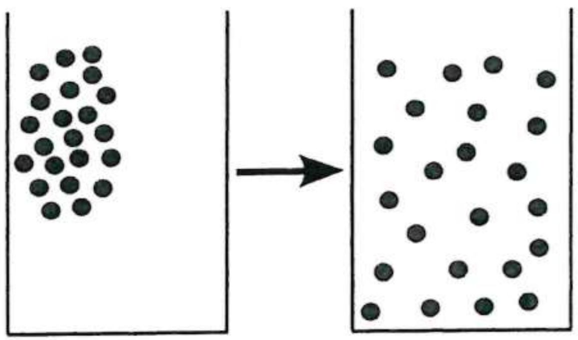
$$\text{Magnification} = \frac{\text{Image size}}{\text{Actual size}}$$

Example :
An image of a cell is 3mm long, but it's actual size is 0.012mm. Calculate the magnification

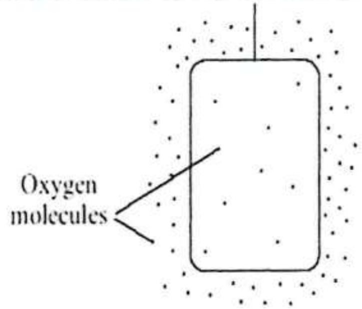
$$\text{Magnification} = \frac{3}{0.012}$$

Magnification = 250 x

How do cells get what they need?

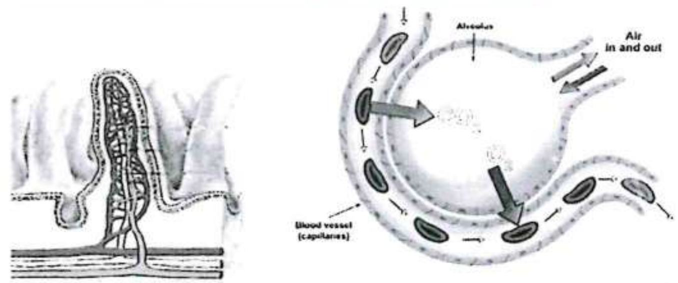


Diffusion is the spreading out of particles from a high concentration to a low concentration



Diffusion takes place across the cell membrane to allow substances like oxygen in

Internal surfaces



The intestines and lungs are highly folded to make diffusion as fast and easy as possible. The membranes are thin

1 What are the functions of the cell membrane?

2 What is the role of mitochondria?

3 What is the function of ribosomes in a cell?

4 This controls the activities of the cell.

5 What do plant cells have that animal cells do not have?

6 Groups of cells are known as……

7 Tissues are organised into……

8 What is the job of the digestive system?

9 These are found in the nucleus and code for different characteristics.

10 These substances pass into living animal cells.

11 Which magnification should you start with on a microscope?

12 Where is chlorophyll found in plant cells?

13 Which feature do bacterial cells NOT have

14 Name 2 types of cell that have a cell wall

15 The stomach, small intestine and large intestine are part of which system?

16 Name the process by which substances move into and out of cells

17 How do folded surfaces inside the body speed up diffusion?

Longer questions:

1. Describe how use a microscope to view cells:

2. Describe how the following cells are specialised for their jobs:

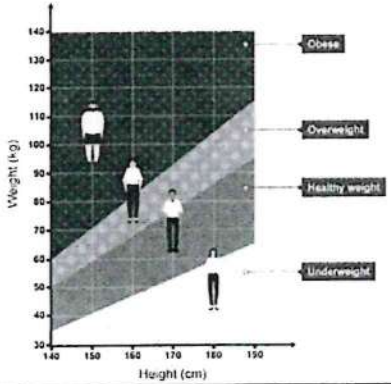
3. An image of a cell is 5mm, the real size is 0.015mm. Calculate the magnification

Digestion and Nutrition

Too thin, too fat
If the amount of energy you get from your food is different from the amount of energy you need, your diet will be imbalanced:
- too little food can make you underweight
- too much food can make you overweight

Starvation happens if you eat so little food that your body becomes very underweight. This can eventually cause death.

Obesity happens when you eat so much food that your body becomes very overweight. This can harm health and shorten **life expectancy**, eg by heart disease.



Nutrient	Use in the body	Good sources
Carbohydrate	To provide energy	Cereals, bread, pasta, rice and potatoes
Protein	For growth and repair	Fish, meat, eggs, beans, pulses and dairy products
Lipids (fats and oils)	To provide energy. Also to store energy in the body and insulate it against the cold.	Butter, oil and nuts
Minerals	Needed in small amounts to maintain health	Salt, milk (for calcium) and liver (for iron)
Vitamins	Needed in small amounts to maintain health	Fruit, vegetables, dairy foods
Dietary fibre	To provide roughage to help to keep the food moving through the gut	Vegetables, bran
Water	Needed for cells and body fluids	Water, fruit juice, milk

Energy needs
Each person needs a different amount of energy depending on factors such as:
- gender (male or female)
- age
- amount of daily activity

Energy in food is measured in **kilojoules**, kJ.

A **balanced diet** contains the correct amounts of necessary nutrients.
An **imbalanced diet** can contain too much or too little of a particular nutrient.

Too little of a particular nutrient is called a **deficiency**.

Mineral and vitamin deficiencies
You only need small amounts of each minerals or vitamins in your diet to stay healthy, but vitamin or mineral deficiencies can make you ill. For example:

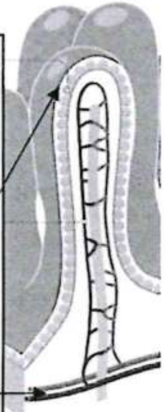
Minerals
- iron deficiency causes anaemia, where there are too few red blood cells;
- iodine deficiency can cause a swelling in the neck called goitre.

Vitamins
- vitamin A deficiency can cause blindness;
- vitamin C deficiency causes scurvy, which makes the gums bleed;
- vitamin D deficiency causes rickets, which makes the legs bow outwards in growing children.

Absorption across a surface happens efficiently if:
- the surface is thin;
- its area is large.

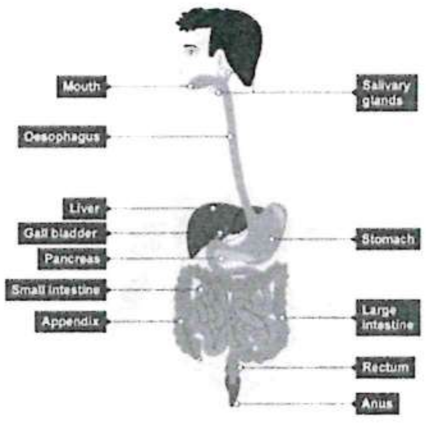
The inner wall of the small intestine is adapted. It has:
- a thin wall, just one cell thick;
- many tiny **villi** to give a really big **surface area.**

The villi contain blood **capillaries** to carry away the absorbed food molecules.



