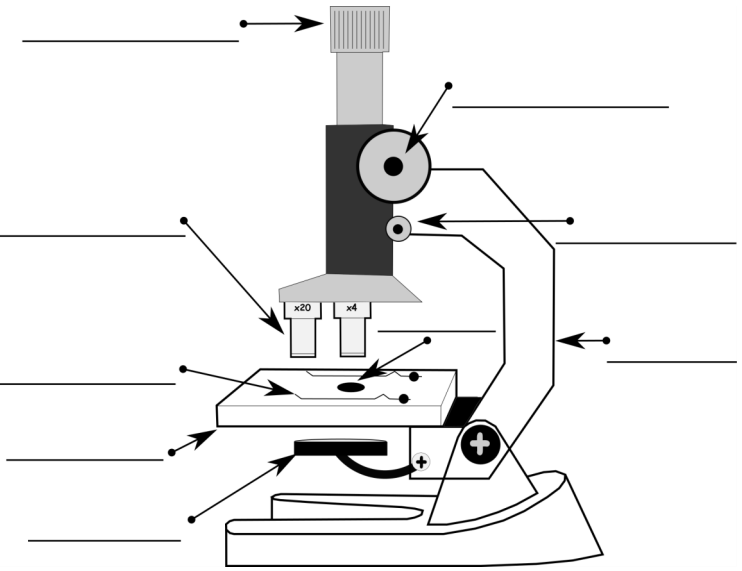
Questions on The Light Microscope

Comprehension

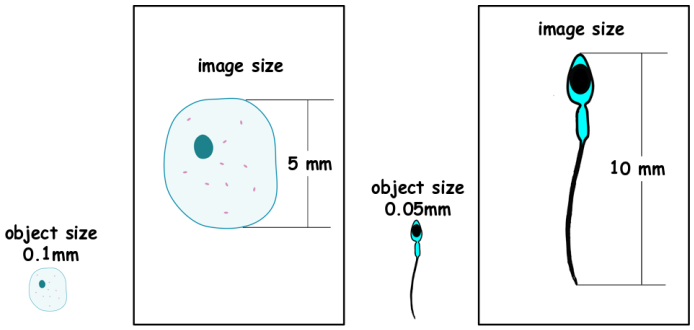
1. What used to be the limit of what humans can see?
2. About how small an object can you see with the naked eye?
3. What are living organisms made from?
4. What is the average size of a cell?
5. What could we say is the simplest microscope?
6. What does a compound microscope use to make objects look even bigger?
7. What is the lens that you look through called?
8. How do you calculate magnification?
9. What magnification do eyepiece lenses often have?
10. How do we get the **total magnification** of a microscope?
11. What do we use to hold the slide in place?
12. When using a microscope, which power lens should you use first?
13. To begin with, where should the objective lens be positioned?
14. Which way should you move the objective lens when beginning to focus?
15. What should you adjust to obtain the clearest image possible?

Additional tasks

1. Label and memorise the parts of the microscope opposite.



2. Calculate the magnification of the cell images below.



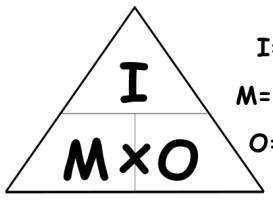
magnification _____ magnification _____

3. Calculate the **total magnification** when using a compound microscope with the following eyepiece and objective lenses.

a.	Eyepiece lens X10, objective lens X10	_____
b.	Eyepiece lens X10, objective lens X20	_____
c.	Eyepiece lens X10, objective lens X40	_____
d.	Eyepiece lens X5, objective lens X100	_____
e.	Eyepiece lens X5, objective lens X50	_____

4. Calculate the 'real' object size (O) using the magnification and image size in the table below;

Magnification	Image size on paper (mm)	Object size (mm)
40	40	1.
100	20	2.
250	5	3.
50	1	4.



I=image size
M=magnification
O=object size

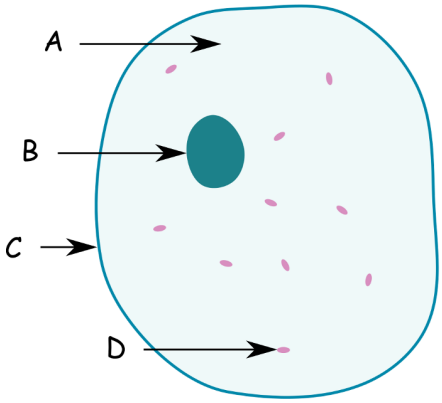
Questions on Cells

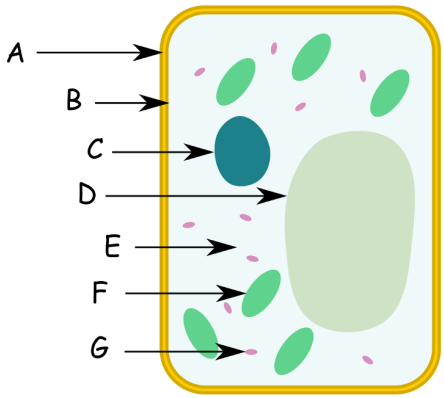
Comprehension

1. What are living things made from?
2. What are cells?
3. What are the specialised structures that make up the cell called?
4. What do plant and animal cells both have in common?
5. What does the cell membrane control?
6. Chemical reactions happen in the ……..?
7. Where is the DNA stored and what does it do?
8. What stops plant cells being floppy (flaccid)?
9. Where is cell sap contained?
10. What is in the chloroplasts and what is it used for?
11. How are sperm cells specially adapted?
12. What do root hair cells have for absorbing water and nutrients?
13. How is tissue formed?
14. When different types of tissues work together what is formed?
15. What is an organ system?
16. What happens if different organ systems combine?

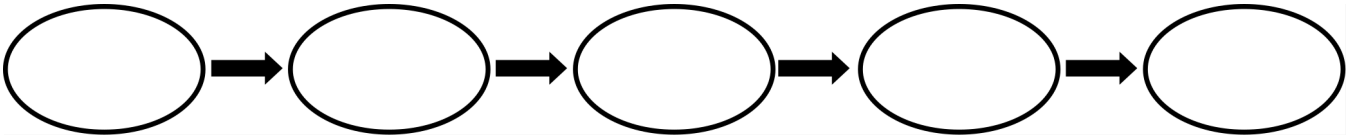
Additional tasks

1. Label and memorise the parts of a plant and animal cell below.





2. Complete the flow diagram showing how **cells** can group together, finally forming an **organism**.



3. Match the organ (s) below to their organ systems.

1. Ear canal, ear drum, ossicles	**Digestive system**
2. Mouth, gullet, small intestines	**Female reproductive system**
3. Pupil, lens, retina	**Nervous system**
4. Lungs and wind pipe	**Respiratory system (breathing)**
5. Blood vessels	**Male reproductive system**
6. Penis and testes	**Visual system**
7. Spinal cord	**Hearing (auditory) system**
8. Ovaries, oviduct, womb	**Circulatory system**

4. Rearrange the jumbled up letters to reveal the names of the cell organelles and write next to the organelle, **plant only** or **animal and plant**.

LECL BRNEAMEM _____ **LSUECNU** _____

PSTLSAOLROHC _____ **ALCOVUE** _____

CPOTSMALY _____ **ELCL LLWA** _____

CHOTIMRIODNON _____

Questions on Diffusion

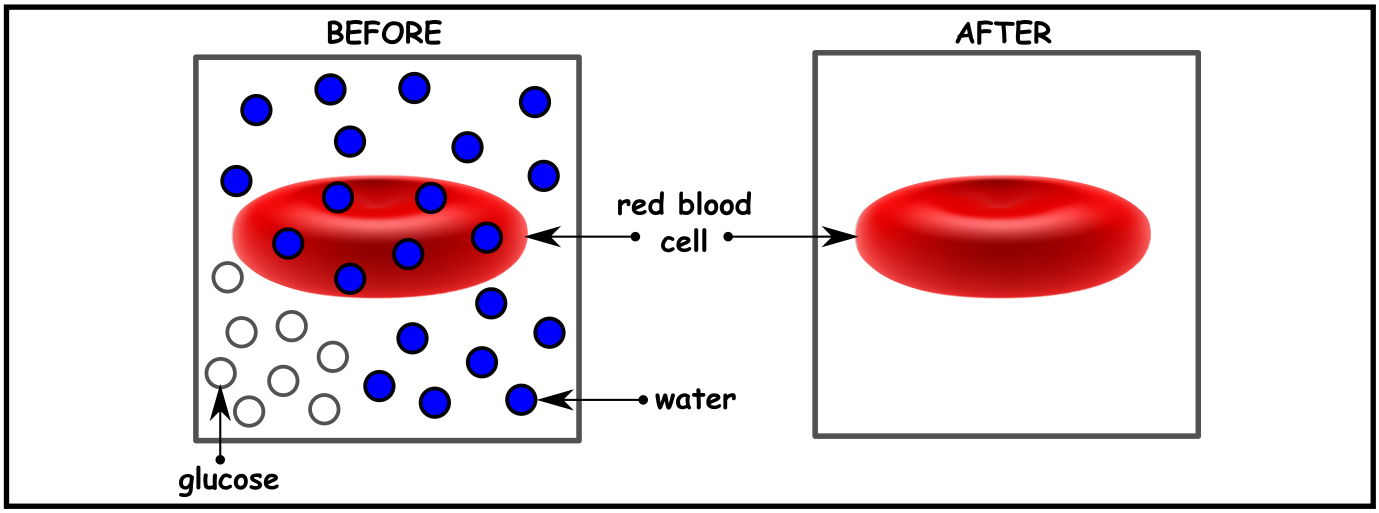
Comprehension

1. What do we call the process of 'smells spreading out'?
2. How can we think of diffusion?
3. From where to where do the particles diffuse?
4. When would the particles of orange squash stop diffusing?
5. In what sort of substances does diffusion happen?
6. In what sort of motion do the particles move?
7. What is digestion?
8. What happens to the high concentration of food particles in our small intestines?
9. What does the large surface area of root hair cells allow?
10. 'Normally' how does the concentration of water and nutrients in soil compare to the root hair cell?
11. Where does the oxygen in the air we breathe end up?
12. Why does carbon dioxide build up in our blood?
13. What is respiration?
14. What happens to the carbon dioxide that has built up in the blood?

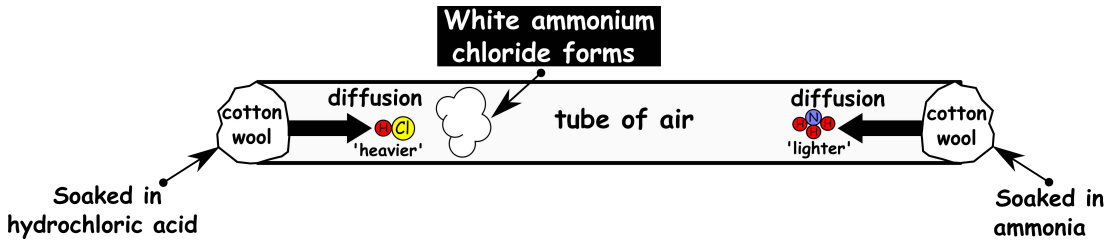
Additional tasks

Glucose with a higher concentration in the blood can diffuse into a red blood cell with a lower concentration.

1. Complete the diagram below to show what things look like after diffusion (it looks just like the squash and chips opposite). Any colour is fine.
2. Where have some of the glucose molecules ended up?!



3. Hydrochloric acid particles and ammonia particles diffuse through the tube of air. When they meet they react to form ammonium chloride, a **white solid**. This happens nearer to where the hydrochloric acid particles came from. They diffuse slower because they are heavier and move more slowly than ammonia particles. Complete the gapped exercise below to explain what is happening. Choose from the words in bold.



quickly, particles, diffuse, ammonium chloride, meet, heavier, faster, white solid, more slowly, Heavier, slowly

Hydrochloric acid (HCl) and ammonia (NH_3) _____ both _____ through the tube. When they _____ they form _____, this _____ _____ forms nearer to where the hydrochloric acid particles came from. Hydrochloric acid particles are _____ and move _____ _____ then ammonia particles. _____ and slower particles diffuse more _____. Lighter _____ moving particles diffuse more _____.

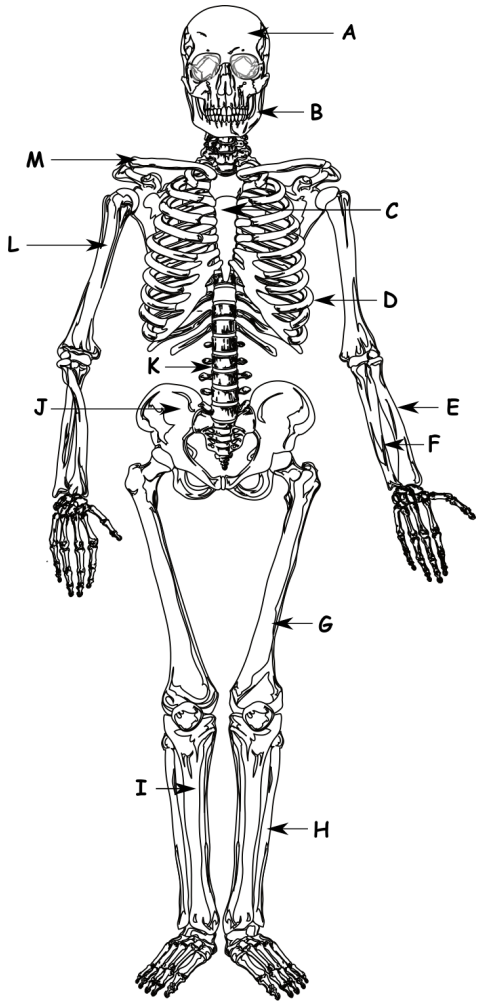
Questions on the Skeleton and Muscles

Comprehension

1. How many bones does a human skeleton have?
2. Why are bones made mostly from calcium?
3. What is an endoskeleton?
4. What sort of skeleton do insects have?
5. What is chitin?
6. What are the four main jobs of the human skeleton?
7. What is the purpose of the skull?
8. What do bone joints do?
9. What sort of joint does your shoulder have?
10. Why are ball and socket joints really useful?
11. What is made inside of bones?
12. What do red blood cells carry?
13. What holds the muscles to the bones?
14. What do ligaments do?
15. What happens to your triceps when your biceps contract?
16. What do we call muscles that work in pairs contracting and relaxing?

Additional tasks

1. Name and memorise the bones below.



A. _____ B. _____
C. _____ D. _____
E. _____ F. _____
G. _____ H. _____
I. _____ J. _____
K. _____ L. _____
M. _____

2. Below are examples of where we find **pivot joints** (for rotation), **hinge joints** (for bending and straightening) or **ball and socket joints** for movement in most directions. For each one write down which type of joint you think they are.

   a. the hip joint
   b. the knee joint
   c. the finger joints
   d. the ankle joint
   e. the joint connecting the head to the neck

3. Write down next to the animal's name below, whether you think they have an exoskeleton or endoskeleton.

WASPS	**FISH**
BEARS	**HORSES**
CRABS	**CENTIPEDES**
BIRDS	**BEETLES**
LIZARDS	**GRASSHOPPERS**

4. 100 children test their bicep strength by **pushing up** on a **force meter** fixed under a desk. The results are shown below. Plot a histogram of the results (see pg50).

Force (N)	101-110	111-120	121-130	131-140	141-150
Number of pupils	10	15	50	15	10

5. Explain what you think the job of the rib cage and the spine is.

   Can you explain the job of any other bones?

Questions on the Healthy Human Diet

Comprehension

1. What is a healthy diet all about?
2. Complete the sentence; There isn't a..... food that contains everything we need.
3. What do carbohydrates do?
4. What is the main role of lipids?
5. What helps you grow and repair tissue?
6. Give two examples of minerals needed by the body?
7. In what quantities are vitamins needed?
8. What is fibre and what does it do?
9. Where do starchy foods mainly come from?
10. What are pulses and what food group are they a good source of?
11. What kind of vegetables are a good source of iron?
12. What causes scurvy?
13. What are the symptoms of scurvy?
14. What is night blindness?
15. What does lack of calcium and vitamin D cause?

Additional tasks

1. Match the food groups below to their use and memorise.

Carbohydrates	are used to help you grow and repair tissue
Fats or lipids	are essential organic (contain carbon) compounds needed for good health
Proteins	is needed to hydrate (provide water for) our cells and aids with digestion
Minerals	their main role is as an energy store
Vitamins	is undigested food, it provides your waste with bulk
Fibre	essential inorganic (don't contain carbon) compounds needed for good health
Water	provide energy

2. a. Use the eat well plate to write down in order, the types of foods we should eat most of to the types of food we should eat least of.

   b. Write down which food groups you would get too much of and which too little of if you ate the following:

   i. Only fruit and vegetables

   ii. Only dairy foods

   iii. Only meat, fish, eggs and beans

3. Match the vitamins and minerals below to what they help keep healthy.

VITAMIN C	healthy bones
IRON	healthy vision
VITAMIN D	healthy blood
CALCIUM	healthy bones
VITAMIN A	healthy skin

4. Design a healthy diet for the five days of the working week to include breakfast, lunch, dinner and a snack. Choose from the foods below or use your own.

Breakfast;

Two pieces of toast, bowl of cereal, two crumpets, bowl of porridge, bacon sandwich, sausage sandwich, egg sandwich, full English, crisps, chocolate bar, can of pop.

Lunch;

Cheese sandwich, fish and chips, toasted sandwich, ham sandwich, tuna sandwich, burritos, beans on toast, sausage roll, chips, sausages, spaghetti bolognese, lasagne, chilli con carne, curry and rice, pizza, pasta, baked potato with topping, apple, banana, orange, grapes, pear, packet of crisps, chocolate bar, can of pop, apple pie and custard, slice of cake, snack bar, biscuits.

Dinner;

Fish and chips, curry and rice, chilli con carne, beans on toast, mashed potatoes, meat and vegetables, chips, pizza, baked potato with topping, salad, noodles, pasta, spaghetti bolognese, cheese on toast, burritos, lasagne, burger and chips, ribs, fish pie, spaghetti on toast, cheese and potato pie, chicken and chips.

Questions on Food Fuel

Comprehension

1. What is a fuel?
2. Through what process do humans slowly burn their food?
3. What happens if humans consume more energy than they use in daily activities?
4. What is energy measured in?
5. What does Kilo mean?
6. How many joules are in 5kJ?
7. What does the value of 8400kJ tell us?
8. In which years does a child need more energy and why?
9. What does the nutritional information on food labels usually tell us?
10. How is this information often given?
11. What does %RI tell us?
12. If an adult just ate biscuits, which food group would they be eating too much of?
13. What wouldn't they get enough of?
14. What do we mean by a balanced diet?

Additional tasks

1. Use a calculator to complete the %RI columns for **100g** of the **Multigrain cereal** and the **Cheese and onion sandwich** below. The reference intakes are;

energy 8400kJ, protein 50g, fat 70g, carbohydrate 260g, fibre 30g, Sodium (salt) 6g.