Stages of digestion
After we swallow, our food passes through these organs in turn:
1. oesophagus or gullet
2. stomach
3. small intestine
4. large intestine

- Food is **digested** in the mouth, stomach and small intestine;
- Digested food is **absorbed** into the bloodstream in the small intestine;
- Excess water is absorbed back into the body in the large intestine;
- Undigested food passes out of the anus as faeces.



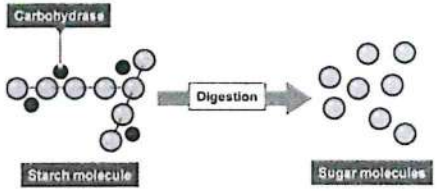
Liver and pancreas
- The liver produces **bile**, which helps the digestion of lipids (fats and oil).
- The pancreas produces biological **catalysts** called digestive **enzymes** which speed up the digestive reactions .

The digestive system contains many **bacteria** which are important. For example, they:
- can digest certain substances humans cannot digest;
- reduce chance of harmful bacteria multiplying, causing disease;
- produce vitamins that humans need eg vitamins B & K.

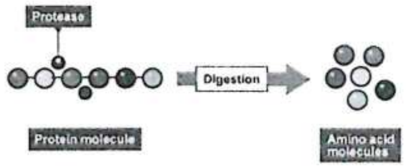
Digestion is when large **insoluble** food particles are broken down into small **soluble** particles so that they can be absorbed into our bloodstream.

This is carried out by **enzymes** - special proteins that can break large molecules into small molecules.

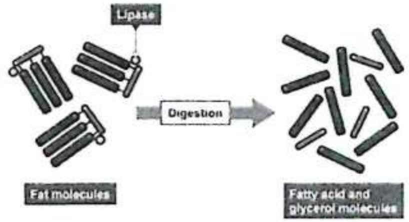
Different enzymes can break down different nutrients:
- **Carbohydrates** (eg starch) are broken down into **sugar** - by **carbohydrase** enzymes



- **Proteins** are broken down into **amino acids** - by **protease** enzymes;



- **Lipids** (ie fats and oils) are broken down into **fatty acids** and **glycerol** - by **lipase** enzymes.



Minerals, vitamins and water are not digested, as they are already small enough to be absorbed.
Digestive enzymes cannot break down dietary fibre, which is why the body cannot absorb it.

ingestion (eating) → digestion (breaking down) → absorption → egestion (removal from the body

9BB
Biological systems and processes

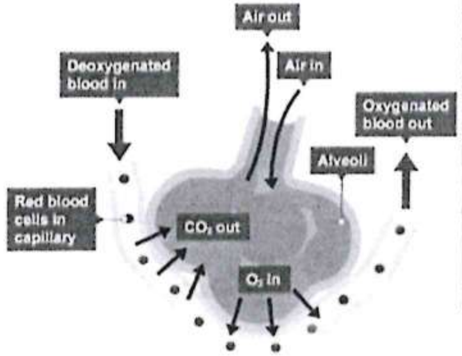
The human gas exchange system

- Oxygen is needed for respiration;
- Carbon dioxide produced in respiration needs to be removed;

Gas exchange is moving oxygen from the air into the blood, and removing waste carbon dioxide from the blood into the air.

The respiratory system contains the organs that allow us to get the oxygen we need and to remove the waste carbon dioxide we do not need:

- Air passes from the mouth into the **trachea** (windpipe);
- The trachea divides into two **bronchi** - one for each lung.
- Each bronchus divides into smaller tubes called **bronchioles** .
- At the end of each bronchiole, there are air sacs (**alveoli**)
- The alveoli increase the **surface** of the lungs.

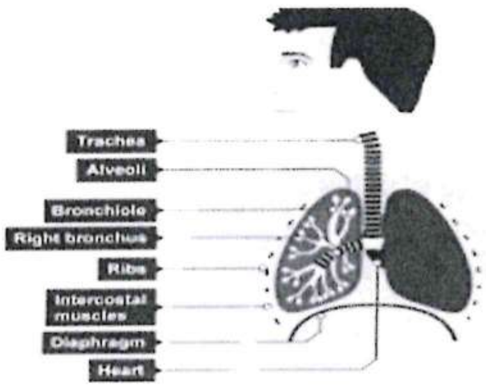


Features of the alveoli

- Increase surface area of lungs;
- Moist, thin walls (just one cell thick);
- A lot of tiny blood vessels called **capillaries**

The gases move by **diffusion** (**from a high concentration to a low concentration**)

- oxygen diffuses from the air into the blood;
- carbon dioxide diffuses from the blood into the air.



Aerobic respiration

Energy is needed for:

- growth and repair
- movement
- control of body temperature in mammals/birds

The equation for aerobic respiration is:

glucose + oxygen → carbon dioxide + water

- Glucose and oxygen react to produce carbon dioxide and water and release energy;
- It is **aerobic** respiration because oxygen is used;
- Respiration happens in all living cells, including plant and animal cells;
- Takes place in the **mitochondria** of the cell;
- Energy is released from glucose;
- <u>Do not</u> confuse respiration with breathing (which is called **ventilation**).

Ventilation

- Ventilation is another word for breathing;
- It involves movements of the **ribs, intercostal muscles** and **diaphragm** to move air in and out of the lungs:
- **Inhale** – breathing in; **exhale** – breathing out;

	Inhaling	Exhaling
Diaphragm	Contracts and moves downwards	Relaxes and moves upwards
Intercostal muscles	Contract, moving the ribs upwards and outwards	Relax, letting the ribs move downwards and inwards
Volume of ribcage	Increases	Decreases
Pressure inside the chest	Decreases below atmospheric pressure	Increases above atmospheric pressure
Movement of air	Moves into the lungs	Moves out of the lungs

Anaerobic respiration

In humans:

The equation for anaerobic respiration in humans is:

glucose → lactic acid

- Lactic acid builds up in the muscles;
- Causing pain and tiredness (fatigue);
- Can lead to cramp;
- Lactic acid is broken down when you start aerobic respiration again.

Fermentation

The equation for anaerobic respiration in yeast is:

glucose → ethanol + carbon dioxide

- Anaerobic respiration happens in microbes (eg bacteria);
- They need to release energy from glucose;
- Yeast (unicellular fungi) can carry out an anaerobic process called **fermentation;**
- Ethanol (alcohol) is produced;
- The ethanol is used to make beer and wine;
- The carbon dioxide helps bread rise.

	Aerobic	Anaerobic
Needs oxygen?	Yes	No
Needs glucose?	Yes	Yes
Product(s) formed	Carbon dioxide and water	Lactic acid
Energy released	More	Less

Impact of exercise - exercise causes an increase in:

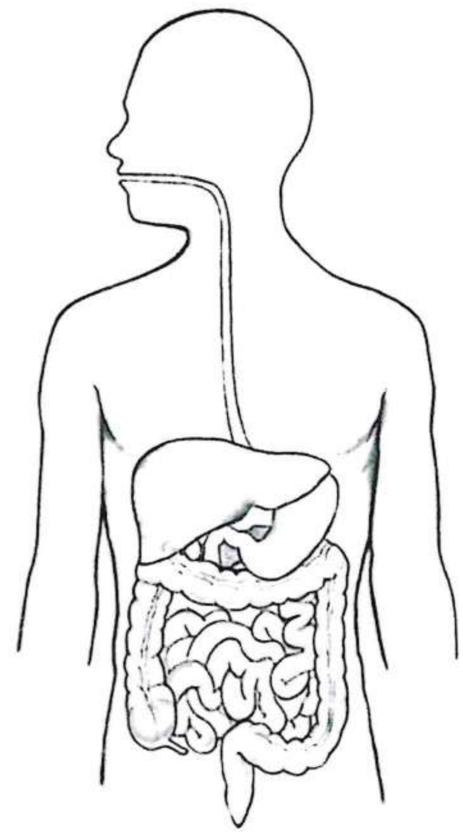
- breathing rate;
- tidal volume (volume of air breathed in/out in one breath);

Regular exercise can increase the:

- strength of the **diaphragm** and **intercostal muscles** ;
- vital capacity (volume of air that can be forcibly exhaled after inhaling fully).

1. Name the 7 nutrients required for a balanced diet.

Label the stomach, liver, gullet, small intestine and large intestine.



2. Describe the test for the following nutrients and their positive results:

3. Explain the possible effects of a diet that does not contain enough calcium for a child.

4. What is mechanical digestion?

5. What is protein needed for in the diet?

6. Why is there hydrochloric acid in the stomach?

7. Name two diseases linked with unbalanced energy or fat intake.

8. What are enzymes?

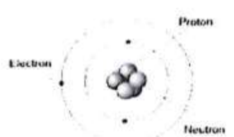
9. Which enzyme digests starch?

10. Why do enzymes not work at high temperatures or the wrong pH?

Atoms are tiny particles that everything is made of.

They are made of smaller particles called:
- protons;
- neutrons;
- electrons.

Dalton's atomic model



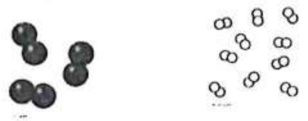
Elements
There are over a hundred different elements.

Atoms have the same number of protons as each other.

Atoms of differing elements have a different number of protons.

The atoms of some elements do not join together, but instead they stay as separate atoms, eg Helium.

The atoms of other elements join together to make **molecules**, eg oxygen and hydrogen.



Compounds
A compound is contains atoms of <u>**two or more different**</u> elements, and these atoms are <u>**chemically joined together.**</u>

For example, water is a compound of hydrogen and oxygen.

Each of its molecules contains two hydrogen atoms and one oxygen atom.

Chemical formulae
Remember that we use chemical symbols to stand for the elements. For example, **C stands for carbon, O stands for oxygen, S stands for sulfur and Na stands for sodium.**

For a molecule, we use the chemical symbols of the atoms it contains to write down its formula. For example, the formula for **carbon monoxide is CO.**

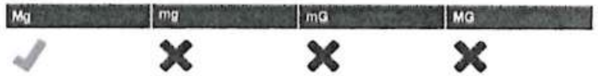
It tells you that each molecule of carbon monoxide is made of one carbon atom joined to one oxygen atom.

Be careful about when to use capital letters. For example, CO means a molecule of carbon monoxide but **Co is the symbol for cobalt** (an element).

Each element is given its own chemical symbol, like **H for hydrogen** or **O for oxygen.**

Chemical symbols are usually one or two letters long.

Every chemical symbol **starts with a capital letter, with the second letter written in lower case.** For example, Mg is the correct symbol for magnesium, but mg, mG and MG are wrong.



Metals have properties in common. They are:
- **shiny**, especially when they are freshly cut
- **good conductors** of heat and electricity
- **malleable** (they can be bent and shaped without breaking)

Most metals also have other properties in common. They are:
- **solid** at room temperature, except mercury;
- **hard** and **strong;**
- they have a **high density;**
- they are **sonorous.**

The elements are arranged in a chart called the periodic table. A Russian scientist, Mendeleev, produced the first periodic table in the 19th century.

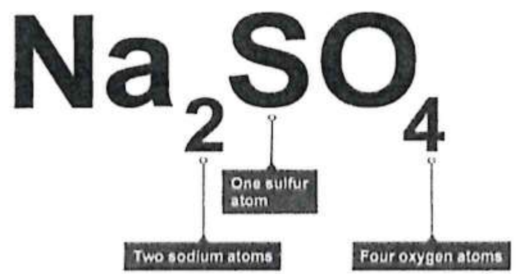
The modern periodic table is based closely on the ideas he used:
- the elements are arranged in order of increasing atomic number (number of protons);
- the **horizontal** rows are called **periods;**
- the **vertical** columns are called **groups;**
- elements in the same group are similar to each other.

Numbers in formulae
We use numbers to show when a molecule contains more than one atom of an element.

The numbers are written **below** the element symbol. For example, CO_2 is the formula for carbon dioxide.

It tells you that each molecule has **one carbon atom** and **two oxygen atoms.**

The **small numbers go at the bottom.** For example:
- CO_2 is correct;
- CO^2 and CO2 are wrong.