Example (boiled potatoes opposite page);

*%RI **energy** = 340 ÷ **8400** = 0.04 (x by 100 to get 4%)*

*%RI **protein** = 1.9 ÷ **50** = 0.038 (x by 100 to get 3.8%)*

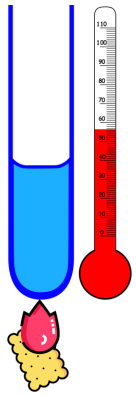
*%RI **carbohydrates** = 20 ÷ **260** = 0.077 (x by 100 to get 7.7%)*

Nutritional information;	*Multigrain cereal*	% RI
	Per 100g	Per 100g
Energy	1500 kJ	
Protein	**9.3 g**	
Fat	**2.9 g**	
of which are saturated fats	*0.6g*	
Carbohydrates	**69 g**	
of which are sugars	*17g*	
Dietary fibre	**12 g**	
Sodium (salt)	**0.5 g**	

Nutritional information;	*Cheese and onion sandwich brown bread*	% RI
	Per 100g	Per 100g
Energy	1200 kJ	
Protein	**10 g**	
Fat	**16.5 g**	
of which are saturated fats	*0.6g*	
Carbohydrates	**42g**	
of which are sugars	*2 g*	
Dietary fibre	**6 g**	
Sodium (salt)	**1.7 g**	

2. One of the ways to measure the amount of energy in foods is to burn the food and use the flame to heat up water. To calculate the energy value (in joules) of the food you've burned, just multiply the **mass of the water (in grams)** by the **temperature change of the water (in °C)** and then **multiply by 4.2**.

a. Explain how you could measure the mass of water in the test tube (what mass will you measure first?).



b. Explain how you could measure the temperature change of the water.

c. **Dividing** the **energy value found from burning the food**, by the **mass of food burned** tells us the *energy value per gram* of that food, the **energy density**. Calculate the energy densities of some common foods in the table below.

	Potatoes	*Biscuits*	*Crisps*	*Peanuts*	*Cereal*	*Banana*
Energy found by burning food (J)	**17,000**	**40,000**	**70,000**	**100,000**	**15,000**	**14,000**
Mass of food burned (g)	5	2	3	4	1	4
Energy density (J/g)						

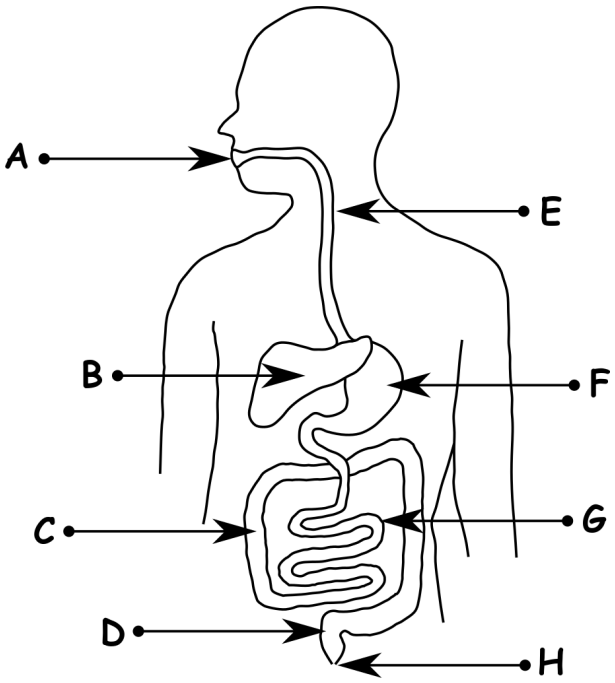
Questions on the Human Digestive System

Comprehension

1. Why can we 'think' of digestion as starting on the plate?
2. What is the purpose of digestion?
3. Where does digestion really start?
4. Where does digestion end?
5. What does excretion mean?
6. What is saliva an example of?
7. Where does food go after entering the mouth and before reaching the stomach?
8. What helps it on its way and what is it similar to?
9. What does churned in the stomach mean?
10. Why are the acidic conditions useful?
11. What does bile do and where does it come from?
12. What happens to the broken down food in the small intestines?
13. How could the food be described in the large intestine?
14. What is the only thing left to absorb in the large intestine?
15. What is another word for waste faeces?
16. Why is it more solid at this stage?
17. What is the name for the part of the digestive system where faeces is stored?
18. Where are faeces finally excreted?

Additional tasks

1. Label and memorise the names of the organs in the human digestive system shown below.



A. _____
B. _____
C. _____
D. _____
E. _____
F. _____
G. _____
H. _____

2. Write **1** to **11** next to the mixed up order of events for digestion to put them in their correct order. 1 first, 11 last

___ *water is absorbed from the faeces*
___ *food moves down the gullet*
___ *food is chewed*
___ *food enters the stomach*
___ *saliva is added*
___ *food is churned*
___ *faeces is stored in the rectum*
___ *food moves to small intestine*
___ *faeces excreted from anus*
___ *bile is added*
___ *undigestible food moves to large intestine*

3. Write about why 'bacteria are important too', include the words; **micro-organism, faeces, vitamins, nutrients, gut bacteria, probiotics.**

Bacteria are important too

Questions on Enzymes

Comprehension

1. What do enzymes do?
2. What do catalysts do to chemical reactions?
3. Why are enzymes called biological catalysts?
4. What produces the enzymes?
5. How many main types of enzyme are there in the human digestive system?
6. Which enzyme breaks down proteins?
7. What does lipase do?
8. What do enzymes act like in breaking down undigestible food molecules?
9. What is starch?
10. Which well known enzyme breaks down starch into simple sugars?
11. What does adding protease to washing powder help with?
12. Protease in baby foods breaks down protein, how is this helpful?
13. Why is invertase injected into chocolates?
14. What can enzymes in yeast do?
15. Which enzyme is used in cheese making?

Additional tasks

1. Match the words below to their meanings and memorise.

Catalysts	enzymes that break down carbohydrates
Enzymes	enzyme for breaking down sugar (sucrose)
Carbohydrase	substances that speed up chemical reactions without being used up
Protease	enzymes that break down fats (lipids)
Lipase	enzymes that break down proteins
Invertase	biological catalysts

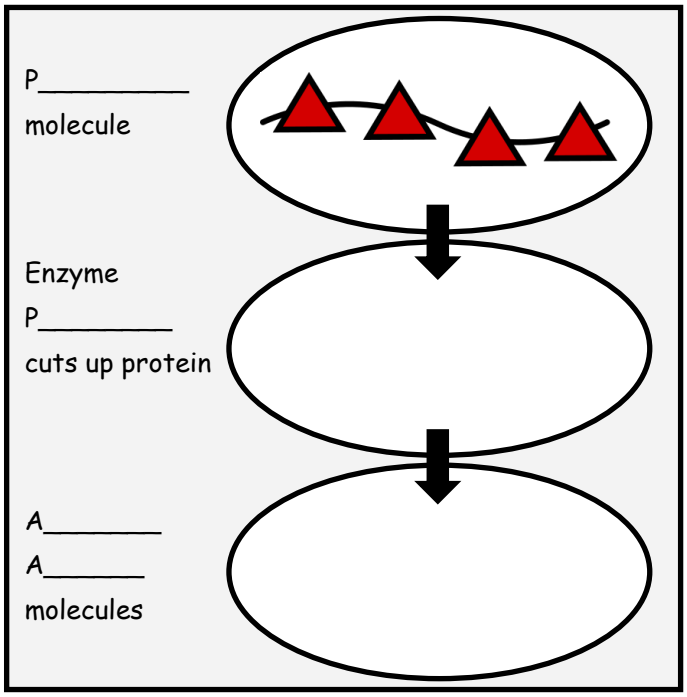
2. Complete the gap filling exercise below on enzymes. Choose from the words in bold.

carbohydrase, soluble, chemical, used, digest, insoluble, protease, sugars, catalysts, fats, amino, lipase, oils, proteins

Enzymes are biological _____. This means they speed up _____ reactions without being ____ up. Enzymes help us _____ our food. They breakdown larger _____ molecules into smaller _____ ones. _____ enzymes break down _____ into _____ acids, _____ enzymes break down carbohydrates into _____ and _____ enzymes break down ____ and ____.

3. Write a few sentences about how our lives are made better because of enzymes (NB: the petrol that we put in our cars is 5% alcohol).

4. **Proteins** are **big molecules** made from **smaller molecules** linked together called **amino acids** (shown as triangles below). Complete the diagram below (exactly the same as the one of starch being broken down into sugar opposite), showing proteins being broken down into **amino acids** by the enzyme **protease**. Don't forget the scissors showing the protein molecule being cut into amino acids.



Questions on Plants and Energy Flow; Food Chains and Webs

Comprehension

1. What would happen to animal life with no plants?
2. Why are plants called producers?
3. What do herbivores eat?
4. What do animals called omnivores eat?
5. What is the name of an animal that eats only other animals?
6. What do plants use light for?
7. What happens to the energy in a food chain?
8. What do primary consumers eat?
9. What do food webs show?
10. What do we call the plants and animals found in a certain location?
11. What would happen if a hawk entered the ecosystem?
12. What might the foxes and wolves do if this happened?
13. What do we mean by conflict?
14. What might one of the animals do to avoid this conflict?
15. What are predators at the top of the food chain called? (WHAT? box)
16. How is energy 'lost' as it moves between levels in a food chain? (WHAT? box)

Additional tasks

1. Match and memorise the words below.

Producer	animals that eat meat (other animals) only
Consumers	animals that eat plants only
Glucose	amount of living material
Biomass	a sugar
Herbivores	animals that eat plants and meat (other animals)
Carnivores	the animals
Omnivores	the plants

2. Draw food chains for the following *jumbled up* producers and consumers.

a. ***rabbit, grass, snake***

b. ***mouse, seeds, hawk***

c. aphids, leaf, ladybirds

d. hawk, caterpillar, robin, cabbage

e. tuna, zooplankton (tiny ocean animals), herring, shark

f. humans, cow, grass

g. greenfly, spider, leaf, ladybird

h. grass, hawk, snake, vole

3. Write the food chains **a** and **b** above side by side and show how they can connect to form a **food web** like the one opposite (pg20).

4. Write down **four** food chains from the food web opposite (pg20).

5. Out of the two food chains shown below, which is best for the planet and wastes least energy? Explain why. (The WHAT? box opposite helps)

Wheat → Humans

Wheat → Cows → Humans

6. Complete the food chain word search below.

TROPHICLEVEL, ECOSYSTEM, HERBIVORE, OMNIVORE, CONSUMER, BIOMASS, ENERGYFLOW, PHOTOSYNTHESIS, CARNIVORE, PRODUCER

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

Questions on The Respiratory System; Breathing

Comprehension

1. What does respire mean?
2. Why do we respire?
3. What does respiration do?
4. What is the waste gas from respiration?
5. How much oxygen is in the air we breathe in and how much in what we breathe out?
6. What does this tell us?
7. What is the diaphragm?
8. What does contract mean?
9. What happens to the space inside the lungs when we breath in?
10. What does this do to the air pressure inside the lungs?
11. What does this mean will happen?
12. In breathing out what does the increase in pressure in the lungs do?
13. What do we mean by gas exchange?
14. What are the tiny air sacs in the lungs called?
15. How many are there?
16. What are the alveoli touching?
17. Through what process is oxygen absorbed into the capillaries?
18. Why does carbon dioxide move the other way?

Additional tasks

1. Put the descriptions below in the correct order to describe **breathing in** and **breathing out**.

Breathing in

Diaphragm contracts, lung space increases, air pushed into lungs, air pressure inside lungs decreases, intercostal muscles contract

_____ → _____ → _____

→ _____ → _____

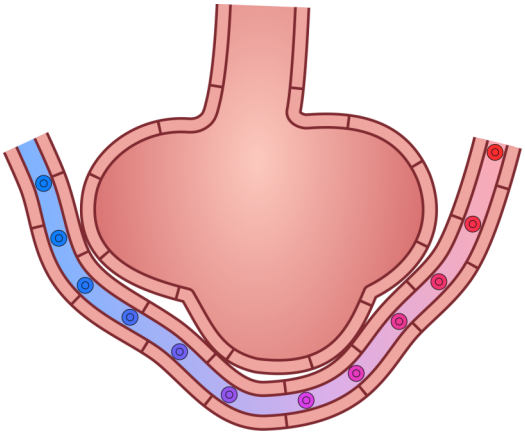
Breathing out

intercostal muscles relax, air pushed out of lungs, Diaphragm relaxes, air pressure inside lungs increases, lung space decreases

_____ → _____ → _____

→_____ →_____

2. Label your own version of the alveoli (air sac) below using the diagram opposite.



3. Below is a model of the lungs, when the rubber balloon (diaphragm) is pulled down the lungs inflate. When it is released they deflate. Explain why.

Questions on Aerobic and Anaerobic Respiration

Comprehension

1. What does aerobic mean?
2. Through what process do cells release energy?
3. What is respiration without oxygen called?
4. In what form does most of our energy come from?
5. Give three examples of life processes.
6. What are the products of aerobic respiration?
7. What does expelled mean?
8. Why is respiration sometimes called slow burning?
9. When might our bodies require anaerobic respiration?
10. What is the downside to anaerobic respiration?
11. What does this lead to?
12. What did Louis Pasteur discover?
13. What is yeast?
14. Why is aerobic respiration used in bread making?
15. What is another word for ethanol?
16. What are the products of fermentation?

Additional tasks

1. Match the words below to their meanings and memorise.

Aerobic	the release of energy in a cell
Anaerobic	single celled organism used in brewing and baking
Respiration	involving oxygen
Lactic acid	anaerobic respiration by yeast producing alcohol and carbon dioxide
Yeast	not involving oxygen
Fermentation	an acid produced during anaerobic respiration that causes muscle 'burn'

2. 130 Year 8 students see how many push ups they can do before lactic acid causes enough pain that they have to stop. Plot a bar chart of the results with number of students on the y-axis (vertical) and number of push ups on the x-axis (horizontal). See pg50 for example bar chart.

Number of students	1	2	4	8	15	24	28	22	12	7	4	2	1
Number of push ups	4	5	6	7	8	9	10	11	12	13	14	15	16

3. a. The following are the chemical formulae for carbon dioxide, oxygen, water, glucose, ethanol and lactic acid (they are not in order!). **O_2, $C_6H_{12}O_6$, CO_2, H_2O, $C_3H_6O_3$, C_2H_5OH (ethanol).** All apart from lactic acid can be found in the book (use the index). Select the correct formula and write it in the correct place to make a formula equation for the following:

Aerobic Respiration

_____ + _____ ⟶ _____ + _____ + ***Energy***

Anaerobic Respiration

_____ ⟶ _____ + ***Energy***

Proofing (baking)

_____ + _____ $\xrightarrow{\text{yeast}}$ _____ + _____ + ***Energy***

Fermentation

_____ $\xrightarrow{\text{yeast}}$ _____ + _____ ***(alcohol)***

b. The equations are **not** balanced. Use the anaerobic respiration equation to explain what we mean by this.

Questions on Exercise, Asthma and Smoking

Comprehension

1. What do we mean by exercise?
2. Why do humans exercise?
3. What diseases is exercise known to reduce the risk of?
4. What does exercise do for our energy levels?
5. How much exercise is recommended for 5 to 18 year olds?
6. How is more blood pumped to the muscles during exercise?
7. What is the long term effect of exercise on your muscles?
8. What do your tendons do?
9. What holds your bones together?
10. Why is an increase in bone density good?
11. What does the condition asthma affect?
12. What does chronic mean?
13. What are the symptoms of asthma?
14. What can happen to a person's airways who has asthma?
15. What should someone who is having an asthma attack do?
16. Why is smoking addictive?
17. What is tar exposure linked to?
18. What are cilia and what do they do?
19. What is the negative (bad) effect of carbon monoxide?

Additional tasks

1. Match the words to their meanings below and memorise.

Exercise	the addictive drug from smoking
Stress	a disease of the airways leading to breathlessness and wheezing
Nicotine	an activity that requires physical effort
Asthma	a state caused by demanding activities
Tar	a toxic gas from smoking that reduces the ability of the blood to carry oxygen
Carbon *monoxide*	a sticky brown substance from smoking and the main cause of throat and lung cancer

2. Design a five day exercise regime for a 12 year old who should do about **one hour** of exercise per day.

Monday	Tuesday	Wednesday	Thursday	Friday

3. One of the ways to measure fitness is your **recovery heart rate**. This is the amount of time that it takes your heart rate (**beats per minute**) to return to its resting value after exercise. The table below gives data for the recovery rate of **six 40 year olds** asked to **run** at the **same speed** for **10 minutes**.

Adult	*1*	*2*	*3*	*4*	*5*	*6*
Recovery time (mins)	1.5	8	2	10	7.5	9

   a. Which adults do you think are 'fit'?
   b. Why do you think they were asked to run at the same speed for the same time?
   c. What would you advise the 'unfit' 40 year olds to do?
   d. What 'things' doesn't the data tell you that may affect the results?

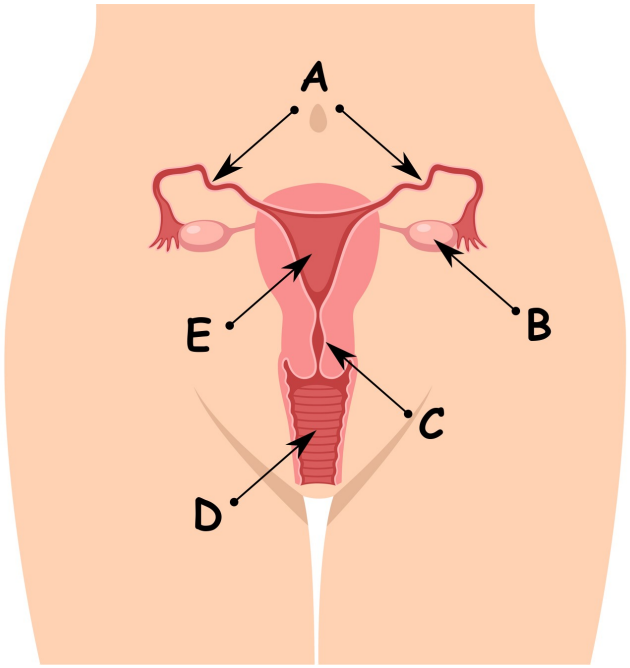
Questions on Reproduction in Humans; Women

Comprehension

1. What are gametes?
2. Where are a woman's gametes made?
3. What is made in the testes?
4. What is the name of the type of reproduction where sperm and egg meet?
5. What are hormones?
6. On what day is the egg released?
7. What does the menstrual cycle describe?
8. What happens when a woman's uterus lining breaks down?
9. What do we call this?
10. How long does a woman's period last?
11. What is the release of a mature egg called?
12. Where does the egg go after release from the ovaries?
13. How long does the egg stay alive?
14. What happens if the egg is not fertilised by a sperm?
15. What are the main hormones involved in a woman's menstrual cycle?
16. What does fertilisation mean?
17. How does the fertilised egg grow?
18. What does the placenta do?
19. What do we call the embryo after it starts to develop human features?

Additional tasks

1. Label and memorise the parts of a woman's reproductive system below.



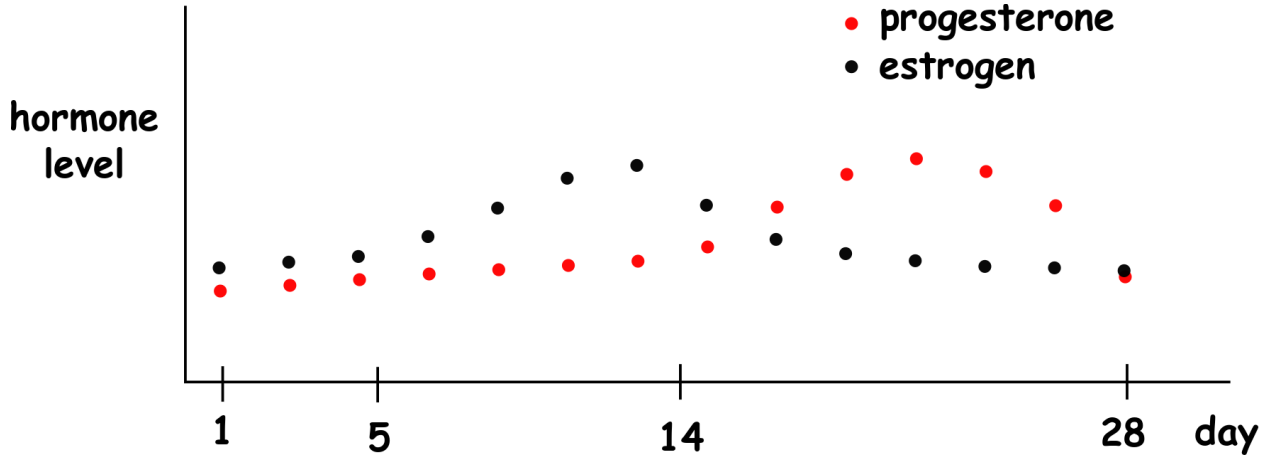
2. Solve the jumbled up letters to reveal words relating to the female reproductive system.