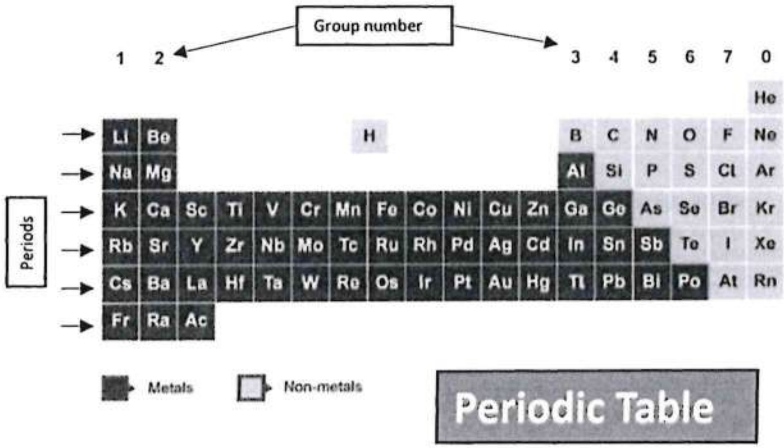


Some formulae are more complicated. For example, the formula for sodium sulfate is Na_2SO_4. It tells you that sodium sulfate contains two sodium atoms (Na x 2), one sulfur atom (S) and four oxygen atoms (O x 4).

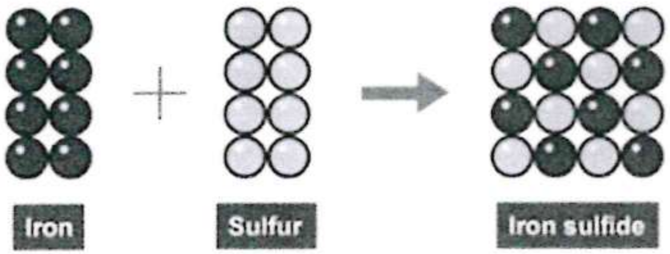
We can use the periodic table to predict the properties of elements in the same group.

Group 7	Melting point	Density	Reactivity
Fluorine Chlorine Bromine Iodine	Increases down the group	Increases down the group	Decreases down the group

Group 1	Melting point	Density	Reactivity
Lithium Sodium Potassium Rubidium	Decreases down the group	Increases down the group	Increases down the group



Chemical reactions
When chemicals react, the atoms are rearranged. For example, iron reacts with sulfur to make iron sulfide



Iron sulfide, the compound formed in this reaction, has different properties to the elements from what it is made.

	Iron	Sulfur	Iron sulfide
Type of substance	Element	Element	Compound
Colour	Silvery grey	Yellow	Black
Is it attracted to a magnet?	Yes	No	No
Reaction with hydrochloric acid	Hydrogen formed	No reaction	Hydrogen sulfide formed, which smells of rotten eggs

- The atoms in a compound are joined together by forces called **bonds**.
- The properties of a compound are different from the elements it contains;
- You can only separate its elements using another chemical reaction;
- Separation methods like filtration and distillation will not do this.

Chemical equations
We summarise chemical reactions using equations:

reactants → products

- **Reactants** are shown on the **left** of the arrow;
- **Products** are shown on the **right** of the arrow.

<u>Do not</u> write an equals sign instead of an arrow.

If there is more than one reactant or product, they are separated by a + sign. For example:

copper + oxygen → copper oxide

Reactants: copper <u>and</u> oxygen
Products: copper oxide

A **word equation** shows the names of each substance involved in a reaction, and **must not include any chemical symbols or formulae**

Periodic Table

Conservation of mass
When atoms are rearranged in a chemical reaction, they are not destroyed or created.

- **Reactants** - the substances that react together;
- **Products** - the substances that are formed in the reaction;
- **Mass is conserved** in a chemical reaction, this means...
- Total mass of the reactants = total mass of the products;

Symbol equations

A balanced **symbol** equation includes the **symbols** and **formulae** of the substances involved. For example:

<u>Word equation:</u>
Copper + Oxygen → Copper Oxide

<u>Symbol equation</u> (unbalanced):
$Cu + O_2 \rightarrow CuO$

There is one copper atom on each side of the arrow, but two oxygen atoms on the left and only one on the right. This is **unbalanced.**

A **balanced** equation has the **same number of each type of atom on each side of the arrow.** Here is the balanced symbol equation:

$$2Cu + O_2 \rightarrow 2CuO$$

Some more examples of balanced symbol equations
- $C + O_2 \rightarrow CO_2$
- $2H_2 + O_2 \rightarrow 2H_2O$
- $2Mg + O_2 \rightarrow 2MgO$
- $CuCO_3 \rightarrow CuO + CO_2$
- $Mg + 2HCl \rightarrow MgCl_2 + H_2$

1 What is an element?

2 What is a compound?

3 What are the vertical columns in the periodic table called?

4 What is used to order the elements in the modern periodic table?

5 What are the three particles that make up the atom called?

6 Which two particles are found in the nucleus?

7 Which particle is tiny, has a negative charge and is found orbiting the nucleus?

8 What do all elements in the same group have in common in terms of electrons?

9 What are the two types of element?

10 Name the compound formed when copper reacts with chlorine.

11 Name the three elements joined together in copper carbonate

12 How many different elements are there in KNO_3?

13 What happens to reactivity going down group 1?

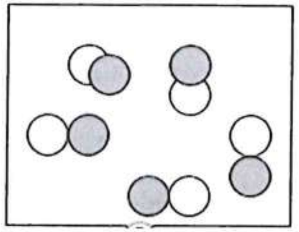
14 Name the gas given off when group 1 react with water

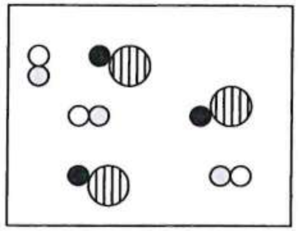
15 What is the name for group 7?

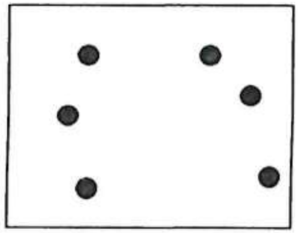
Complete the table below:

Compound formula	Name	Elements contained and number of each
MgO	Magnesium oxide	1 Magnesium, 1 oxygen
KCl		
$CaCO_3$		
$LiNO_3$		

Describe the substances below







Word equations to symbol equations:
- replace names of each substance symbols or formula
- use numbers to balance the equation

Example:

copper + oxygen → copper oxide

$$2Cu + O_2 \rightarrow 2CuO$$

Two copper atoms (2Cu) react with **one oxygen molecule (O_2)** to produce **two units of copper oxide (2CuO)**

Property	Metals	Non-metals
Appearance	Shiny	Dull
State at room temperature	Solid (except mercury, a liquid)	Half solids, half gases, and one (bromine) is a liquid
Density	High	Low
Strength	Strong	Weak
Malleable or brittle	Malleable	Brittle
Conduct heat?	Good	Poor
Conduct electricity?	Good	Poor (except graphite carbon)
Magnetic material	**Only** iron, cobalt & nickel	None
Sound when hit	Make a ringing sound (sonorous)	They make a dull sound

Naming salts

Hydro**chloric** acid → metal **chlorides**

Sulfuric acid → metal **sulfates**

Nitric acid → metal **nitrates**

Bases v alkalis

A **base** is a substance that can react with acids and **neutralise** them.

Bases are usually:
- **metal oxides**, such as copper oxide
- **metal hydroxides**, such as sodium hydroxide, or
- **metal carbonates**, such as calcium carbonate

Many bases are insoluble in water.
If a base does dissolve in water it is called an **alkali**.

Metal oxides v non-metal oxides
- Metals react with oxygen in the air to produce **metal oxides:**
  - **Solid at room temperature**
  - Metal oxides are **bases** (if they dissolve they form **alkalis**)
- Non-metals react with oxygen in the air to produce **non-metal oxides:**
  - Usually **gases at room temperature;**
  - Dissolve to form **acids.**

Acids and metals (MASH equations)

Acids react with most metals to produce a salt and hydrogen
This is the general word equation :

metal + acid → salt + hydrogen

An example would be:

magnesium + hydrochloric acid → magnesium chloride + hydrogen

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

It doesn't matter which metal or which acid is used, if they react we get hydrogen gas and a salt.

The lab test for hydrogen

Squeaky pop test – **lighted splint** goes 'pop' when put in a test tube of hydrogen.

Reactivity Series

The **reactivity series** is a list of elements in order of their reactivity:

Most reactive

Potassium	**K**
Sodium	**Na**
Calcium	**Ca**
Magnesium	**Mg**
Aluminium	**Al**
Carbon	**C**
Zinc	**Zn**
Iron	**Fe**
Tin	**Sn**
Lead	**Pb**
Hydrogen	**H**
Copper	**Cu**
Silver	**Ag**
Gold	**Au**
Platinum	**Pt**

Least reactive

Reactivity

Extracting iron from iron oxide

Iron is extracted from **iron oxide** using carbon. This is done on an industrial scale in a **blast furnace**.

- Lumps of iron oxide are mixed with **carbon;**
- dropped into the top of the blast furnace;
- hot air is blasted in at the bottom;
- The oxygen in the air reacts with carbon, forming **carbon monoxide**:

carbon + oxygen → carbon monoxide

$2C + O_2 \rightarrow 2CO$

- The carbon monoxide reacts with the iron oxide:

iron oxide + carbon monoxide → iron + carbon dioxide

$Fe2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Displacement Reactions:

Involve a metal and a compound of a different metal.

The more reactive metal **displaces** a less reactive metal from its compound. For example:

magnesium + copper sulfate → magnesium sulfate + coppe

If the more reactive metal is already in the metal compound, nothing happens. For example:

magnesium sulfate + copper → no reaction

Carbon and metal extraction

Some metals can be extracted from their metal oxides using carbon **if the metal is less reactive than carbon.**

In general:

metal oxide + carbon → metal + carbon dioxide

This works for **zinc, iron, tin, lead** and **copper** because they all less reactive than carbon.

Extracting copper from copper oxide

Copper is so unreactive, it does not react with cold or hot water, so it is used for water pipes

To extract copper:
- mix **copper oxide** powder with **carbon powder;**
- heat the mixture strongly in a **crucible;**
- keep the lid on the crucible, to stop carbon reacting with oxygen in the air;
- the **carbon dioxide** formed in the reaction escapes into the air;
- let the crucible cool down, you tip the mixture into cold water.
- brown copper sinks to the bottom, leaving unreacted powder suspended in the water.

These equations represent the reaction:

copper oxide + carbon → copper + carbon dioxide

$2CuO + C \rightarrow 2Cu + CO_2$

1. Name three properties of metals.

2. Name the three particles in an atom.

3. Which two particles are found in the nucleus?

4. What do elements in the same group in the periodic table have in common?

5. What is the name for an atom that has lost or gained electrons?

6. What is the common surname for alkalis?

8. What are the two products when a metal reacts with an acid?

9. What do we call any chemical that is capable of neutralising an acid?

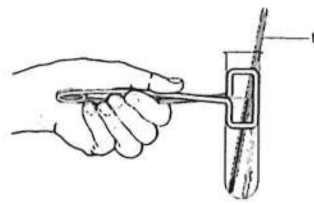
10. Why can carbon be used to extract metals from their ores?

11. What is the term for when a more reactive metal pushes a less reactive one out of a solution?

Using the reactivity series, decide if there will be a reaction and complete the equations:

a) magnesium + copper oxide →
b) Potassium chloride + lithium →
c) Iron oxide + aluminium →
d) Aluminium oxide + zinc →

1. Harry mixed zinc with copper sulphate solution in a test-tube.
A displacement reaction took place and the temperature increased.



a) The word equation for the reaction is shown below.

zinc + copper sulphate → zinc sulphate + copper

Why is this reaction called a displacement reaction?

....

....

b) Harry then repeats his experiment, using magnesium instead of zinc. Explain why the temperature rise in this reaction would be greater than the one obtained with zinc.

....

....

....

Particles

Explaining the properties of solids

Property	Reason
Fixed shape & cannot flow	Particles cannot move from place to place
Cannot be compressed (squashed)	Particles are close together and have no space to move into

Explaining the properties of liquids

Property	Reason
They flow and take the shape of their container	The particles can move around each other
They cannot be compressed (squashed)	The particles are close together and have no space to move into

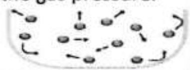
Explaining the properties of gases

Property	Reason
They flow and completely fill their container	The particles can move quickly in all directions
They can be compressed (squashed)	The particles are far apart and have space to move into

State	Solid	Liquid	Gas
Diagram			
Arrangement of particles	Regular arrangement	Randomly arranged	Randomly arranged
Movement of particles	Vibrate about a fixed position	Move around each other	Move quickly in all directions
Closeness of particles	Very close	Close	Far apart

Gas Pressure

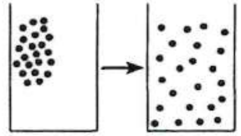
When gas particles hit the walls of their container, they cause pressure. The faster the particles move, the higher the gas pressure.



Diffusion

Diffusion is the movement of a substance from an **area of high concentration** to an **area of low concentration**.