ESTRMUALN	_____
IOAREVS	_____
RUTESU	_____
FALTULOPANIBE	_____
SGVAAIN	_____
TESOERNG	_____
EPORGTRONEES	_____
GAETESM	_____
ONUAVTILO	_____
OMWB	_____
ZOTEYG	_____

3. 'Join the dots' to show how the levels of progesterone and estrogen change during the menstrual cycle.

a. What do you think the rise in estrogen causes?

b. What do you think the drop in progesterone? causes?



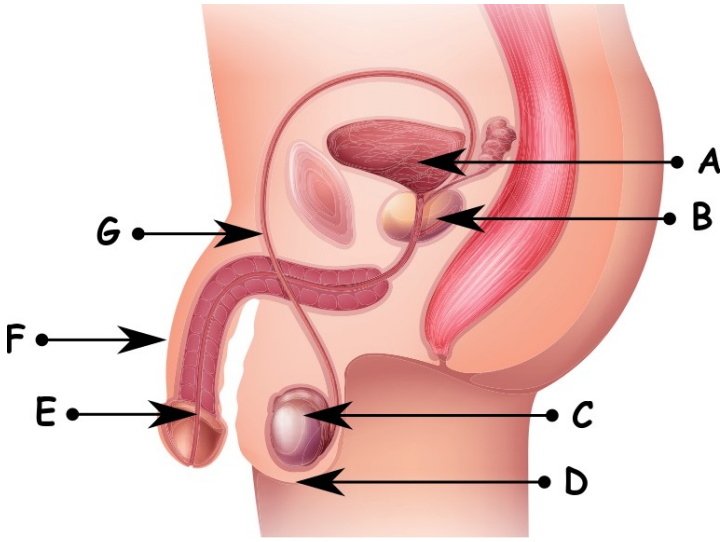
Questions on Reproduction in Humans; Men

Comprehension

1. Which hormone controls the reproductive system in men?
2. Where is testosterone made?
3. What is the main job of the testes?
4. Where are a man's testes kept?
5. Why is it important that this is outside of the body?
6. To have a baby what must happen?
7. What happens to a woman's vagina before wanting sex?
8. What happens to a man's penis to get an erection?
9. What causes a man to ejaculate during sex?
10. Where is semen made?
11. What does the liquid part of semen contain?
12. What happens when an egg and sperm fuse?
13. What do we mean by gestation period?
14. How long is the gestation period for women?
15. What does the woman provide the baby with during pregnancy?
16. What does a woman need more of during pregnancy?
17. Why is folic acid important?
18. Why are alcohol and cigarette smoke harmful during pregnancy?
19. Why are some babies born addicted to drugs?

Additional tasks

1. Label and memorise the parts of a man's reproductive system below.



2. Complete the gap filling exercise on *'making a baby'*.
Choose from the words in bold below.

pregnant, stimulates, ejaculate, sperm, egg, fallopian tube, penis, moist, sexually mature, ejaculate, cervix, fuses, ejaculate, periods

To make a baby both a man and a woman must be _____ _____.This means that a man must be able to _____ and a woman must have started her _____.

If a man can _____ he can release _____.

(CONTINUED)

If a woman has started her periods she is able to release an _____. If a man and woman are aroused, a man's _____ becomes hard and a woman's vagina _____. This allows for the penis to enter the vagina. On inserting his penis the man's back and forth motion _____ him to _____. On ejaculation sperm is released and swims up through the _____ and uterus into the _____ _____ where an egg may be waiting. If the sperm meets an egg and _____ the woman becomes _____.

3. Write down some ideas about why it is important for a woman to stay healthy during pregnancy.
4. Design a healthy diet for ONE DAY for a pregnant woman remembering that she will need more protein, iron and calcium. You can use the healthy human diet page to help (pg12).

Healthy diet

Questions on Drugs and their Impact

Comprehension

1. What is a drug?
2. Why do people use recreational drugs?
3. What can happen with all drugs?
4. What is an obvious example of a good medicine?
5. What is an anaesthetic?
6. Give an example of a use for an anaesthetic.
7. What do antibiotics do?
8. What often happened to people after operations before antibiotics?
9. Why are many infections becoming resistant to antibiotics?
10. What kind of drug is alcohol?
11. What happens to your nerve activity after drinking alcohol?
12. What is a side effect of long term overuse of alcohol?
13. What's one of the reasons that getting drunk is dangerous?
14. Give an example of an illegal depressant.
15. Why can getting 'hooked' on heroin be bad?
16. What does a stimulant do?
17. What are the two legal stimulants mentioned?
18. What are some of the long term side effects of cocaine use?

Additional tasks

1. Match the words below and memorise.

Medicines	drugs taken for enjoyment
Recreational drugs	slows down nerve activity
Anaesthetic	drugs that help us get better from illness
Antibiotics	speeds up nerve activity
Depressant	drugs that cause loss of sensation
Stimulant	drugs taken to treat bacterial infections

2. List as many medicines as you can and write down what they are used for. Ask a friend or adult if you don't know any.

Medicines

3. Below are some '**claimed**' *pros (positives)* and *cons (negatives)* of alcohol. Write down whether you think alcohol is good or bad for society.

   In moderation alcohol has health benefits, the beverage industry employs a lot of people, it makes people happier, it helps people to socialise, it helps people to sleep, it provides a lot of money to government through taxes.

   Too much alcohol is bad for your health, it makes people do stupid things, some people become violent, it can cause accidents and death, gives you a hangover, it is addictive, people 'waste' their money on alcohol.

4. Put the following results of drinking alcohol in order of severity (getting worse). You may debate these!

DRUNK	**MORE RELAXED THAN NORMAL**
VERY RELAXED	**DIFFICULT TO WALK IN A STRAIGHT LINE**
DEATH	**PASS OUT**
SOME SLURRED SPEECH	

Questions on Reproduction in Plants

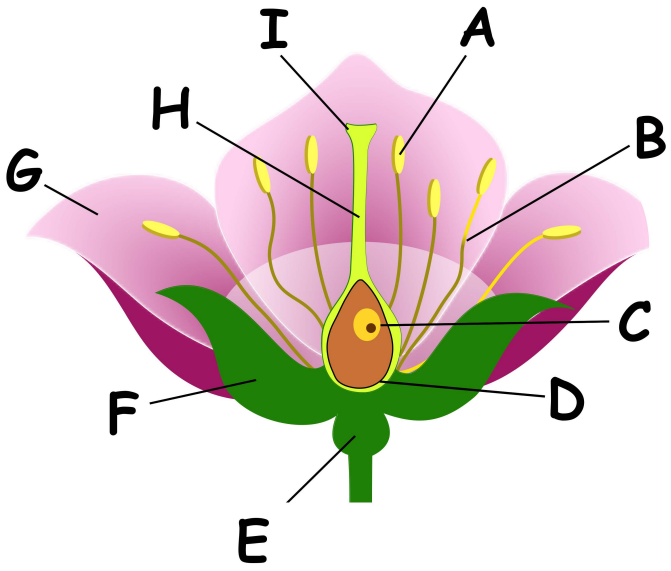
Comprehension

1. How do plants that produce a flower reproduce?
2. What is the male sex cell called?
3. What is the ovule?
4. What do we mean by pollination?
5. Pollination in the same plant is called what?
6. How is the nucleus of the pollen cell able to join with the ovule?
7. What does this produce?
8. What does the ovule become after fertilisation?
9. By what two methods does pollination usually happen?
10. Why do plants produce a sugary liquid called nectar?
11. What else do flowers produce to attract insects?
12. What are the four main methods of seed dispersal?
13. Why is it important that seeds are dispersed?
14. What is germination?
15. What is the embryo inside a seed's protective coating?
16. What percentage of plant life is actually in the oceans? (WHAT? box)

Additional tasks

1. Label and memorise the parts of a flower below.

Parts of a flower



A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

I. _____

2. On a calm day 100 seeds fall from a tree and land close together near to the trunk. On a windy day 100 seeds fall from the tree and are scattered far apart and away from the tree's trunk.

   Write down which seeds are more likely to grow and reasons why.

Seeds most likely to grow and why

3. Put the following statements in the correct order for a plant that undergoes **cross pollination** with another plant of the same species.

__ bee flies to another plant

__ pollen is made in the anther

__ plant is fertilised to produce a seed

__ pollen accidentally sticks to bee

__ pollen grains move from bee to stigma

__ pollen collects on top of the anther

__ pollen grows a tube down to the ovule

__ nucleus of pollen and ovule fuse

__ bee visits flower to collect nectar

Questions on Photosynthesis

Comprehension

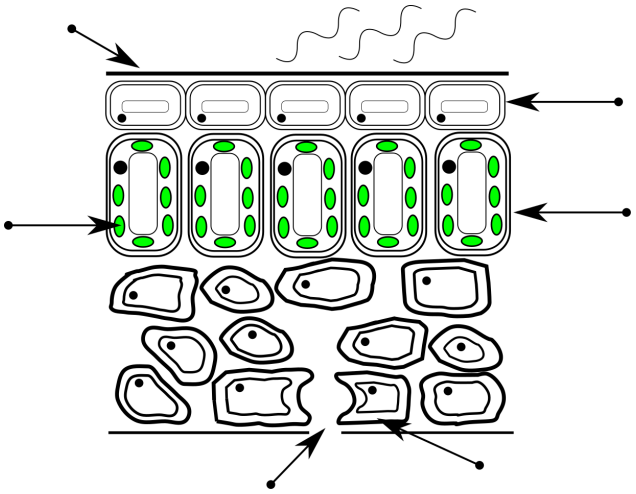
1. What does the 'photo' in photosynthesis refer to?
2. What does photosynthesis mean?
3. What are the two reactants of photosynthesis?
4. What are the chemical formulae of water and carbon dioxide?
5. What is glucose an example of?
6. How is glucose stored?
7. What does oxygen allow the body's cells to do?
8. What would happen without plants?
9. What does carbon dioxide contribute to?
10. What do plants do especially at night?
11. Why are leaves green?
12. What is chlorophyll able to do?
13. Which cells contain most of the chlorophyll?
14. What are stomata?
15. What happens to the stomata during the day time?
16. What is the name of the cells that control the opening and closing of stomata?
17. Why do the stomata close at night?
18. What else helps reduce water loss?

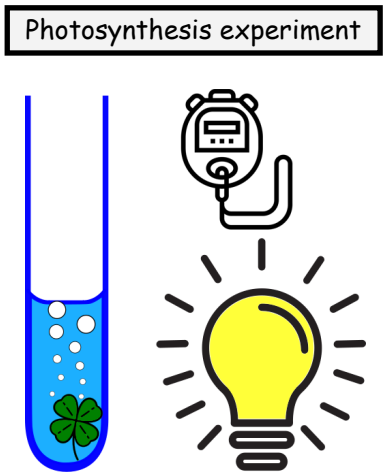
Additional tasks

1. Match and memorise the words and chemical formulae below.

Chlorophyll	a gas produced by photosynthesis, chemical formula O_2
Stomata	a liquid absorbed through photosynthesis, chemical formula H_2O
Oxygen	a gas absorbed through photosynthesis, chemical formula CO_2
Carbon dioxide	a green pigment found in leaves for photosynthesis
Water	a sugar produced through photosynthesis, chemical formula $C_6H_{12}O_6$
Glucose	pores on the underside of a leaf to control gas exchange

2. Label the leaf cross section below.





3. The **number of bubbles** of **oxygen** released in **one hour** were **counted** from a photosynthesising pond plant placed in a test tube. The brightness of light was varied. The results are shown below.

a. Plot a graph of Number of bubbles in one hour on the y-axis (vertical) against light brightness on the x-axis (horizontal) and draw a smooth line.

Light brightness (lux)	100	200	300	400	500	600	700	800	900	1000
Number of bubbles in one hour	10	19	28	36	42	46	49	50	50	50

b. Label three parts to the line with, **FAST CHANGE, SLOW CHANGE, NO CHANGE** as the brightness increases.

Questions on Genetics and Inheritance

Comprehension

1. In biology what do we mean by inheritance?
2. What are our characteristics influenced by?
3. How many genes are there for each characteristic?
4. What do chromosomes look like?
5. Which chromosomes determine your sex?
6. Which sex chromosome do women carry?
7. Why is the population half male and half female?
8. Where is the gene found that determines the sex is male?
9. What percentage of our genes do we share with the chimpanzee?
10. What does evolved mean?
11. What can the same species do?
12. Are horses and donkeys the same species?
13. What happens if they breed?
14. What did Rosalind Franklin and Maurice Wilkins 'fire' at DNA?
15. What did the scattering of the X-rays form, enabling them to work out what the DNA molecule might look like?
16. From this work what did James Watson and Francis Crick come up with?

Additional tasks

1. Match and memorise the words below.

Inheritance	sections of the chromosome that carry information for how we grow
Chromosome	a weaker gene that only produces the characteristic if combined with another recessive gene
Genes	the passing of genetic characteristics from parent to offspring
DNA	a stronger gene that produces a characteristic
Dominant gene	a molecule that makes up chromosomes, has a double helix shape
Recessive gene	carry the genetic information

2. Complete the gap filling exercise using the words in bold below;

offspring, dominant, characteristic, looks, recessive, recessive, inherit, blue eye, punnett, freckles

Our characteristics are the _____ and attributes that we _____ from our parents. Things like eye colour, hair colour and _____. If the stronger gene called the _____ gene combines with another gene of that characteristic then we see that _____ in the _____. The weaker gene is called the _____ gene. We only see that characteristic if it combines with another _____ gene. For example, the recessive blue eye gene only produces blue eyes if it combines with another recessive _____ _____ gene, one from each parent. A _____ square shows the possible combinations.

3 a. Complete the **punnett squares 1 to 4** below to show the possible outcomes for the offspring from moms and dads with the recessive and dominant gene combinations below (like opposite).

b. Write down how many offspring 'out of four' have blue eyes for each punnett square 1 to 4. below.

B = dominant brown eyes gene b = recessive blue eyes gene

1.

Mom \ Dad	B	B
B		
b		

2.

Mom \ Dad	B	b
b		
b		

3.

Mom \ Dad	B	B
b		
b		

4.

Mom \ Dad	b	b
b		
b		

4. Put the following in order of size;

ORGAN, NUCLEUS, MOLECULE, CELL, CHROMOSOME, TISSUE, DNA

Questions on Adaptation

Comprehension

1. What do adaptations do?
2. What may happen if an organism is not well adapted to its environment?
3. How long do adaptations normally take?
4. What does the waterproof outer layer of a cactus do?
5. What has happened to the leaves of a cactus?
6. What is the sweet liquid that plants produce called?
7. What tells a Venus fly trap to snap shut?
8. What happens to the insects that are trapped?
9. How does the specially adapted Caudal fin help a shark?
10. Why is a shark's streamlined shape so useful?
11. What is a shark's skeleton made from?
12. What colour is a polar bear's skin and how does this help?
13. What is the advantage of a polar bear's big feet?
14. Why is a polar bear's white coat useful?
15. How much water can a camel drink in one go?
16. Why is it an advantage for the camel to sweat very little below 50°C?

Additional tasks

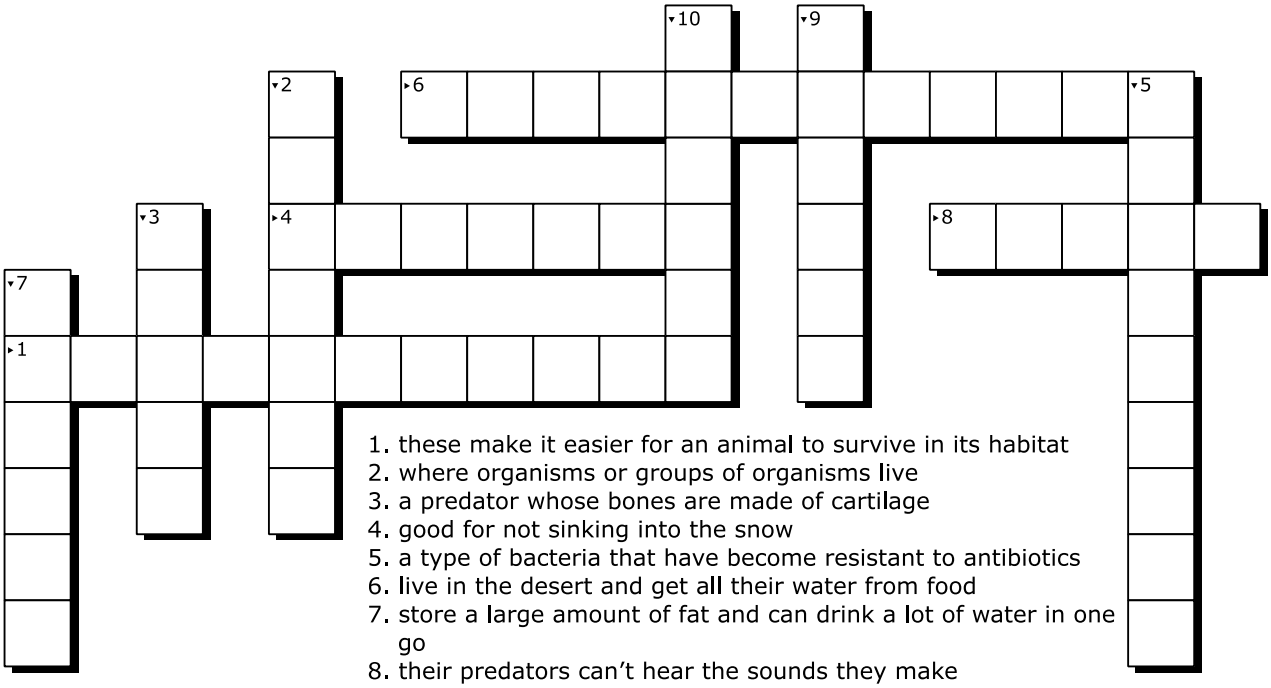
1. Draw / invent an animal that has the characteristics to live and thrive in one or more of the habitats below.

- The sea
- A jungle
- A desert
- Antarctica (South Pole)
- Cold mountain climate
- A forest

2. Complete the adaptations crossword below.

3. Explain how you think the following adaptations help the species to survive.

- Dogs have developed an excellent sense of smell
- Springbok (small deer like animals) jump in the air to make themselves look bigger
- Some non-venomous snakes have very bright colours
- The bee orchid flower looks like a female bee
- Cheetahs have a long spine, long legs, light skeleton and large nostrils
- Mountain goats have rough pads on their hooves, their hooves spread widely and have very strong hind (back) legs for jumping



1. these make it easier for an animal to survive in its habitat
2. where organisms or groups of organisms live
3. a predator whose bones are made of cartilage
4. good for not sinking into the snow
5. a type of bacteria that have become resistant to antibiotics
6. live in the desert and get all their water from food
7. store a large amount of fat and can drink a lot of water in one go
8. their predators can't hear the sounds they make
9. the male part of a flowering plant
10. roots spread wide to collect water

Questions on Evolution and Natural Selection

Comprehension

1. What does evolve mean?
2. What are the two causes of mutations in genes mentioned in the text?
3. What do these mutations lead to?
4. How does having traits adapted for the environment or finding food affect an animal's chance of survival?
5. What happens to these traits in the population over time?
6. What two words do we use to describe this?
7. What do we call those that survive because they are better adapted?
8. What happens to species that are less well adapted to survive?
9. Who is credited with first presenting the ideas behind evolution?
10. Where did Charles Darwin famously study many species?
11. What is an insecticide?
12. What can some insects' bodies do to the insecticide chemicals?
13. What happens to the population of these insects?
14. What is another name for MRSA?
15. What have MRSA bacteria evolved to be resistant to?
16. What has made this worse?