Diffusion happens in **liquids** and **gases** because their particles move randomly from place to place.



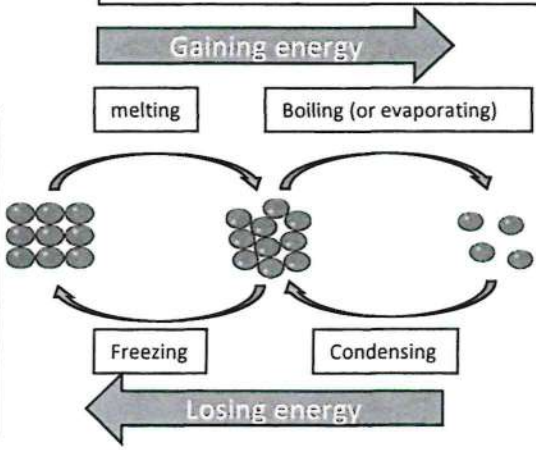
Conservation of mass

The particles stay the same when a substance changes state - only their **closeness, arrangement** or **motion** change. This means that the **mass of the substance stays the same**.

For example, 10 g of water boils to form 10 g of steam, or freezes to form 10 g of ice. This is called **conservation of mass.**

Losing energy

	Condensing	Freezing
Description	Gas to liquid	Liquid to solid
Closeness of particles	Become much closer together	Stay close together
Arrangement of particles	Stay random	Random to regular
Motion of particles	Stop moving quickly in all directions, and can only move around each other	Stop moving around each other, and only vibrate on the spot



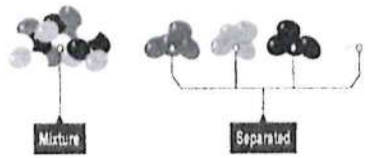
Gaining energy

	Melting	Evaporating or boiling
Description	Solid to liquid	Liquid to gas
Closeness of particles	Stay close together	Become much further apart
Arrangement of particles	Regular to random	Stay random
Motion of particles	Start to move around each other	Start to move quickly in all directions

Particles

A pure substance contains only one type of particle.
For example:
- Pure iron contains only iron particles (called iron atoms);
- Pure water contains only water particles (called water molecules);
- Pure oxygen only contains oxygen particles (called oxygen molecules).

A mixture contains more than one type of particle that are not chemically joined together.
For example:
- Steel contains iron particles and small amounts of carbon particles (called carbon atoms);
- Tap water contains water particles and small amounts of other particles (called ions);
- Air contains 21% oxygen, 78% nitrogen and 1% of other gases (eg argon and carbon dioxide).



We can separate mixtures in different ways depending on their properties:
- Filtration
- Evaporation
- Chromatography
- Distillation

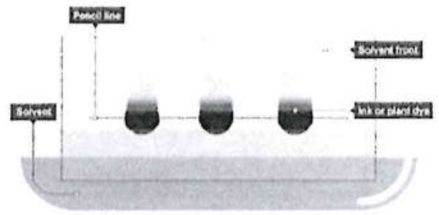
Dissolving is one way to make a mixture. For example, when salt is stirred into water, the salt **dissolves** in the water to make salt **solution**.

In a solution:
- the substance that dissolves is called the **solute;**
- the substance that the solute dissolves in is called the **solvent**.

In salt solution, salt is the solute and water is the solvent.

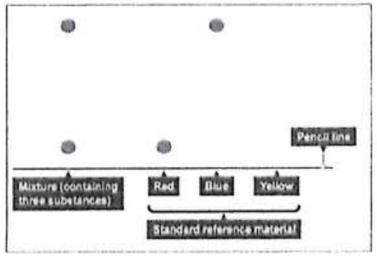
Chromatography is a method for separating dissolved substances from one another.

It works because some of the coloured substances dissolve better than others, so they travel further up the paper.



A pencil line is drawn, and spots of ink or dye are placed on it. There is a container of solvent (eg water or ethanol). Pencil is used because that is insoluble in water or ethanol and so will not run.

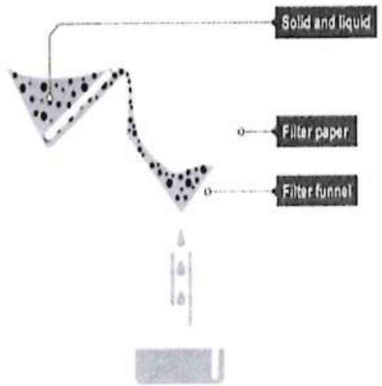
As the solvent continues to travel up the paper, the different coloured substances spread apart.



A **chromatogram**, the results of chromatography experiment.

Filtration is a method for separating an **insoluble** solid from a liquid.

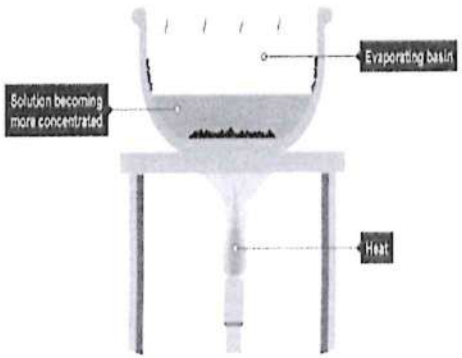
When a mixture of sand and water is filtered:
- the sand stays behind in the filter paper (it becomes the **residue**);
- the water passes through the filter paper (it becomes the **filtrate**).



Evaporation is used to separate a **soluble** solid from a liquid.

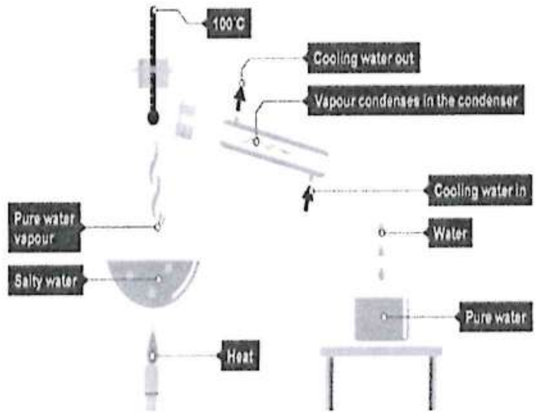
For example, copper sulphate is soluble in water – its crystals dissolve in water to form copper sulphate solution.

During evaporation, the water **evaporates** away leaving solid copper sulphate crystals behind.



Distillation is a method for separating the solvent from a solution.

For example, water can be separated from salt solution because water has a much lower boiling point than salt. When the solution is heated, the water **evaporates**. It is then cooled and **condensed** into a separate container. The salt does not evaporate and so it stays behind.

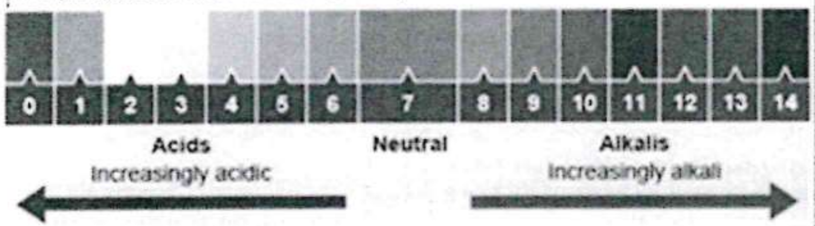


The pH scale

Solutions can be **acidic**, **alkaline** or **neutral**

- **Acidic solutions** form when **acids** dissolve in water;
- **Alkaline solutions** form when **alkalis** dissolve in water;
- Solutions that are neither acidic nor alkaline are **neutral**
- Pure water is neutral.

Universal Indicator can tell us how strong acidic or alkaline a solution is. This is measured using the **pH scale**, which runs from pH 0 to pH 14.



- **The closer to pH 0** you go, the **more strongly acidic** it is,
- **The closer to pH 14** you go, the **more strongly alkaline** it is.

Conservation of mass

Total mass of reactants = **Total mass of products**

We say that **mass is conserved** in a chemical reaction.

Chemical Reactions

Oxidation reactions

An example of an oxidation reaction is where metals react with oxygen to make metal oxides.

metal + oxygen → metal oxide

E.g. magnesium + oxygen → magnesium oxide

Another example is a combustion reaction, where we burn fuels in oxygen:

Fuel + oxygen → carbon dioxide + water

We can represent theses reactions using **WORD EQUATIONS**

The substances that react together are called the reactants

The substances that are formed in the reaction are called the products

The → shows that we are making something new

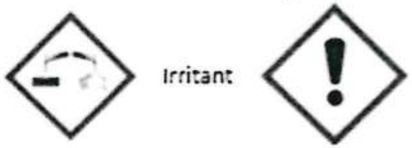
Reacting metals with acids

metal + acid → metal salt + hydrogen

E.g. **zinc + hydrochloric acid → zinc chloride + hydrogen**

To test if **hydrogen is produced**,
hold a **lit splint** to the gas and
listen for it to **burn with a squeaky pop**

Hazard signs to be aware of when dealing with acid and alkalis:

Corrosive  Irritant

Neutralisation

When an acid reacts with an alkali (or **base**), a **neutral** salt solution is formed. This is called **neutralisation**.

acid + alkali → salt + water

eg sodium hydroxide + hydrochloric acid → sodium chloride + water

Naming salts

The name of a salt has two parts:

- The first name comes from the **metal** in the alkali used.
- The second name comes from the acid that was used.

From an alkali containing potassium, eg potassium hydroxide

Potassium nitrate

From the acid "NITRIC ACID"

Acid used	Second name of salt
hydrochloric acid	chloride
sulfuric acid	sulfate
nitric acid	nitrate

Energy

Different energy stores:

- **Chemical;**
- **Kinetic;**
- **Gravitational potential;**
- **Elastic potential;**
- **Magnetic;**
- **Electrostatic;**
- **Internal (or thermal);**

We can measure the amount of energy in a store

Units of energy:
joules (J);
kilojoules (kJ);
kilowatt-hours (kWh).

Note that **electrical, light** and **sound** are not included on this list, they are not energy stores, but are ways of transferring energy from one store to another.

Power is a measure of how fast energy is being transferred.

Units of power:
watts (W);
kilowatts (kW).

Power
Power is calculated by dividing energy transferred by time taken

P = E/t

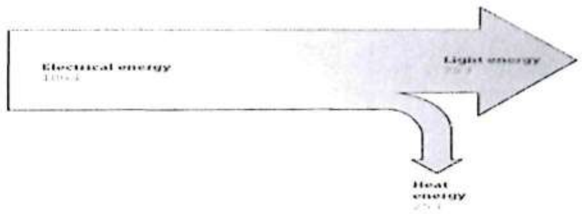
P= :Power (W); E = energy (J); t = time (s).

Heat transfer
Conduction – heat transfer in a solid;
***Particles** gain energy and **vibrate**; they pass vibrations (and therefore energy) to adjacent particles. In **metals**, this happens because **free electrons** gain energy and **move** through the metal, colliding with particles and transferring energy to them.*

Convection – heat transfer in fluids (liquids and gases);
***Particles** in a fluid gain **energy** and **move further apart**. This makes the fluid **less dense**, causing it to **rise**.*

Radiation – heat transfer via **infra-red (thermal) radiation** – can travel through a vacuum.

The energy laws:
1) Energy can not be destroyed or created, only transferred - this is called **conservation of energy;**
2) Energy tends to spread out and become less useful (eg hot objects always eventually cool down).



Transferring energy
The following are ways that energy can be transferred:
- by **mechanical** work (a force causing an object to move);
- by **electrical** work (when charges move due to a potential difference);
- By **heating** (due to a difference in temperature);
- By **radiation** (due to electromagnetic waves, eg light or to mechanical waves, eg sound).

Energy costs money.
To work out how much it costs you need to know:

- the amount of **units** of energy used (in **kWh** not **joules**);
- the **cost per unit** (1 unit is 1 kWh) – you will be told this

total cost (p) = number of kilowatt-hours (kWh) × cost per kilowatt-hour (p)

You can work out how many units something uses if you know its power (in kW) and how long you have used it for (in hours):

number of units of energy used (kWh) = power (kW) x time (s)

÷60
mins – hours
x60

÷1000
Watts – kilowatts
x1000

Renewable and non-renewable resources:

1) Non-renewable energy resources cannot be replaced once they are all used up;

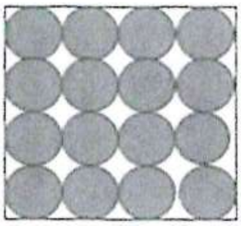
- ***Fossil fuels (coal, oil, gas)***
  - releases carbon dioxide (a greenhouse gas and increases global warming). - releases sulphur dioxide and nitrogen oxides, which cause acid rain
- ***Nuclear***
  + nuclear fuels do not produce carbon dioxide or sulphur dioxide;
  - non-renewable energy resources. They will run out one day;
  - risk of radioactive material being released into the environment