Additional tasks

1. Match and memorise the meanings of the terms below.

Mutate	single celled organisms
Evolve	the characteristic of an animal, for example thick fur
Traits	chemicals that kill insects
Insecticides	to change from what you were
Bacteria	animals with the best adaptations for survival
Survival of the fittest	to change over time

2. Complete the sentences choosing from the words in bold describing what trait each animal has evolved over time to help them survive.

smell, speeds, upright, sharp, brains, hearing, sensitive, long, teeth, nectar, wolf, bipedalism, 'fly', detect, streamlined

- **Sharks** have evolved to constantly replace their _____ over a lifetime. This ensures they are able to maintain many rows of _____ teeth.
- **Humans** have evolved big _____ enabling them to solve problems and also evolved to walk _____ on two legs called _____.
- **Dogs** have evolved excellent _____ , sharp teeth and an exceptional sense of _____ to help them hunt. All from their ancestor, the _____.
- **Tarantulas** have evolved to be _____ to small vibrations in the ground to _____ prey.
- **Humming birds** have evolved _____ beaks so that they can reach _____ inside flowers.
- **Penguins** have evolved wings that allow them to '_____' underwater at high _____ to catch fish and are beautifully _____ to reduce water resistance.

3. Write true or false next to the statements about evolution below.

Every one now believes the theory of evolution (_____) Evolving is a slow process 'normally' (_____)
Darwin was the only one to come up with the theory (_____) Evolution has stopped now (_____)
The Goblin shark has barely evolved over millions of years (_____) Mutations drive evolution (_____)
Some humans that live at high altitude have evolved to have higher blood oxygen content (_____)
We are still learning about evolution (_____) If species don't evolve they risk extinction (_____)

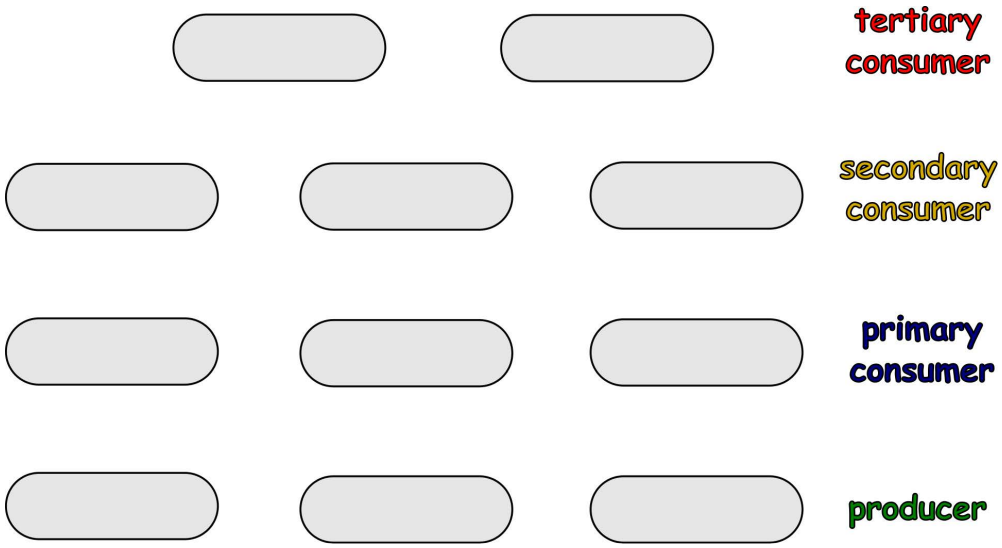
Questions on Biodiversity and Gene Banks

Comprehension

1. What does the desert food web show?
2. What does diverse mean?
3. What might happen if insecticide is used to kill the grasshoppers?
4. What is biodiversity essential for?
5. What does less biodiversity in an ecosystem mean for the various species in it?
6. What can organisms do if there is a bad year in a diverse ecosystem?
7. What would be put in danger if we allowed the number of honey bees to decrease?
8. Why is this?
9. What can the introduction of non-native species do?
10. Why were Cane toads introduced to Australia?
11. Why did the number of some native predators decline (like lizards)?
12. What has put pressure on other native animals?
13. What still happens even with protected areas and captive breeding programs?
14. What are gene banks a way of doing?
15. What can the genetic material be used for?

Additional tasks

1. Use these three food chains; **leaves, rabbit, fox**; **corn, rat, snake**; **grass, vole, ferret** and a **wolf** and **eagle** as the tertiary consumers, to fill the boxes below and draw arrows between who eats what.



2. Here are some statements about captive breeding programs, put them under the title ***Pros*** (advantages) or ***Cons*** (disadvantages).

- Captive breeding programs are not cheap.
- We learn a lot about the animals in captive breeding programs.
- Many people have jobs in breeding programs.
- Animals are often not introduced back into the wild and this should be the aim.
- Reintroduced species often don't survive.
- It means we can still see endangered animals without having to enter their habitat.
- Captive breeding programs have limited success.
- Some endangered animals may still have benefits to humankind that we still don't know about.
- Some habitats are reopening to wild animals, if we don't have captive breeding programs we may not be able to reintroduce.
- It's important for maintaining biodiversity.

3. Write down **your opinion** as to whether captive breeding programs are useful or a waste of time and money.

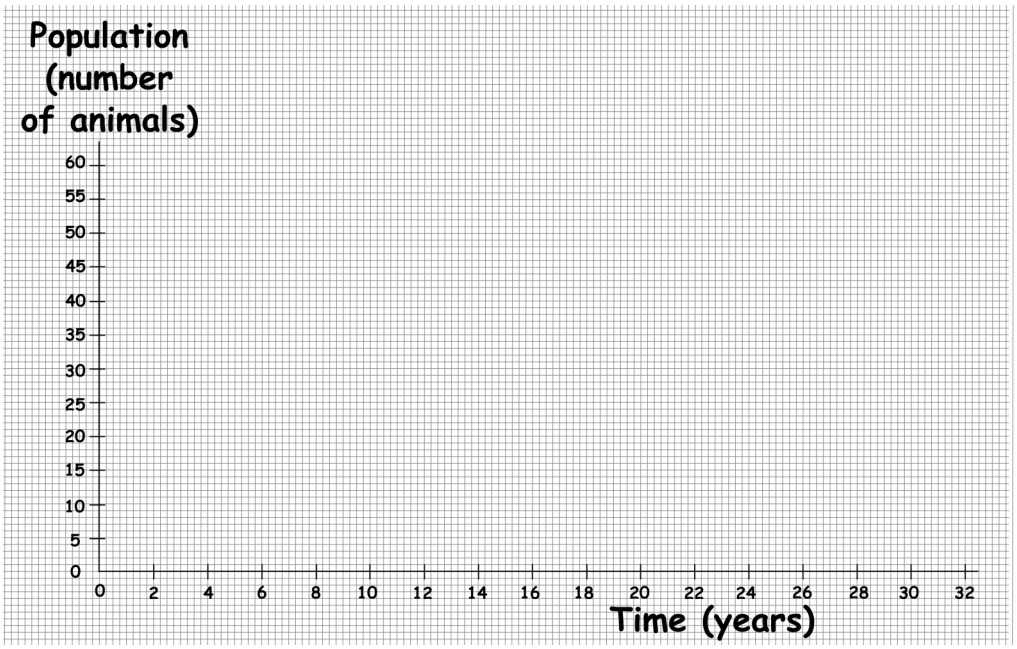
Questions on Predator, Prey and Populations

Comprehension

1. What is a predator?
2. What is a good example of a predator and a prey?
3. What happens to the population of mice as the cats eat them?
4. Why does this cause the cat population to decrease?
5. What causes the mice population to begin to rise again?
6. Why over time does this allow the cat population to increase again?
7. What do predator prey graphs show?
8. When are they simple to follow?
9. Apart from predators, what else can affect the number of prey?
10. Why don't hyenas want lions in their territory?
11. Why will animals of the same species also compete for territory?
12. Especially if scarce, what else can be competed for?
13. What are the famous 'Darwin's finches' on the Galapagos islands?
14. Why does the population of birds with medium sized beaks struggle when there are more birds with medium sized beaks?
15. Why do populations of birds with shorter and longer beaks do better on the **same** island?

Additional tasks

1. Plot the number of predator and prey on the graph below and draw in as smooth a curve as you can. Label both lines.



Predator number	Prey number	Time (years)
5	20	4
10	40	8
20	60	12
23	20	16
20	10	20
10	20	24
5	40	28
10	60	32

2. How long does it take the predator numbers to go from a **maximum** to a **minimum** value (or vice versa)?

3. Many factors limit how big a population can become. Human population is heading towards 8 billion. It can't grow forever otherwise we wouldn't be able to grow enough food for everyone and have enough space for housing.

   Below are some limiting factors that affect the size of a population.

NUTRIENTS IN SOIL	PREDATORS
FOOD	LIGHT TO GROW
PREY	SPACE
DISEASE	OXYGEN
WAR	WEATHER OR CLIMATE

   Write about how you think these factors can affect the size of a population of **any** species, e.g. ***not many nutrients in the soil means not many tomatoes on my tomato plant!***

Questions on Pyramids of Numbers and Toxin Accumulation

Comprehension

1. What are toxins?
2. How many routes do they have into an organism?
3. What does ingested mean?
4. What are pesticides used for?
5. Which toxic metals can be passed up the food chain?
6. What do pyramids of numbers show us?
7. Each level in the food chain is drawn in …… to the size of the population?
8. Why do they often look like pyramids?
9. How many green fly could one bush feed?
10. Each trophic level tells us the size of the population but not what?
11. How can chemical fertiliser get into our water?
12. What is one of the ways that toxins can get into soils?
13. What happens to the toxin concentration as it is transferred higher up the food chain?
14. How high can the mercury levels reach in tuna and shark?

Additional tasks

1. Draw a pyramid of numbers in the boxes below for the following two food chains;

5,000 Clover leaves, **100** Snails, **10** Robins, **2** Buzzards (birds of prey)

Pyramid of numbers

1 Oak tree, **1000** Caterpillars, **50** Pigeons, **2** Kitty hawks (birds of prey)

Pyramid of numbers

2. Another way of drawing pyramids for food chains is to draw **pyramids of biomass**. This is where each trophic level is drawn to represent the **mass** of living material (biomass) rather than the number of each species.

a. Complete the table below to calculate the **total biomass** for each organism by multiplying the number of organisms by their mass.

	Caterpillar	**Robin**	**Elderberry bush**
Mass of organism (g)	3	75	5000
Number of organisms	100	2	1
Total biomass (g)			

3. Use the total mass to draw a **pyramid of biomass** for the food chain.

Elderberry bush → Caterpillar → Robin

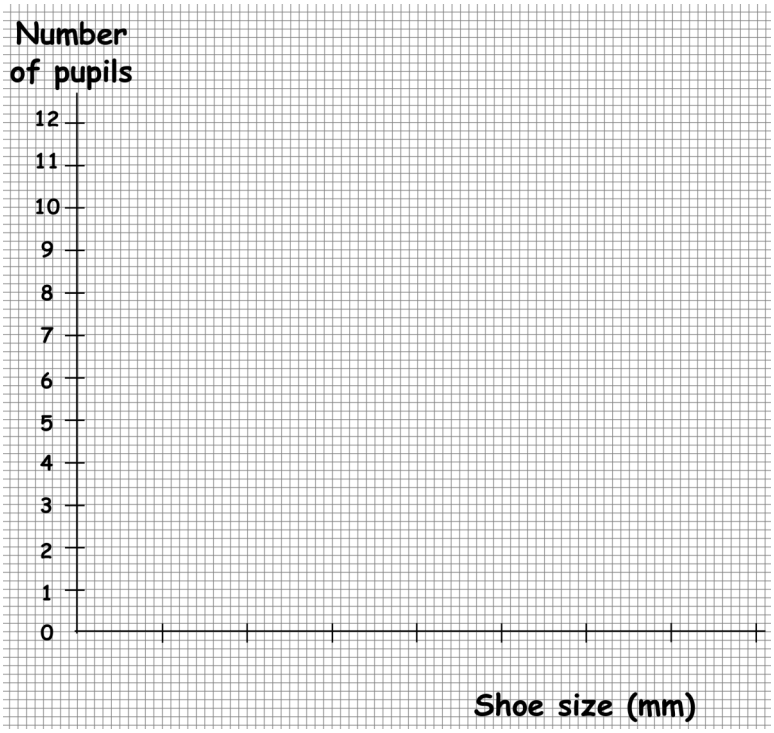
Pyramid of biomass

Questions on Variation

Comprehension

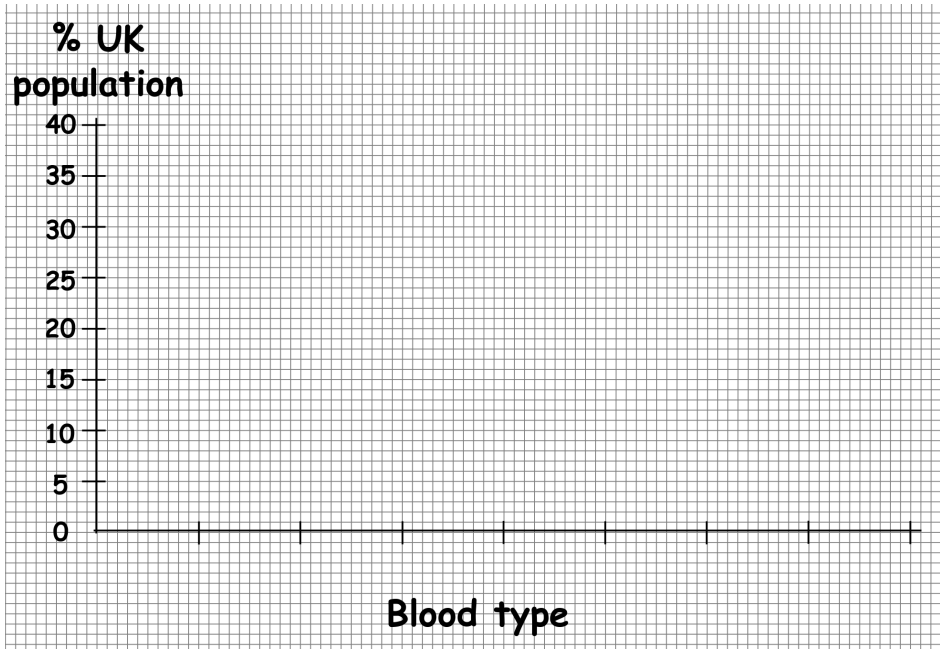
1. What clearly exists between species?
2. Why can all dogs breed with each other?
3. What does discontinuous mean?
4. Name four human characteristics that are discontinuous.
5. What do continuous characteristics have?
6. Name four human characteristics that are continuous.
7. What does a histogram plot?
8. What sort of data is plotted on a bar chart?
9. How much of our genes come from mum and how much from dad?
10. What two factors affect our characteristics?
11. How can the environment change our skin colour?
12. What 'could' cause the child of tall parents to be small?
13. What is thought to influence asthma?
14. What debate has been around for a long time?
15. Why is it not true to say 'I'm not good at maths' or 'I'm not clever' because my parents aren't?
16. What might genes mean for certain tasks for certain individuals?

Additional tasks



1. Draw a histogram for the data below showing the shoe size for a class of 30 year 7 pupils.

Number of pupils with that shoe size	Shoe size range (mm)
1	195-204
2	205-214
6	215-224
12	225-234
6	235-244
2	245-254
1	255-264



2. Draw a bar chart of the percentage of people with each blood type in the UK.

Percentage of people in UK	Blood type
30	A+
8	A-
8	B+
2	B-
35	O+
13	O-
2	AB+
1	AB-

Questions on the Particulate Nature of Matter

Comprehension

1. What do we call minute pieces of matter?
2. Who is first thought to have presented the idea that substances are made from particles?
3. How small are these particles?
4. What do we now call these particles?
5. What does indivisible mean?
6. Existing as a solid, liquid or gas depends very much on what?
7. What does density tell us?
8. In solids, is the force of attraction strong, medium, or weak between particles?
9. What sort of shape and volume does this give to solids?
10. In a solid the particles can't move from their positions, but what do they do in that same position?
11. How strong is the force of attraction between particles in liquids?
12. In what way can the particles in a liquid move?
13. What sort of shape do liquids take?
14. Why can't liquids be compressed?
15. How far apart are the particles in a gas and what does this mean for the force of attraction between the particles?
16. Why are gases easily compressed?

Additional tasks

1. Match the words to their meanings and memorise.

Indivisible	the gaseous (gas) form of water
Density	means with no particular pattern, the way particles in a gas move
Bond	means can't be divided or split
Water vapour	a force of attraction between particles
Volume	tells us how tightly packed particles are
Randomly	is the amount of space a substance occupies

2. Write next to the statements as to whether they are correct for a solid, liquid or a gas.

Particles are the closest together _____
Are easily compressed _____
Medium strength bonds _____
Fixed volume but not fixed shape _____
No fixed shape or volume _____
Least dense _____
Most dense _____
Usually less dense than solids _____
Particles vibrate around one position _____
Strong bonds _____
Weak or no bonds _____
Can flow _____
Atoms arranged regularly _____

3. The density of carbon dioxide as a solid, liquid and gas is given below.

Solid CO_2 (density **1560** kg/m^3)

Liquid CO_2 (density **1100** kg/m^3)

Gaseous CO_2 (density **2.0** kg/m^3)

Explain the difference in density using how the particles are arranged and the spacing between them. Draw diagrams if you wish.

4 a. Helium has a density of 0.18 kg/m^3 and air has a density of 1.3 kg/m^3. What does this mean that a helium balloon will do?

b. What do you think this tells you about why objects float?

Questions on Atoms, Elements, Compounds and Molecules

Comprehension

1. What did John Dalton develop?
2. What are atoms like?
3. How did John Dalton check his rules about atoms?
4. What are chemical reactions or changes due to?
5. What is a pure element made from?
6. Which element is a pure diamond made from?
7. When are compounds formed?
8. What is a chemical bond?
9. What is the chemical formula for water?
10. What is another name for alcohol?
11. What is a molecule?
12. Why is oxygen normally found as a molecule?
13. What do we draw to represent atoms on a piece of paper?
14. What does the number of each circle tell us?
15. What is the most common element in the universe?
16. What **doesn't** helium form?
17. How is helium normally found?

Additional tasks

1. Match the words to their meanings and memorise.

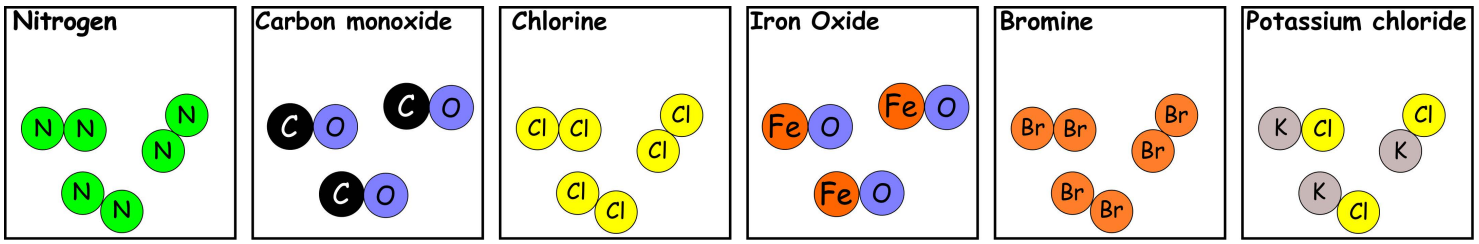
John Dalton	is a molecule made from two oxygen atoms and one carbon atom
Element	a substance formed from two or more **different** atoms
Compound	a scientist who developed the idea that matter is made from atoms
Molecule	is a molecule made from two hydrogen atoms and one oxygen atom
Water	is two or more atoms bonded together, they can be the same or different atoms (the smallest complete unit of a substance)
Carbon dioxide	a substance made from only one type of atom

2. Complete the gap filling exercise, choose from the words in bold below;

molecules, one, water, Oxygen, unit, different, same, different, carbon dioxide, compound, Helium

A pure element will only be made from _____ type of atom. _____ is an element often used in party balloons. _____ is the element that we breathe. Oxygen and hydrogen are both elements that form _____ . Molecules are the smallest complete _____ of a substance. They are made from two or more atoms that can be _____ or the _____.
A molecule like _____, H_2O is an example of a _____. Compounds are formed from two or more _____ atoms bonded together. The gas that we breathe out called _____ _____ is a compound.

3. The images below show either **an *element made from molecules*** or **a *compound made from molecules*.** Write underneath each image whether you think they are an element or compound.



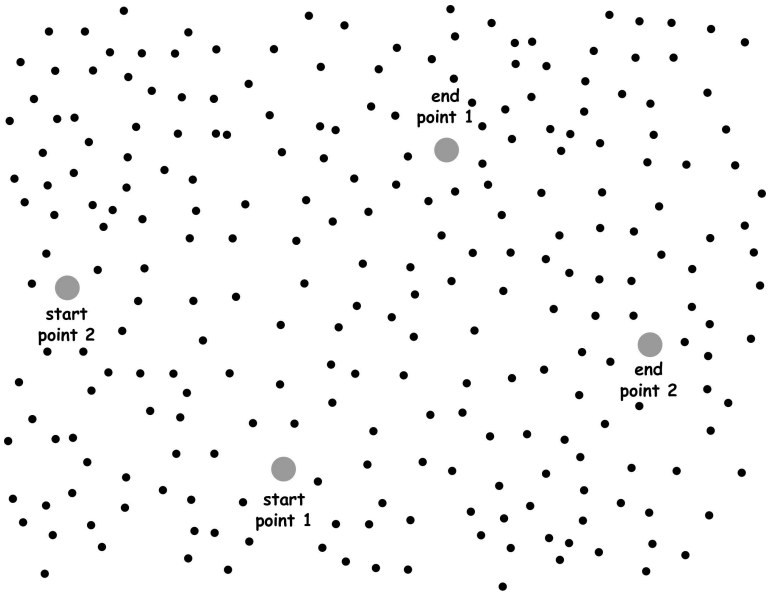
Questions on Evidence for Particles

Comprehension

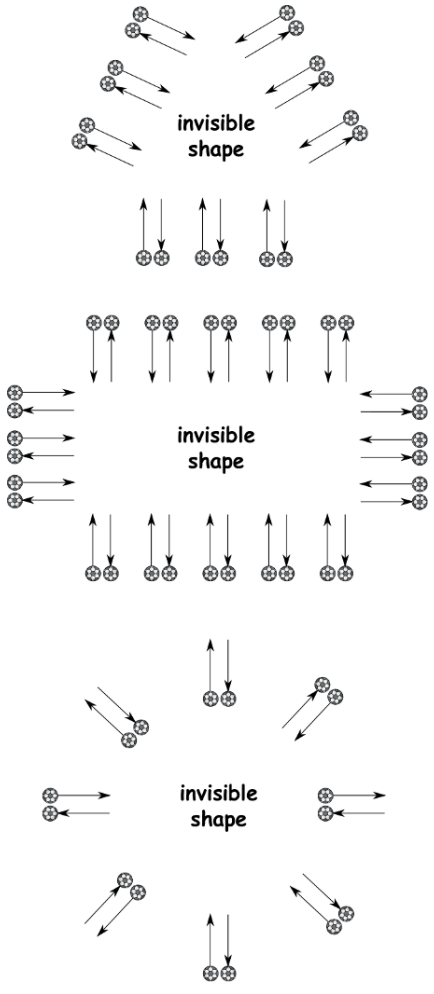
1. What did scientists think caused the difference between elements?
2. Why don't you normally see a speck of dust in the air?
3. When can you sometimes see dust particles moving around in the air?
4. In what direction do the particles seem to move?
5. What was Robert Brown doing in 1827?
6. What was Robert Brown unable to do?
7. How do we know air exists?
8. What causes the dust particles to move erratically?
9. What is the name given to the particles moving erratically from their start point to end point?
10. How did Albert Einstein explain the motion?
11. What was most important about Einstein's explanation?
12. What is a simple way to know the rough size of an oil molecule?
13. What do we assume about how thick the layer of oil is?
14. What do many other experiments do?

Additional tasks

1. Sketch your own random walks below from start point to end point, for the dust particles being pushed around by the air particles. They are different every time.



2. Draw in what you think the invisible shapes are by how the balls are bouncing off.



3. An atom is about **0.0000001mm** across (diameter).

Use a calculator to divide the thickness of these everyday items by the diameter of an atom to calculate how many 'atoms thick' they are. Write your answer as a number and in words.

Remember *1,000 = thousand*

1,000,000 = million

1,000,000,000 = billion

a. human hair = 0.1mm

b. piece of paper = 0.08mm

c. human skin = 2mm

d. the height of a door = 2000mm

e. house paint = 0.05mm

f. wooden shelf = 15mm

g. the length of a brick = 215mm

Questions on Chemical Symbols and Chemical Formulae

Comprehension

1. How many elements have been discovered so far?
2. Often the chemical symbol is what version of the full name?
3. Others come from what language?
4. Who are some of the elements named after?
5. What is the chemical formula for water?
6. How many hydrogen and oxygen atoms does a water molecule have?
7. Why is carbon monoxide dangerous?
8. How many hydrogen and carbon atoms are there in methane?
9. In what form is calcium carbonate commonly found?
10. How many of each atom are there in baking powder?
11. What is glucose?
12. What are common compounds known by?
13. What is a compound that normally ends in **–IDE** made from?
14. If a compound's name ends with **–ATE**, what will one of the elements be?

Additional tasks

1. Match the formula to the compound and memorise.

Water	$CuSO_4$
Carbon dioxide	$CaCO_3$
Methane	H_2O
Calcium carbonate	$C_6H_{12}O_6$
Copper sulphate	CH_4
Glucose	CO_2

2. Choose from the words below to name the elements or compounds in the text box on the left hand side. Use the periodic table on pg90 to help.

   Magnesium chloride, Nitrogen, Calcium oxide, Sodium carbonate, Hydrogen chloride, Iron dioxide, Magnesium carbonate, Calcium sulphate, Iron oxide, Magnesium oxide, Oxygen, Potassium sulphate, Sulphur, Silver nitrate

3. In the right hand box, write the number of each atom from the formula e.g. *Lithium sulphate,*

   Li_2SO_4, 2 X Li (lithium) atoms, 1 X S (sulphur) atom, 4 X O (oxygen) atoms.

$CaSO_4$ _____

N_2 _____

Na_2CO_3 _____

HCl _____

$MgCl_2$ _____

FeO _____

FeO_2 _____

S_8 _____

$MgCO_3$ _____

CaO _____

MgO _____

O_2 _____

K_2SO_4 _____

$AgNO_3$ _____

$CaSO_4$ _____

N_2 _____

Na_2CO_3 _____

HCl _____

$MgCl_2$ _____

FeO _____

FeO_2 _____

S_8 _____

$MgCO_3$ _____

CaO _____

MgO _____

O_2 _____

K_2SO_4 _____

$AgNO_3$ _____

Questions on Chemical Reactions

Comprehension

1. What are the two chemicals that react together called?
2. What sort of substance is formed?
3. How many products are often formed?
4. How many ways can we tell if a chemical reaction has happened?
5. What is the name given to a solid that forms in a liquid?
6. What is a simple example of the products of a chemical reaction being a different colour?
7. Why wouldn't you feel anything if you put your hand above an **unlit** Bunsen burner?
8. What do hand warmers have inside them?
9. What does milk that has 'gone off' tell you?
10. Why do boiled eggs smell?
11. What do we call it when bubbles of gas are given off in a liquid?
12. How can you tell oxygen gas is produced by plants in a fish tank?
13. What chemical reaction is this due to?
14. Why does limewater go cloudy when carbon dioxide is bubbled through it?
15. What happens when water is added to Ouzo?

Additional tasks

1. Match the words to their meanings and memorise.

Precipitate	the name given to bubbles formed in a liquid
Rusting	a chemical used to test for the presence of carbon dioxide gas
Hydrogen sulphide	a commonly used word for the chemical Calcium carbonate, $CaCO_3$
Effervescence	a solid formed in a solution (liquid)
Limewater	a smelly chemical given off from boiled eggs
Chalk	a chemical reaction between iron (or steel), air and water producing orange – red - brown *rust* (chemical name iron oxide)

2. Complete the chemical reaction word search below.

PRODUCTS, ODOUR, EFFERVESCENCE, LIMEWATER , PRECIPITATE, RUSTING, HYDROGENSULPHIDE TEMPERATURE , BUBBLES, SMELL, COLOUR , CHALK, EMISSION, BUNSENBURNER

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

3. Underline what tells you a chemical reaction might have happened in the statements below. *One of them is '**wrong**', can you spot it and explain why?*

a. Magnesium burns very brightly in air and gets very hot
b. Add magnesium to acid it fizzes and gets warm
c. Colourless silver nitrate solution is added to sodium bromide solution and a cream solid forms
d. Acetic acid is added to alcohol and a noticeable aroma is smelt
e. Copper carbonate (green) is heated and turns black
f. An ice cube left in a beaker melts
g. Barium hydroxide and ammonium chloride are mixed and the beaker gets too cold to hold
h. Bubbles appear on a pond plant underwater
i. Baking powder releases carbon dioxide when a cake is baked to make it rise

Questions on Chemical Reactions; Atoms Rearranged

Comprehension

1. How do we already know when a chemical reaction has taken place?
2. We always start with reactants and 'go to' what?
3. What does a chemical equation show us?
4. What can happen when two substances react together?
5. What are bonds?
6. How do we know a chemical reaction has taken place instead of a physical change?
7. What can't 'usually' happen to chemical reactions?
8. What change happens if you put water in the freezer?
9. What does sublimation mean?
10. Is boiling an egg a chemical or physical change?
11. What happens when you add water to sand and cement?
12. What is in a cake mixture?
13. How do you know a chemical reaction has taken place when you bake a cake?
14. What is a an example of a reversible reaction? (WHAT? box)

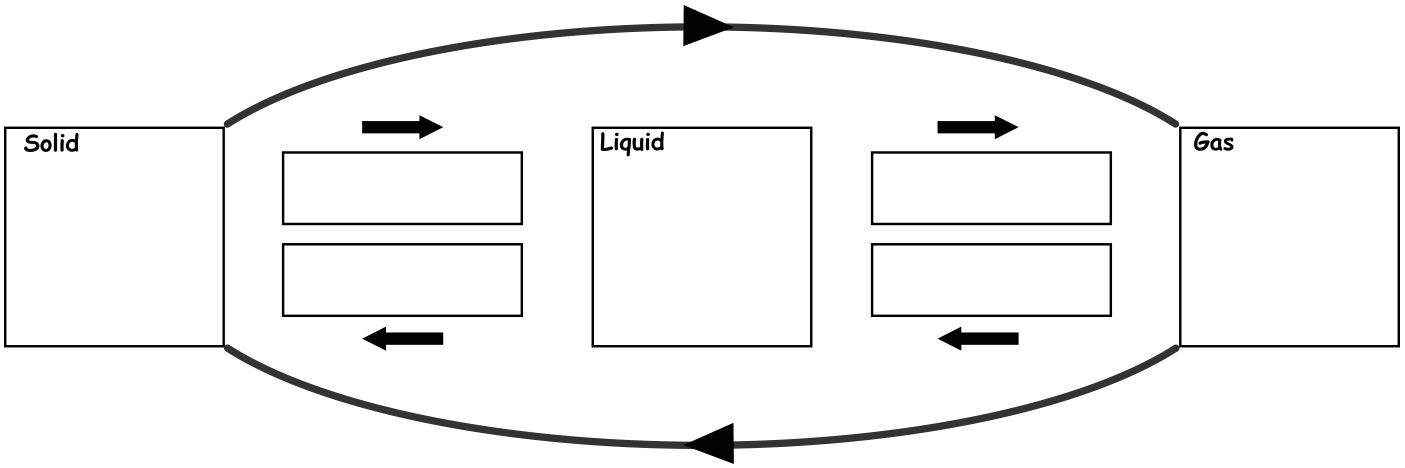
Additional tasks

1. Write next to the examples below whether you think they are chemical or physical changes.

Frying an egg _____	Milk going off _____
Boiling water _____	Mixing sugar and salt _____
Dropping a metal in acid _____	Burning toast _____
Mixing sand with water _____	A lit sparkler _____
Evaporating alcohol _____	Rotting wood _____
Melting chocolate _____	Mixing oil and water _____
A cloud making rain _____	Making popcorn _____
Filtering dirty water _____	Rusting _____

2. Sketch the arrangement of the particles in a solid, liquid and gas then label the arrows with the following words (pg54 and pg130 help);

   MELTING, VAPOURISING, CONDENSING, SOLIDIFYING (FREEZING), DEPOSITION, SUBLIMATION



3. Write down some thoughts on whether dissolving sugar in water is a chemical or physical change. Think about whether something new is formed and if it is possible to get back to what you started with.

Questions on Conservation of Mass and Balancing Equations

Comprehension

1. What does conservation of mass tell us?
2. How often is conservation of mass true?
3. Why can't we write Mg + O ?
4. When one carbon atom reacts with one oxygen molecule, what is produced?
5. How do the number of atoms before and after always compare?
6. What is the product of reacting carbon dioxide with water?
7. When hydrogen reacts with oxygen, what molecule is produced?
8. What does putting numbers in front of the molecules show?
9. How many atoms are there in two molecules of hydrogen?
10. The number '2' in front of H_2 and the '2' in front of H_2O means how many atoms of hydrogen are on both sides of the equation?
11. What does the reaction between nitrogen and hydrogen produce?
12. Why is the first equation for nitrogen plus hydrogen not balanced?
13. Once balanced how many hydrogen and nitrogen atoms are there on the left and right hand side of the equation?
14. When lead oxide reacts with carbon what are the products?

Additional tasks

1. Balance the equations below, to help there is a space if a number is needed.

a. ___K + F_2 ⟶ ___KF

b. ___Na + Cl_2 ⟶ ___NaCl

c. ___Ca + O_2 ⟶ ___CaO

d. S_8 + ___O_2 ⟶ ___SO_2

e. ___Al + ___Br_2 ⟶ ___$AlBr_3$

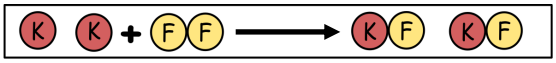
f. Mg + ___HCl ⟶ $MgCl_2$ + H_2

g. CH_4 + ___O_2 ⟶ ___H_2O + CO_2

h. ___Al + ___FeO ⟶ Al_2O_3 + ___Fe

2. Draw diagrams like the ones opposite to show the atoms and molecules for the reactions below, e.g.

2 K + F_2 ⟶ 2 KF



A. 2 C + O_2 ⟶ 2 CO	
B. 2 Cu + O_2 ⟶ 2 CuO	
C. 2 HCl + 2 K ⟶ 2 KCl + H_2	
D. 2 Mg + O_2 ⟶ 2 MgO	
E. 2 Ca + O_2 ⟶ 2 CaO	
F. $CaCO_3$ (pg60) ⟶ CaO + CO_2	

3. Acid in a flask is placed on a balance, the balance reads 100g. Magnesium weighing 10g is added to the beaker and the mass goes up to 110g. The magnesium starts *fizzing* and the mass goes down.

a. Why do you think the mass goes down when we know mass is conserved (same before and after)?

b. What would happen to the mass if a bung was placed on top and why?

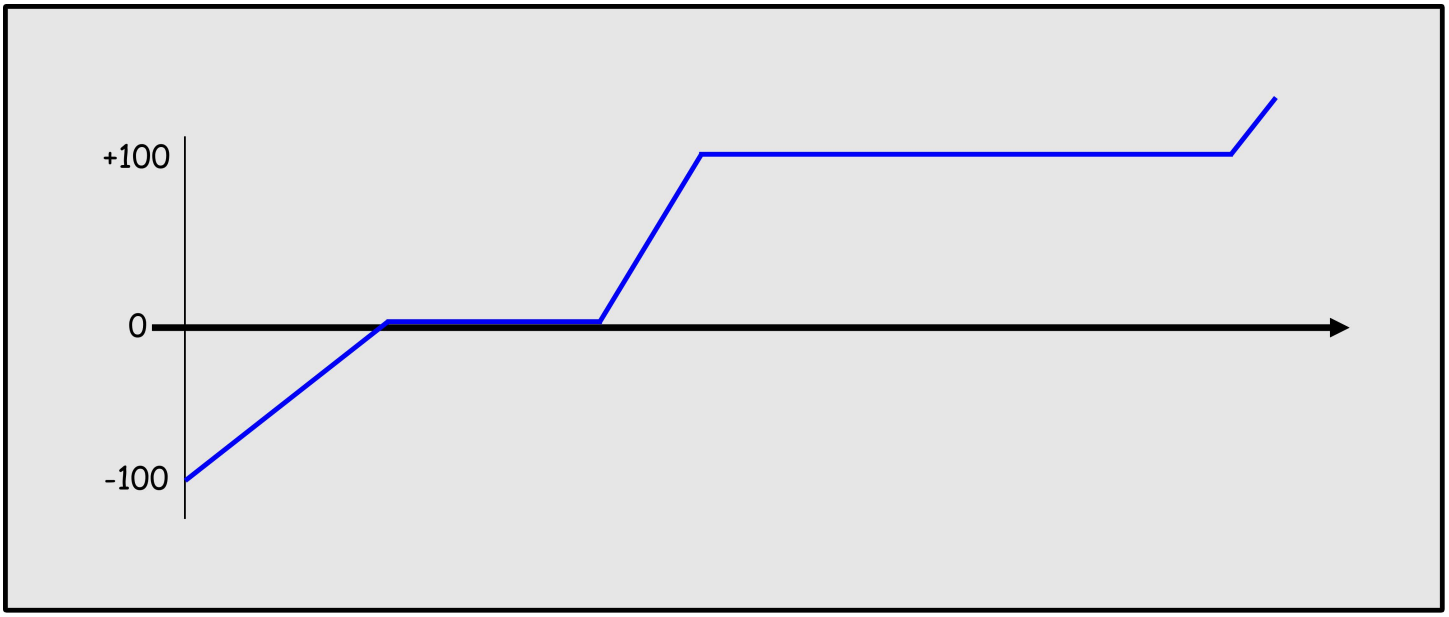
Questions on Changes of State

Comprehension

1. When we talk of changing state, what do we mean?
2. To do this what must happen?
3. What do we mean by gaseous state?
4. How do we nearly always think of water?
5. What happens if we remove energy from the water molecules in the air?
6. If the water molecules are closer together, what happens to the force of attraction between them?
7. What change of state begins to happen?
8. If we continue to remove energy from the water molecules what happens to them?
9. What happens to the force of attraction eventually?
10. What state of matter is now formed?
11. What does line '**a**' show on the graph?
12. What happened to the 'energy in' during line '**b**' on the graph?
13. When line '**b**' meets '**c**', what has happened to all the ice?
14. What happens to the water at 100°C and what is another name for it?
15. At '**e**' on the graph, what has happened to all the water?
16. Which have more internal energy, hot or cold substances?