2) Renewable energy resources can be replaced, and will not run out;

- ***Wind***
  + no release of carbon dioxide or sulphur dioxide
  - if there is no wind, there is no electricity.
- ***Water (wave, tidal or hydroelectric)***
  + noif there is no wind, there is no electricity.
  release of carbon dioxide or sulphur dioxide
  - difficult for wave machines to produce large amounts of electricity.
  - tidal barrages destroy the habitats;
  - hydroelectric floods farmland and push people from their homes.
- ***Geothermal***
  + no release of carbon dioxide or sulphur dioxide
  - most parts of the world do not have suitable areas for geothermal
- ***Solar***
  + no release of carbon dioxide or sulphur dioxide
  - if there is no sunlight, there is no electricity.

solids, liquids and gases

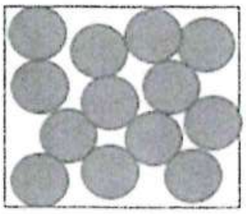
1. Describe the arrangement, movement and attraction between particles in solids, liquids and gases below:



Arrangement

Movement

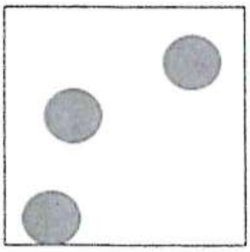
Attraction between particles



Arrangement

Movement

Attraction between particles



Arrangement

Movement

Attraction between particles

2. Explain why solids keep their shape, but liquids and gases take the shape of their container.

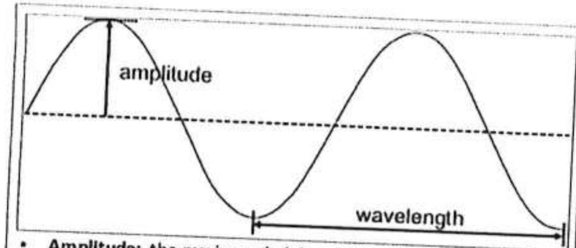
3. Explain why gases can be compressed, but liquids and solids cannot.

United Learning

Extension

Explain why 1 kilogram of a solid and gas have the same mass but occupy different volumes.

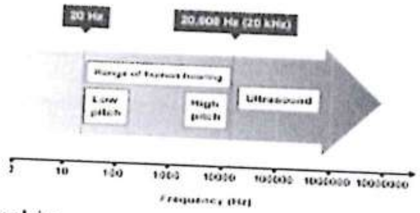
9PS Sound



- **Amplitude:** the maximum height of the wave from its resting position:
    - the greater the amplitude, the louder the sound
- **Wavelength:** the distance between two **crests** (tops) next to each other (or any other two identical point on waves next to each other)
- **Frequency:** the number of **waves per second** (**Hertz - Hz**): the higher the frequency, the closer together the waves are, the higher the pitch

Ultrasound

Human beings can generally hear sounds as low as 20 Hz and as high as 20,000 Hz (20 kHz).



Ultrasound is:

- any sound with a frequency of **more than 20,000 Hz.**
- Too high pitched for humans to hear
- Other animals (eg dogs, cats and bats) can hear it.
- Ultrasound can be used to check on the health of unborn babies, clean jewellery and in physiotherapy.

Types of waves

All waves transfer energy from place to place.

There are two types of wave: **longitudinal** and **transverse**:

Longitudinal waves

Sound waves are **longitudinal waves.**

The vibrations are **parallel to the direction of travel.**

Transverse waves

Light waves (and water waves) are **transverse waves.**

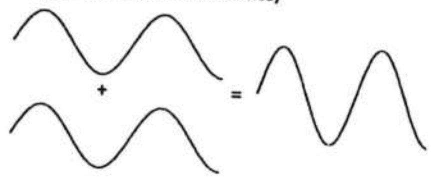
The vibrations are **perpendicular to the direction of travel.**

Water waves

- Water waves move with a transverse motion
- The **undulations** (up and down movement) are at 90 ° to the direction of travel.
- Water waves, like all waves, can be **reflected**, **refracted** and **diffracted**.

Superposition is w here two waves meet and they affect each other: **adding** or **cancelling** .

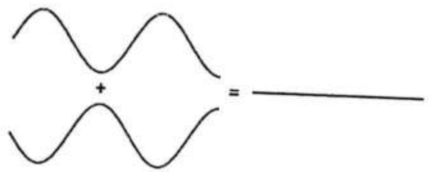
Adding (constructive Interference)



If two waves meet each other **in step**, they add together and reinforce each other. They produce a much higher wave, a wave with a greater **amplitude** .

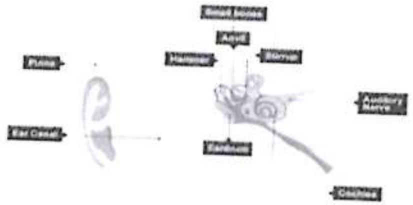
Cancelling (destructive Interference)

If two waves meet each other **out of step**, they cancel out.



Ears

- An ear has an **eardrum** , connected to **three small bones**
- Vibrations in air make the eardrum vibrate
- which in turn vibrates the three small bones (called **ossicles**) to a spiral structure called the **cochlea**
- Signals are passed from the cochlea to the brain
- through the **auditory** nerve.



Reflection

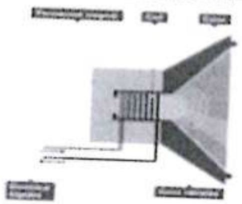
- Sound waves can reflect off surfaces
- These reflections as heard as **echoes**
- **Hard, smooth surfaces** are good at reflecting sound (more echoes)
- **Soft, rough surfaces** are good at absorbing sound (less echoes)

Microphones

- Microphones contain a **diaphragm** , which does a similar job to an eardrum
- The vibrations in air make the diaphragm vibrate. These vibrations are changed to electrical impulses.

Loudspeakers

- Loudspeakers work by converting electrical current into vibrations
- This moves the cone which creates the sound waves.



The speed of sound is **330 m/s**

Properties of sound waves

- When something vibrates, it produces sound
- These sound waves are carried by vibrating particles
- Sound can only travel through solids, liquids or gases
- They cannot travel through empty space (a **vacuum**).

1. Complete the definitions:

Type of wave	Caused by	Examples
Longitudinal		
Transverse		

2. Give one way that all waves are the same

....

3. Give two differences between sound waves and light waves

....

....

....

....

4. Give two ways that light waves are similar to sound waves

....

....

....

5. give the definition of frequency

....

....

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