Additional tasks

1. Label the y-axis (vertical) and the x-axis (horizontal) and the five different parts of the graph.



2. A chemical called salol has a melting point of 42°C. Salol is placed in a test tube with a thermometer and heated to 70°C. The temperature was then recorded every minute for 20 minutes as the **salol cooled.**

a. Plot a graph of the data with temperature (°C) on the y-axis against time (mins) on the x-axis. Connect the points to make a line.

b. Label the three parts of the line with; **SOLIDIFYING (FREEZING), LIQUID COOLING, SOLID COOLING**.

c. Which part of the graph shows no change in temperature.

Temperature of salol (°C)	70	65	60	55	51	47	45	43	42.5	42	42	42	42	40	38	36	34	32	30	29	28
Time (minutes)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

3. Arrange the points below into two sentences to explain the ***flat section*** of the graph (spot the clues!).

this releases heat energy into the salol / bonds are formed /
This happens until all liquid has turned to solid / and stops the temperature falling. /
and the temperature begins to fall again. / During solidification

Questions on Pure Substances, Mixtures and Separation

Comprehension

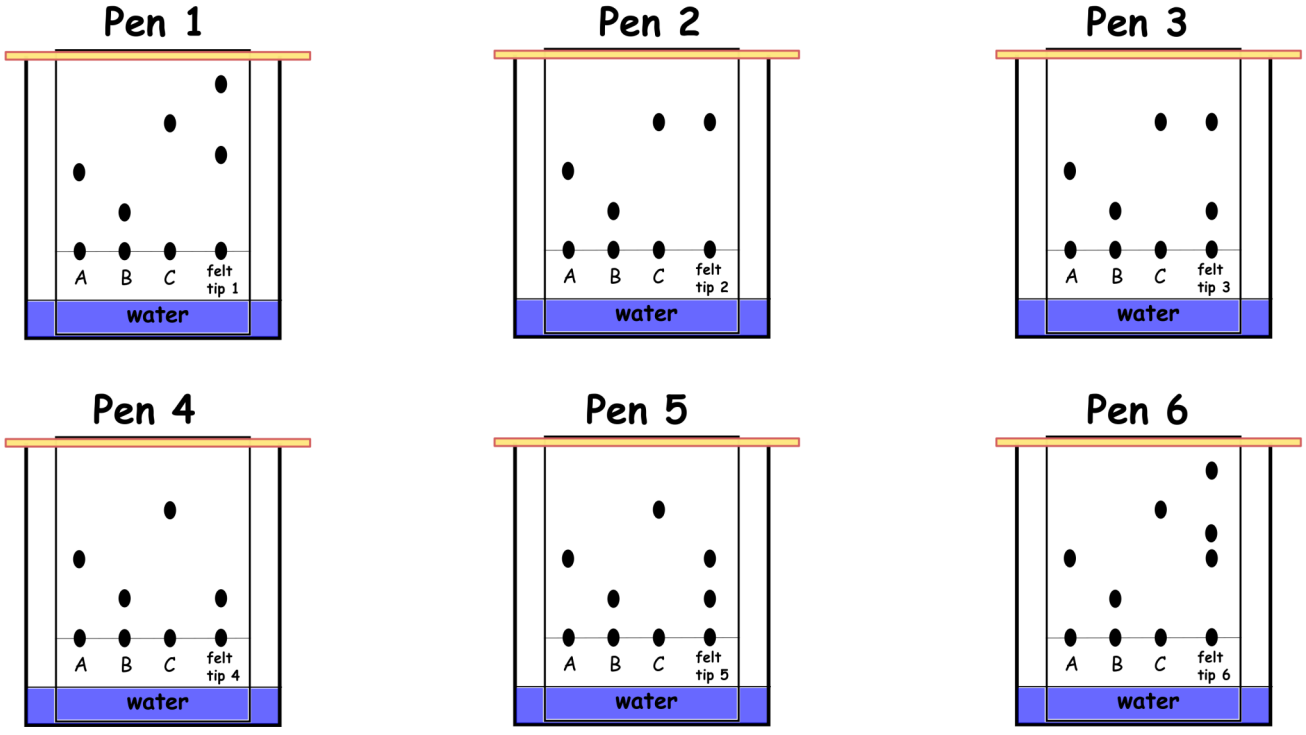
1. What is a pure substance made from?
2. What are two examples of mixtures?
3. In a mixture the substance aren't what?
4. How could you separate a sand and water mixture?
5. What does immiscible mean?
6. What does filtering simply allow to happen?
7. What is the insoluble solid that doesn't pass through after filtering called?
8. What does magnetic separation simply mean?
9. What are the names of the three magnetic elements?
10. What does the word chromatography mean?
11. Chromatography is a method of what?
12. When performing chromatography what happens to some of the colours (chemicals)?
13. What happens to the others?
14. When the dissolved substances are separated what is produced?
15. How can we see if inks contain the same colours?

Additional tasks

1. Match the words below to their meanings and memorise.

Mixture	describes liquids that don't stay mixed, like oil and water
Immiscible	a combination of substances that are not chemically combined (bonded)
Filtrate	the three magnetic metals
Residue	a record of the separated substances by chromatography
Iron, Nickel and Cobalt	the liquid that passes through the filter
Chromatogram	the solid left behind after filtering

2. Six new felt tips need to be tested to make sure that they don't contain any of dyes, **A**, **B** or **C** that are banned. Compare the chromatograms and state whether felt tip pens 1 to 6 contain any of the banned dyes.



3. **Four** boys share a desk. One of the boys feels a push in his side and notices some blue/black ink on his white shirt. **Two** of the other boys have **different black** pens and **one** has a **blue** pen. It is difficult to tell if the ink is blue or black. The teacher uses a cotton bud to absorb some of the ink and says to the three boys 'I'm going to find out who did this, give me your pens'.
Explain how the teacher could use chromatography to find out which pen it was.

Questions on Evaporation and Distillation

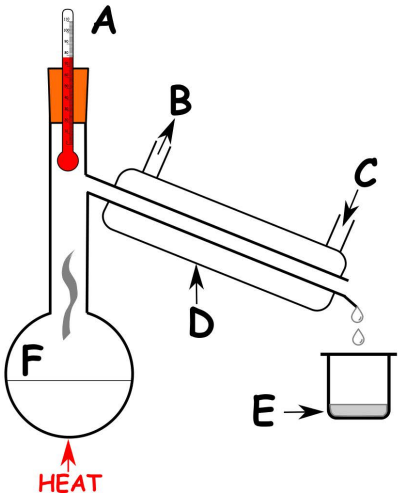
Comprehension

1. What happens to the molecules when we evaporate a liquid like water?
2. At what temperature can evaporation take place?
3. When water molecules break away at the surface what do they take with them?
4. What does this do to the liquid left behind?
5. When you sweat and the water evaporates, what is left behind?
6. What can be seen left behind when a puddle evaporates?
7. If you let the water evaporate from a sugary drink what are you left with?
8. What can make this effect faster?
9. Why is it better to evaporate just below the boiling point?
10. Simple distillation is a way of doing what?
11. What does it involve?
12. What are we able to obtain by distilling sea water?
13. What is this process called?
14. We can use distillation to separate a mixture of liquids because they have different what?
15. You can separate a mixture of alcohol and water by boiling off the alcohol at what temperature?

Additional tasks

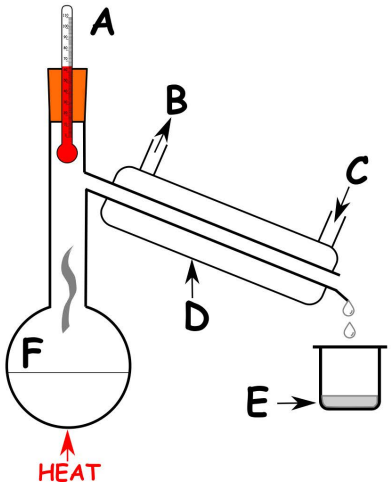
1. Label the apparatus below.

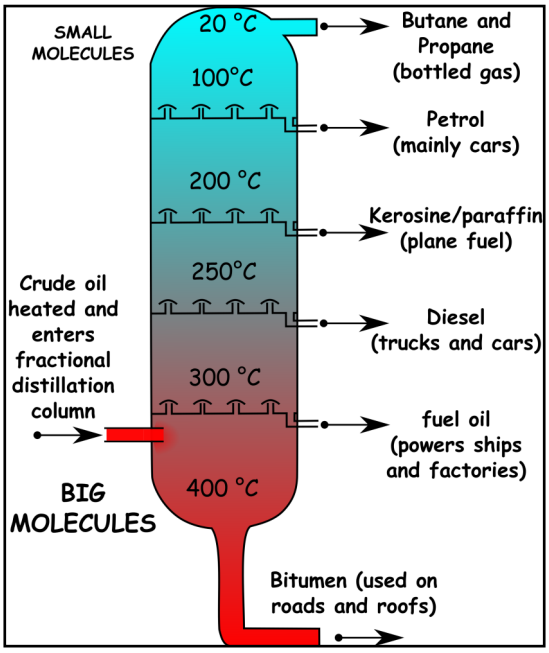
Label A-F below using the following.
Water/salt mixture, condenser, cold water in, thermometer reads 100°C, warm water out, pure water



2. Label the apparatus below.

Label A-F below using the following.
Acetone and water mixture, condenser, cold water in, thermometer reads 65°C, warm water out, pure acetone





3. Crude oil is a **mixture** and can be separated into its useful parts using **fractional distillation**. Complete the gap filling exercise that begins to explain how fractional distillation works. *Most answers are in the diagram, **look carefully**.*

Crude oil, condenses, coolest, Gases, boiling, different, diesel, points, hottest, petrol, sized, 100°C, 250°C

The column is _____at the bottom and _____at the top. _____ ___is a mixture of different _____ molecules that have different _____ points. This means they condense back to liquids at _____ temperatures. At different _____up the column we can collect the liquid that _____ at that temperature. The _____ part of crude oil condenses at about _____. The _____ part of crude oil condenses at about _____. _____ collect at the top and are the smallest molecules.

Questions on Dissolving

Comprehension

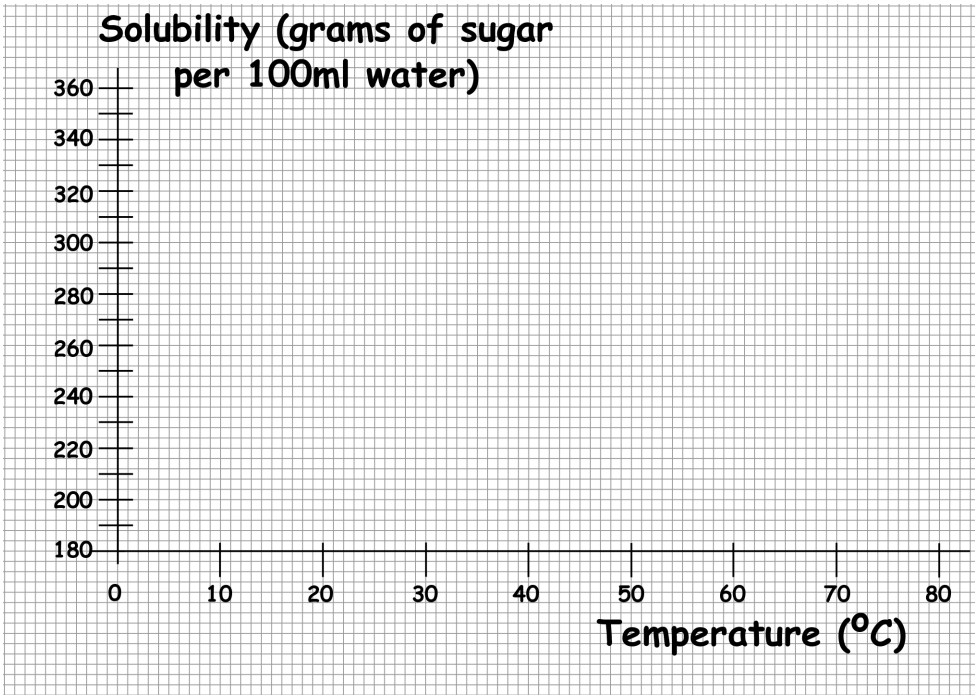
1. What does dissolving mean?
2. What 'appears' to happen to the solid that is dissolved?
3. What happens to the sugar molecules, once they are surrounded by the water molecules?
4. What is the substance you are dissolving called?
5. What name is often given to water?
6. What is another common solvent?
7. What does solubility tell you?
8. What do people mean when they say you are saturated because of the rain?
9. Why some substances dissolve and others don't, is simply down to what?
10. What will happen if the force of attraction between the water molecules and sugar molecules is stronger than the attractive force between the sugar molecules?
11. What else will dissolve in liquids?
12. Which gas is dissolved in fizzy drinks?
13. What can affect how quickly substances dissolve?
14. Why do fish sometimes come to the surface to 'gasp' for air? (WHAT? box)
15. What has no effect on nail polish?
16. What solvent is nail polish remover and what else can it dissolve?

Additional tasks

1. Match the words to their meanings and memorise.

Solute	what is produced when a solute dissolves in a solvent e.g. salty water
Solvent	not able to be dissolved, e.g. chalk, sand, glass
Solution	the substance being dissolved
Soluble	when no more solute can be dissolved by the solvent
Insoluble	the liquid you are dissolving into
Saturated	able to be dissolved, e.g. sugar, salt, metal in acid

2. The table below shows how much sugar dissolves in 100ml of water and how this changes with temperature. Plot solubility (grams of sugar per 100ml of water) on the y-axis against temperature (°C) on the x-axis. Draw in a smooth curve.



Solubility (grams of sugar per 100ml of water)	Temperature (°C)
190	10
200	20
215	30
235	40
260	50
290	60
325	70
360	80

3. 360 grams of salt can dissolve in one litre (1000ml) of water before saturation. Say whether the following amounts would be saturated or not.

a.	190g of salt in 500ml of water	b.	36g of salt in 120ml of water	c.	7g of salt in 20ml of water
d.	80g of salt in 250ml of water	e.	720g salt in 1500ml of water	f.	40g of salt in 100ml of water

Questions on Combustion

Comprehension

1. What is another name for combustion?
2. What are the three requirements for combustion?
3. Where does the oxygen normally come from?
4. What happens if you remove one of the requirements for combustion?
5. What are hydrocarbons commonly used as?
6. What are the products of burning methane, CH_4?
7. When does complete combustion happen?
8. What are hydrocarbons made from?
9. As well as methane what other common fuels are used for heating and cooking?
10. Why do the windows 'steam up' when a gas oven is on for a long time?
11. In the combustion experiment what happens to the limewater and the chemical in the 'U' tube?
12. What is **incomplete** combustion also called?
13. When does incomplete combustion happen?
14. What are the three products of incomplete combustion?

Additional tasks

1. Write out the word equation for complete combustion and incomplete combustion below;

Complete combustion

Incomplete combustion

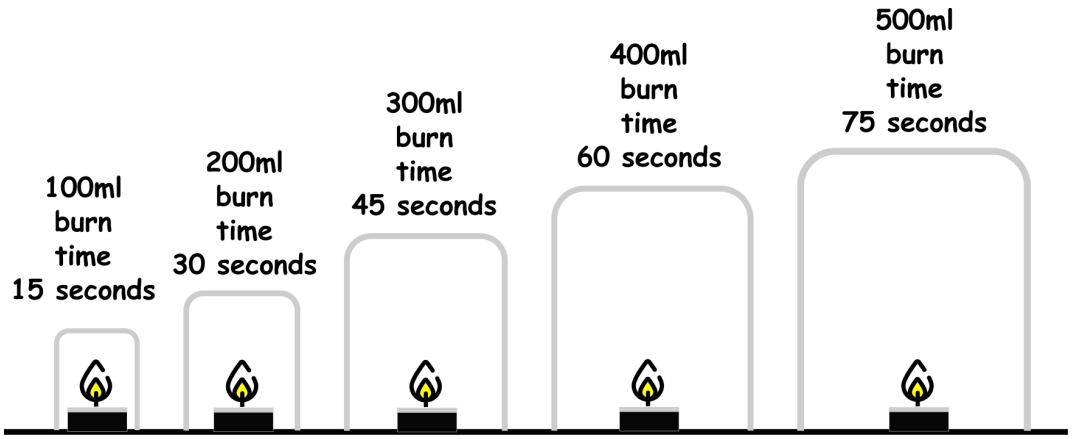
2. Using the 'balanced' symbol equations opposite, write the number of carbon, hydrogen and oxygen atoms underneath the left hand side and right hand side of **both** equations.
Remember 4 CH_4 means 4 X C, 4 carbon atoms (4 C) and 4 X H_4, 16 hydrogen atoms (16 H). They should be the same on both sides!

3. **Identical candles** are lit and then different sized (volume) beakers are placed on top. A stop watch is then used to time how long it takes before the candles go out.

a. Why do the candles go out?

b. Why do they burn longer under bigger beakers?

c. What pattern can you see in the results? What is the name for this relationship (pg152)?



d. If you plotted burn time (y-axis) against volume (x-axis), what would a graph of the results look like (pg152)?

e. Predict how long you think it would take for the candle to go out under a 1000ml volume beaker.

Questions on Thermal Decomposition

Comprehension

1. What is heat used for in thermal decomposition?
2. What do we usually use to heat the solid in a laboratory?
3. What is another name for calcium carbonate, $CaCO_3$?
4. What happens if you add water to calcium carbonate, $CaCO_3$ before it is heated?
5. What is another name for calcium oxide, CaO?
6. Where are huge amounts of calcium oxide, CaO made every year?
7. What is formed after calcium carbonate, $CaCO_3$ is heated?
8. What does copper carbonate, $CuCO_3$ turn into after heating?
9. How do we know a gas is given off when copper carbonate, $CuCO_3$ is heated?
10. How do we know that this gas is carbon dioxide, CO_2?
11. Where do carbonates come from?
12. What does zinc carbonate, $ZnCO_3$ decompose to?
13. Where does zinc oxide, ZnO, have lots of uses?
14. What products can it be found in?

Additional tasks

1. Complete the word equations for the thermal decomposition of the carbonates below.

Calcium Carbonate $\xrightarrow{\text{(heat)}}$ *Calcium _____ + Carbon dioxide*

Copper Carbonate $\xrightarrow{\text{(heat)}}$ *_____ oxide + _____ dioxide*

Zinc Carbonate $\xrightarrow{\text{(heat)}}$ *Zinc _____ + _____ _____*

Magnesium Carbonate $\xrightarrow{\text{(heat)}}$ *_____ _____ + Carbon dioxide*

Sodium Carbonate $\xrightarrow{\text{(heat)}}$ *_____ _____ + _____ _____*

2. Solve the following 12 clues.

i. *Another name for calcium carbonate* _____

ii. *Calcium carbonate will thermally decompose to?* _____

iii. *Thermal refers to?* _____

iv. *An element bonded to CO_3 is called a?* _____

v. *A black powder from heating copper carbonate?* _____

vi. *This liquid turns cloudy when carbon dioxide is bubbled through?* _____

vii. Decompose refers to? _____

viii. Another name for calcium oxide? _____

ix. Used to heat things in a lab? _____

x. Has many uses in medicine? _____

xi. Cement, water and sand make? _____

xii. Huge amounts of calcium oxide are made in? _____

3. Complete your own version of the flow chart 'Uses of $CaCO_3$' as a **mind map**. Draw pictures if you like. Other uses you can add include; as *writing chalk, in indigestion tablets, used in making steel, used in making paper, used in making paints, used in dietary supplements, used in cosmetics, used in bread making, used in animal feed and used in making many pills.*

Questions on Oxidation Reactions

Comprehension

1. What would happen to us without oxidation reactions?
2. What is steel mainly made from?
3. Why does an apple soon turn brown once bitten?
4. What is oxidation?
5. What is the product of oxidation called?
6. What is produced when copper is heated to high temperatures in air?
7. What kind of reaction is combustion?
8. What is produced when hydrocarbons are burned?
9. What is coal mainly made from?
10. What is the product of burning carbon?
11. During respiration what is glucose oxidised to give?
12. What is respiration the same as?
13. Because of this, what is respiration also called?
14. What sort of temperatures does respiration happen at?

Additional tasks

1. Complete the word equations for oxidation below.

a. Zinc + Oxygen → _____

b. Beryllium + _____ → Beryllium oxide

c. _____ + Oxygen → Calcium oxide

d. _____ + Oxygen → Iron oxide

e. Aluminium + _____ → Aluminium oxide

f. Nickel + Oxygen → _____

g. _____ + Oxygen → Sulphur dioxide

h. Silicon + Oxygen → _____ dioxide

i. _____ + _____ → Carbon dioxide

2. Unscramble the words below to do with oxidation. They all appear on the opposite page!

USNRGTI _____

ITIDAONXO _____

RONBINGW _____

XINOIIGDS _____

OYNXEG _____

RODIIOENX _____

OPICXREPDEO _____

OBOCISNMTU _____

EPIRTRNSOIA _____

ABICXDEROONID _____

URNBGNI _____

REHBEAT _____

3. Use the periodic table to help with names.

a. Write the name of the oxide below underneath its chemical formula.

Sulphur trioxide, Aluminium oxide, Iron oxide, Chromium oxide, Vanadium oxide, Di hydrogen monoxide, Barium oxide, Lithium oxide, Potassium oxide

Al_2O_3	V_2O_5	SO_3
CrO_3	Fe_2O_3	BaO_2
Li_2O	H_2O	K_2O

4. Write the number of each atom in the molecule from its formula e.g. one form of iron oxide has the formula Fe_3O_4. This means 3 X Fe (iron) atoms and 4 X O (oxygen) atoms.

Questions on Displacement Reactions and the Reactivity Series

Comprehension

1. What is the dictionary definition of displacement?
2. Why are you able to grab back your favourite toy from your little brother or sister?
3. In chemistry how do we describe the stronger chemical?
4. Why is 'Z' able to steal 'X' from 'Y'?
5. What do we say that 'Z' has done to 'Y'?
6. What are the names of the four salts in the classic displacement experiment?
7. What are the salts (sulphates) reacted with?
8. What do we call it when elements are put in order of reactivity?
9. What is a metal higher in the reactivity series able to do?
10. Which is the most reactive metal of the four in the classic experiment?
11. How can we see that a chemical reaction has taken place?
12. Why does adding magnesium to magnesium sulphate produce no reaction?
13. Which displacement reaction gets hot enough to weld metal together? (WHAT? box)
14. What are some explosions examples of? (WHAT? box)

Additional tasks

1. In the empty spaces of the jumbled table below, write either, **no reaction** or **yes** followed by the **name** of the metal **displaced**. Try using the reactivity series rather than the table opposite.

Salt solution	Iron metal	Magnesium metal	Copper metal	Zinc metal
Magnesium sulphate				
Zinc sulphate				
Iron sulphate				
Copper sulphate				
Number of reactions				

2. Use the reactivity series to write **WILL** or **WILL NOT** to the following.

Potassium _____ displace platinum Sodium _____ displace calcium

Magnesium _____ displace calcium Carbon _____ displace aluminium

Zinc _____ displace tin Lead _____ displace copper

Copper _____ displace carbon Tin _____ displace silver

Silver _____ displace gold Platinum _____ displace copper

Sodium _____ displace magnesium Aluminium _____ displace lead

Hydrogen _____ displace zinc Carbon _____ displace iron

3. Here is a mnemonic for remembering the reactivity series. Make a better one of your own.

Please **S**top **C**alling **M**e **A** **C**areless **Z**ebra **I**nstead **T**ry **L**earning **H**ow **C**opper **S**aves **G**old **P**lease.

Questions on Acids, Alkalis, Neutralisation and the pH Scale

Comprehension

1. How can acids and alkalis be thought of?
2. If we mix the right amount of acid and alkali what can happen?
3. What do we call this?
4. What are the two most commonly used acids in schools?
5. When is it true that acids are dangerous?
6. Why is the hydrochloric acid, HCl, in our stomachs essential?
7. What might have something to do with the pain we experience from bee stings?
8. What is the most commonly used alkali in schools?
9. How does the sodium hydroxide used in making soap leave it?
10. How do indigestion tablets help calm your stomach?
11. What might have something to do with the pain we experience from wasp stings?
12. What do we use indicators for in chemistry?
13. What is the pH scale and what does it tell us?
14. What do we often use to know the pH of a solution?
15. What colour is neutral on the pH scale?
16. Why can't litmus indicator tell us the pH?

Additional tasks

1. Complete the jumbled pH table below using the examples given on the opposite page.

pH	Example	Acid or alkali?
4		
8		
10		
6		
11		
5		
1		
12		
2		
9		
3		
14		
7		
13		

3. Design your own leaflet explaining the benefits and uses of acids and alkalis (A4 paper folded in half).

Or

Design your own hazard symbol, warning of the dangers of strong acids and alkalis.

2. Complete the gap filling exercise below. Choose from the following words.

acid particles, corrosive, skin, test tubes, acidic, Sulphuric acid, soaps, concentrated, 12, Hydrochloric acid, acetic acid, sodium hydroxide, washing powders, volume, strong, neutralise, stomachs, alkaline, neutral, red, metals, blue, bleach

Acids are only dangerous if they are _____ or _____. Concentration is how many _____ _____ are in a certain _____. Acids and alkalis can be _____. This means they can damage your _____ or attack _____. The hazard symbol for corrosive has a picture of two _____ _____in it. _____ _____, H_2SO_4 is used in car batteries. _____ _____ helps our digestive system to work properly. Another name for vinegar is _____ _____.

Alkalis like _____ _____ are commonly used in schools. _____ is alkaline and has a pH of about ___. So are _____ and _____ _____. Alkalis _____ acids so can be used to treat upset _____. pH stands for potential of hydrogen. On the pH scale, pH-1 is strongly _____, pH-14 is strongly _____ and pH-7 is _____. pH-7 is green, becoming more acidic the colour changes to yellow then _____, becoming more alkaline the colour changes to more _____ then purple.

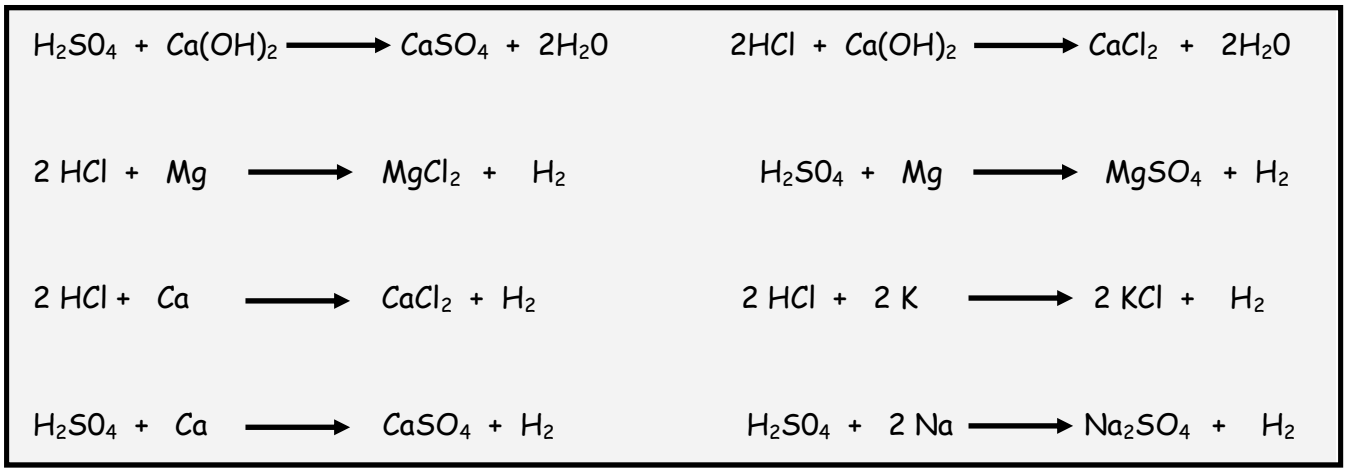
Questions on Reacting Acids and Alkalis and Acids and Metals

Comprehension

1. What can happen when you react an acid with an alkali?
2. What does an acid plus an alkali produce?
3. What is produced when an acid reacts with a metal?
4. When hydrochloric acid, HCl, is reacted with sodium hydroxide, NaOH, what is the name of the salt produced and what is its formula? (text box)
5. When sulphuric acid, H_2SO_4, is reacted with sodium hydroxide, NaOH, what is the name of the salt produced and what is its formula? (text box)
6. What is the name of the salt produced when using hydrochloric acid, HCl?
7. What is the name of the salt produced using sulphuric acid, H_2SO_4 ?
8. Which fertiliser is made by reacting sulphuric acid, H_2SO_4 with ammonium hydroxide?
9. If magnesium metal is added to hydrochloric acid, HCl, what will you quickly see?
10. What is the test for hydrogen gas?
11. How quickly a reaction takes place between an acid and metal depends upon what?
12. When sulphuric acid, H_2SO_4 is reacted with zinc metal, what is the name and formula of the salt produced?
13. When hydrochloric acid, HCl, reacts with potassium metal, what is the name and formula of the salt produced?

Additional tasks

1. Write the name of the salt produced underneath the chemical formula. Use the periodic table (pg90) to help and choose from; ***Calcium sulphate, Magnesium chloride, Calcium chloride, Magnesium sulphate, Potassium chloride, Calcium sulphate, Sodium sulphate and Calcium chloride***



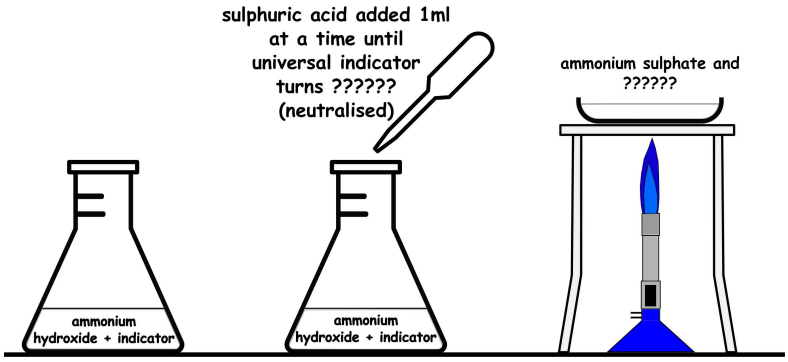
2. Ammonium sulphate (a fertiliser) is made by adding sulphuric acid (an acid) to ammonium hydroxide solution (an alkali). The steps are shown below.

a. What colour would the ammonium hydroxide solution and universal indicator be to begin with? (pg84)

b. When enough acid is added to neutralise the ammonium hydroxide what colour would you expect? (pg84)

c. After neutralisation, apart from ammonium sulphate what else is produced?

d. Why is the Bunsen burner used to heat the solution?



3. Ammonium sulphate is a good fertiliser for grass (lawns). Explain how you could you test how effective it is? Think about;

- What would you measure?
- What would you keep the same / control?
- How would you make it reliable (repeats?)

Questions on Exothermic and Endothermic Chemical Reactions

Comprehension

1. What happens whenever a chemical reaction takes place?
2. When the reactants release heat (get warm or hot), what is this reaction called?
3. What will you see, if you measure the temperature before and after an exothermic reaction?
4. When the reactants absorbs heat (get colder), what is this reaction called?
5. What will you see if you measure the temperature before and after an endothermic reaction?
6. What happens to chemical bonds during a chemical reaction?
7. What happens when chemical bonds are formed?
8. What happens when chemical bonds are broken?
9. What happens to the 'heat energy' during an endothermic reaction?
10. What do energy level diagrams show?
11. Why is dissolving some salts in water endothermic?
12. What is an 'obvious' exothermic reaction?
13. What is neutralisation and is it exothermic or endothermic?
14. What is the chemical reaction of releasing energy from our food called?

Additional tasks

1. Complete the third of column of the table by writing whether the chemical reaction is **endothermic** or **exothermic**.

Starting temperature of reactants (°C)	Final temperature of products (°C)	Endothermic / Exothermic ?
20	30	
25	6	
-10	15	
22	65	
16	5	
18	-6	

2. If we take away the **energy released** in **making** bonds from the **energy absorbed** in **breaking** bonds we can work out if a reaction is endothermic or exothermic.

a. Minus the **energy released** from the **energy absorbed** (the energy difference) and complete the last two columns of the table. Try **without** a calculator!

Chemical Reaction	*Energy absorbed breaking bonds (KJ/ mole)*	*Energy released making bonds (KJ/mole)*	*Energy difference*	*Exothermic/ Endothermic*
$C + O_2 \rightarrow CO_2$	1200	1600		
$H_2 + Cl_2 \rightarrow 2HCl$	678	862		
$2HBr \rightarrow H_2 + Br_2$	732	629		
$2H_2 + O_2 \rightarrow 2H_2O$	1368	1852		
$2H_2O \rightarrow 2H_2 + O_2$	1840	1371		
$CaCO_3 \rightarrow CaO + CO_2$	178	0		
$C + 2H_2O \rightarrow CO_2 + 2H_2$	394	484		
$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$	654	763		

3. a. What do you notice about the energy difference for an exothermic reaction?

b. Complete these two sentences.

Exothermic reactions have a **negative** energy difference, the _____s have less chemical energy. Energy is released. Endothermic reactions have a **positive** energy difference, the _____s have more chemical energy. Energy is absorbed.

Questions on The Periodic Table of Elements

Comprehension

1. When scientists began discovering lots of new elements what did they put them in order of?
2. Who had great success with this method?
3. How did he arrange the rows?
4. What did Dimitri Mendeleev leave in his table, for elements he predicted should exist?
5. Each element in the periodic table is made from a different what?
6. Complete the sentence ; the atom is the smallest…
7. How many particles are atoms made from and where aren't they normally found?
8. What is the name of the three particles that the atom is made from?
9. What does the number at the top of each 'square' in the periodic table tell you and what is it called?
10. Why do the charges of an atom cancel out?
11. What does this mean that the atom is?
12. How are the electrons arranged in an atom?
13. What decides how one element reacts with another element?
14. What is the atomic number of chlorine?

Additional tasks

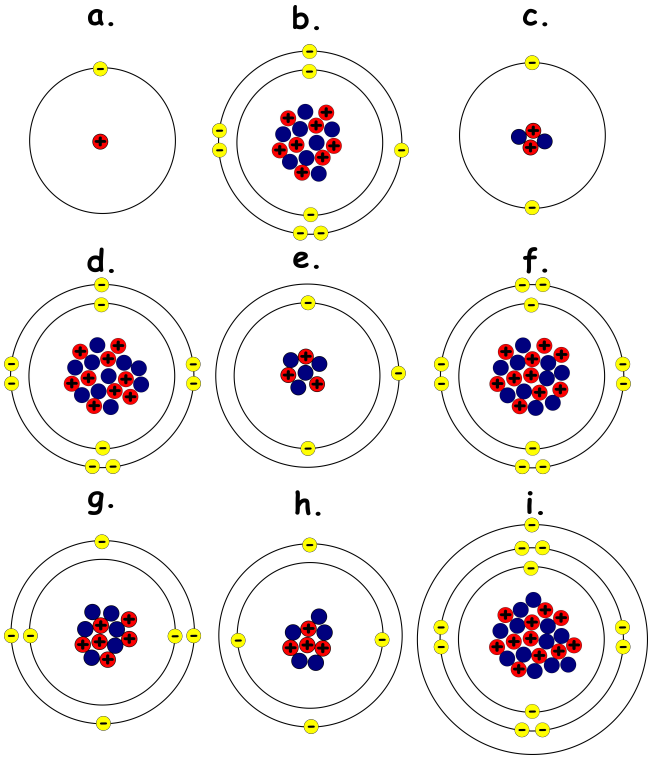
1. Use the periodic table to complete the number of protons, number of electrons and number of neutrons for each element. The first one is done for you.

Element	Number of protons	Number of electrons	Number of neutrons
Boron - 11	5	5	11 - 5 = 6
Carbon - 12			
Magnesium - 24			
Fluorine - 19			
Potassium - 39			
Lithium - 7			
Iron - 56			
Gallium - 70			

2. Unscramble these **amazing elements** from their description. Use the periodic table pg90 to help.

Precious, malleable metal - **GODL**
Liquid metal at room temperature - **ERRMYCU**
Important for strong bones - **ALUCMCI**
Keeps our swimming pools clean - **HLNCIREO**
Gas that makes up 78% of air - **ITNNEORG**
Gas that makes up 21% of air - **OYNXEG**
Heaviest naturally occurring element - **RAUUMNI**
(begins with U, on last column of wordsearch)
A magnetic metal - **CBTOLA**
Most reactive metal in group 1 - **CASMEUI**
Use in computer chips - **ILOSNIC**
A radioactive gas in group 8 - **RANDO**
Important in a healthy diet - **ELUSINME**
Most commonly used radioactive element in medical imaging - **EHUTIEMCTN**
A gas that gives us pretty lights - **NENO**

3. Use the periodic table to identify elements a. to i. below.



Questions on Properties of Metals and Non-Metals

Comprehension

1. What separates the metals from the non-metals on the periodic table?
2. What are metals good at?
3. What does this mean?
4. What does sonorous mean?
5. What do we mean by being dense?
6. What are the names of the three magnetic metals?
7. Why is much of the metal 'around us' magnetic?
8. What is the property of being able to pull metal into wires called?
9. Which metal is particularly ductile?
10. What does being malleable mean?
11. What is a mixture of metals called?
12. Why might you mix a strong, heavy metal, with a light, weak one?
13. Non-metals are bad at conducting electricity and heat which means they are good at what?
14. In what form do non-metals often exist at room temperature?
15. Why are non-metals dull?

Additional tasks

1. Write the following properties in the metals or non-metals column of the table below.

malleable, good conductors, not sonorous, bad conductors, strong, high melting points, ductile, not strong, not ductile, not malleable, sonorous, low melting points

Metals	Non-metals

2. Solve the jumbled words that describe the properties of metals.

ONUSORSO	*HYINS*
UCLDETI	*DEENS*
ALSLYO	*BDA NURIOASSTL*
GODO ODRCOCSNTU	*ALLMBEELA*
SRGTNO	*AGIMTECN*
IGHH GMLENTI PINTSO	*EHAVY*

3a. Shade or colour in a different colour the metals and non-metals. Write a key for the colour or shade you have used. **Remember, although hydrogen is in G1 (group 1) it's not a metal!**

b. Choose two metals and two non metals and write about any uses you know for them.
Do more if you can.

1 H Hydrogen 1																	2 He Helium 4
3 Li Lithium 7	4 Be Beryllium 9											5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
11 Na Sodium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulphur 32	17 Cl Chlorine 35.5	18 Ar Argon 40
19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 63.5	30 Zn Zinc 65	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84
37 Rb Rubidium 85	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium 98	44 Mo Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131
55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222

Questions on Properties of G1, G2, G7 and G8

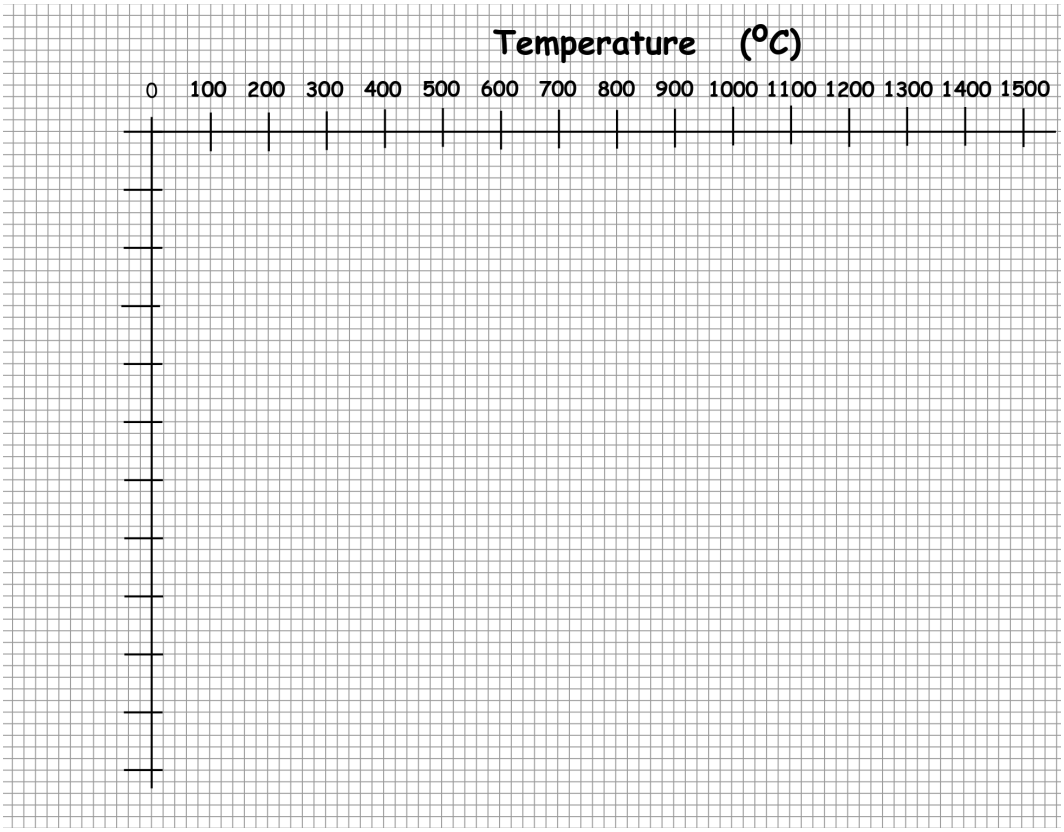
Comprehension

1. What are the Group 1 (G1) elements called?
2. What is one of the ways to investigate their reactivity?
3. What do the alkali metals produce when they react with water?
4. What happens to the reactivity as you move down Group 1?
5. Why does rubidium sink when dropped into water?
6. Why do Group 1 elements react in a similar way?
7. What are Group 2 (G2) elements called?
8. What do they produce when reacted with water?
9. What happens to their melting point as you move down the group?
10. Why do Group 2 elements react in a similar way?
11. What are the Group 7 elements called?
12. What state of matter are fluorine, chlorine, bromine and iodine at room temperature (20°C)?
13. What happens to the reactivity as you move down Group 7?
14. Why do Group 7 elements behave in a similar way?
15. What are the Group 8 elements called?
16. Why are they very unreactive?

Additional tasks

1. Match the terms to their descriptions below.

Groups	(the alkali earth metals), have two electrons in their outer shell
Group 1	(the halogens), have seven electrons in their outer shell
Group 2	(the noble gases), have full or eight electrons in their outer shell
Group 7	(the alkali metals), have one electron in their outer shell
Group 8	these are the columns in the periodic table and tell you the number of electrons in the outer shell. Elements in the same group behave similarly.



2. The melting and boiling points of lithium, sodium, potassium, rubidium and caesium are listed below. Plot a bar chart of the results **side by side** for each element and draw a key.

	Melting Point (°C)	*Boiling Point (°C)*
Li	180	1342
Na	98	883
K	63	759
Rb	30	688
Cs	28	671

3 a. How is **this** pattern different to the group 7 elements?

b. What other pattern in behaviour of the group 7 elements is the opposite?

Questions on Metals and Non-metal Oxides

Comprehension

1. When elements react with oxygen what do they form?
2. If the compound formed has two oxygen atoms, what will the **second part** of its name be?
3. What are the names of the three example monoxides?
4. What kind of elements are carbon, sulphur and nitrogen?
5. What will nearly all of their oxides do in water?
6. Which two compounds released from burning fossil fuels are responsible for acid rain?
7. What type of chemical are all metal oxides?
8. What are the products of the reaction between an acid and a metal oxide (base)?
9. What is the difference between alkalis and bases?
10. What other compounds are bases?
11. If a carbonate base reacts with an acid what gas is produced?
12. What is the formula for calcium carbonate?
13. What is calcium carbonate often used in and why?

Additional tasks

1. Use the difference between an **alkali** and **base** to put the following in the correct column.

   Sodium oxide (soluble in water), Iron oxide (insoluble in water), Copper oxide (insoluble in water), Potassium oxide (soluble in water), Lithium oxide (soluble in water), Tin oxide (insoluble in water)

Alkali	Base

2. Use the pattern on the page opposite **and** page 86 to predict the name of the compound produced when reacting the metal oxides and carbonates below, with sulphuric and hydrochloric acid.

a. *Sulphuric acid + Zinc oxide* → _____ *+ Water*

b. *Sulphuric acid + Magnesium oxide* → _____ *+ Water*

c. *Sulphuric acid + Calcium oxide* → _____ *+ Water*

d. *Hydrochloric acid + Zinc oxide* → _____ *+ Water*

e. *Hydrochloric acid + Magnesium oxide* → _____ *+ Water*

f. *Hydrochloric acid + Copper oxide* → _____ *+ Water*

g. *Hydrochloric acid + Zinc carbonate* → _____ *+ Water +* _____

h. *Hydrochloric acid + Magnesium carbonate* → _____ *+ Water +* _____

i. *Hydrochloric acid + Sodium carbonate* → _____ *+ Water +* _____

j. *Sulphuric acid + Zinc carbonate* → _____ *+ Water +* _____

k. *Sulphuric acid + Magnesium carbonate* → _____ *+ Water +* _____

l. *Sulphuric acid + Calcium carbonate* → _____ *+ Water +* _____

3. Write out four equations of your own. Two for the reaction between **lithium oxide** and **lithium carbonate** with **sulphuric acid** and two for the reaction of **potassium oxide** and **potassium carbonate** with **hydrochloric acid**.

Questions on Using Carbon to Obtain Metal from Ores

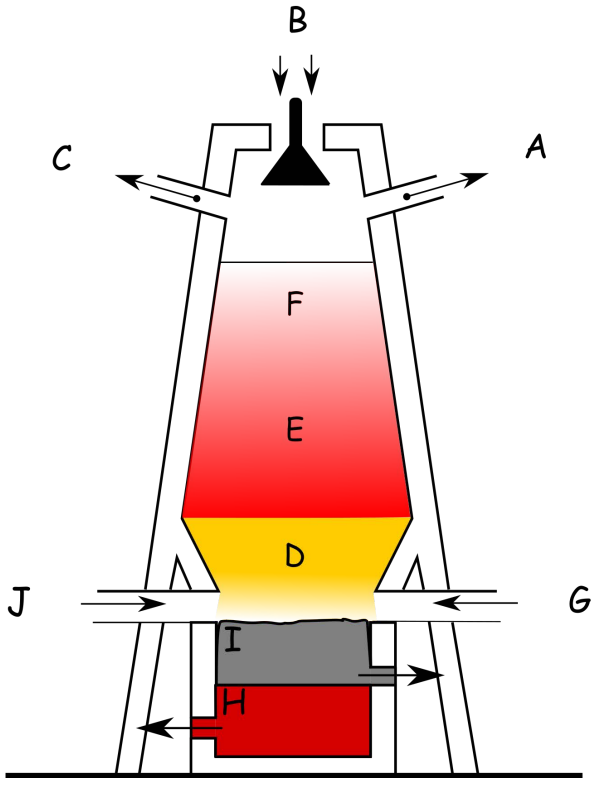
Comprehension

1. What are ores?
2. How are useful metals extracted from ores?
3. What does electrolysis do?
4. What are elements higher up in the reactivity series able to do?
5. What is magnesium metal able to do to copper sulphate?
6. What does the reactivity series mean we can do?
7. Where is carbon in the reactivity series?
8. Why is carbon cheap?
9. What can carbon be used for?
10. Which metals are extracted using carbon?
11. How is carbon used to extract the metal from its ore?
12. What is the name of an iron ore?
13. How is iron obtained from iron oxide?
14. How is lead obtained from lead oxide?
15. Give two uses of lead.

Additional tasks

1. Label the blast furnace below.

Blast Furnace (obtaining iron)



2. Use the periodic table to help (pg 90). Unscramble the names of the **metals** from their ores.

Acanthite an ore used for the production of **SLRIEV**

Bauxite an ore used for the production of **LUUAIIMMN**

Chalcocite an ore used for the production of **CPROEP**

Chromite an ore used for the production of **HRUCIMMO**

Cinnabar an ore used for the production of **ERRMYCU**

Cobaltite an ore used for the product **BLATCO**

Galena an ore used for the production of **ELDA**

Hematite an ore used for the production of **RNOI**

Malachite an ore used for the production of **CPROEP**

Scheelite an ore used for the production of **UNETTSNG**

Sperrylite an ore used for the production of **LAUPNIMT**

Sphalerite an ore used for the production of **CZNI**

Pentlandite an ore used for the production of **NCLIEK**

Rutile an ore used for the production of **ITUTINMA**

3. Other metals that can be extracted using carbon include zinc, tin and copper. This is because they are below carbon in the reactivity series.

Copper is used to make wires that carry electricity. It is also used to make water pipes and in making pots and pans.

Zinc is used to galvanize steel (coat it with zinc to stop it rusting). It is used in making brass for fittings such as door handles, taps and plug pins.
It is also used in making batteries.

Tin's famous use is the 'tin can'.

Write about how our lives are made better through the use of these metals.

Questions on Polymers (Plastics), Ceramics and Composites

Comprehension

1. What are polymers or plastics?
2. How are they made?
3. What are the molecules that link together to make a polymer called?
4. What is polythene made from?
5. Why can PVC be used to make shoes and clothes?
6. What does composite mean?
7. What do you make if you mix sand, cement stones and water?
8. Why is carbon fibre used in making bikes and cars?
9. What does MDF stand for?
10. What is MDF widely used for?
11. What do we think of when we see the word ceramic?
12. What useful properties do ceramics have?
13. What are ceramics used to make?
14. Why are our houses 'made from' ceramics?
15. What property makes ceramics useful on electricity pylons?

Additional tasks

1. Memorise the materials and their uses below.

PVC (polyvinyl chloride), used to make windows (frames) and many building applications. Used to make clothes and bottles, very versatile (many uses).

PTFE (polytetrafluoroethylene), a brilliant insulator and lubricant. Used in loads of applications, non-stick pans, lubricant sprays, as an insulator in electronic circuits, Gore-Tex materials, bullet coatings to reduce friction, plumbing tape, computer mice to reduce friction ……

Concrete, a composite of sand, cement and stones, the most widely used building material in the world.

Carbon fibre, a composite of carbon and plastic resin, light and strong, used widely in bicycle, car and aeroplane manufacture.

Ceramics, hard, durable, brilliant insulators but brittle materials. Made by baking a material like clay in an oven. Great for toilets, sinks and crockery.

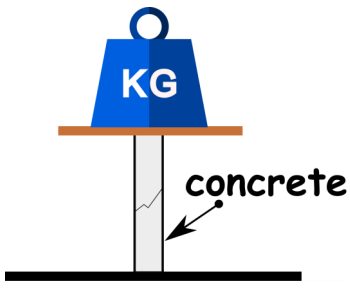
2. Write the materials below into the correct column in the table.

NYLON, CHIPBOARD, HOUSE BRICK, BATHROOM SINK, PLAYDOUGH, PTFE, FALSE TEETH, POLYSTYRENE, REINFORCED GLASS, TILES, FIBRE-GLASS, RUBBER, PAPIER-MACHE, A SAUCER, SILK

Polymer	Composite	Ceramic

3. Your teacher sets a challenge to find the strongest concrete mix (**sand, stones, cement** and **water**). The mix is put in a tube and allowed to set before being tested for how much weight it can withstand before breaking. Write about how you could do this experiment, think about;

- What you would change?
- How many variables would you change at once?
- Would you repeat and why?
- What graph could you plot?



4. The above test is under **compression**. How else could you test the strength of the concrete (clue pg152)?

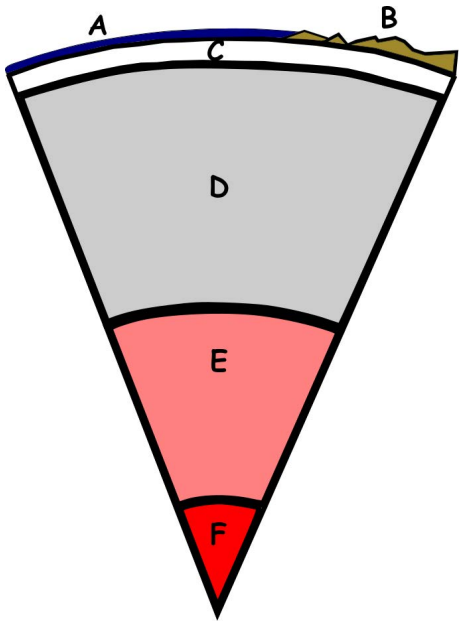
Questions on Composition and Structure of the Earth

Comprehension

1. What is the earth?
2. What is a mineral?
3. How many distinct layers is the earth made from?
4. What are the names of the layers?
5. Which of the layers is the thickest?
6. About how thick is the earth? (Its radius)
7. What happens to the density of the layers as you head towards the centre?
8. What metals are the inner and outer core mainly made from?
9. Where does most of our knowledge of the earth's interior come from?
10. Imagine broken pieces of plate sitting on treacle, what happens to the plates if the treacle is heated?
11. What is this theory called?
12. Scientists have evidence that the earth was what, millions of years ago? What is its name?
13. What happened to this continent?
14. What can be caused by land masses colliding?
15. What are the two easily understood pieces of evidence for plate tectonic theory?

Additional tasks

1. Label A-F below **and** add the approximate temperatures of the mantle, outer core and inner core.



2. Complete the table by writing the name of the layer from its thickness.

Layer	Thickness (miles)
	4
	1400
	25
	760
	1800

3. In terms of **elements** the **composition** of the **mantle** is approximately **45% oxygen**, **22% silicon**, **23% magnesium** and **10% other** (includes iron, aluminium, calcium, sodium and potassium). Draw a pie chart of the composition below. Colour in or shade to make a key.

KEY

PIE CHART TO SHOW COMPOSITION OF THE MANTLE

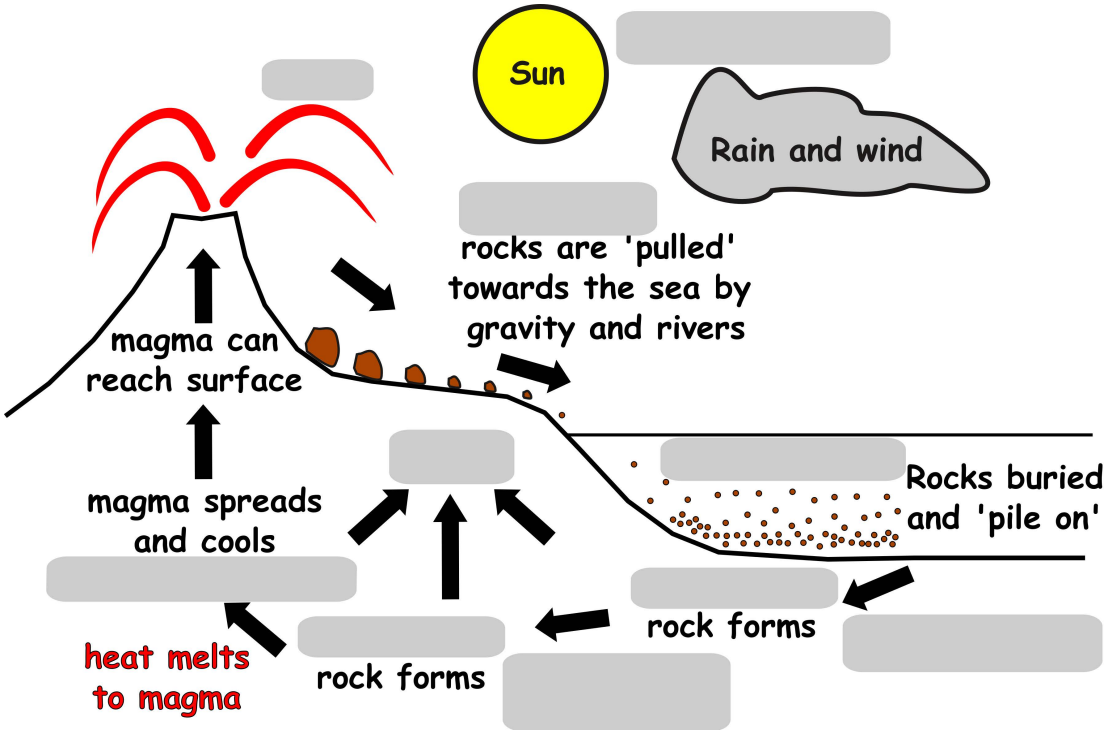
Questions on the Rock Cycle

Comprehension

1. How many different types of rock are there?
2. What does the rock cycle describe?
3. What makes the rock cycle happen?
4. What is liquid rock under the ground called?
5. What do we call liquid rock above the ground?
6. Why is extrusive rock made from smaller crystals?
7. What is the name given to rock being forced to the surface slowly over time?
8. What does weathered mean?
9. How do rocks get transported to the oceans?
10. How is sedimentary rock formed? Give an example of sedimentary rock?
11. What does heat and pressure do to sedimentary rock?
12. What does metamorphosis mean?
13. How is igneous rock formed?
14. What is the name of the igneous rock we use to clean our skin?

Additional tasks

1. Label the blanks below using the words opposite.



2. Solve the jumbled terms from their definitions.

a. Breaking down and dissolving of rock **ETNWIEGARH**
b. Molten rock at the surface **LAAV**
c. The name for rocks being forced to the surface from underground **ULTPFI**
d. An intrusive igneous rock **RATGENI**
e. An extrusive igneous rock **BSTALA**
f. The moving of rocks by water, wind and gravity **ROOENSI**
g. The settling of sediment layers on top of each other **EOODIINPTS**
h. An example of a sedimentary rock **ANNSOSEDT**
i. Molten rock beneath the surface **MAAGM**
j. An example of a metamorphic rock **MREALB**

3. Fossils of long dead sea animals can be found on Mount Everest.

a. How does this provide evidence for **uplift?**

b. Scientists can now use satellites to measure uplift accurately. **Nanga Parbat** in the Himalayas is rising by 7mm per year.

i. How long would it take the mountain to rise the height of a desk (about 80cm = 800mm).

ii. When Nanga Parbat does stop rising what will cause it to shrink in size again?

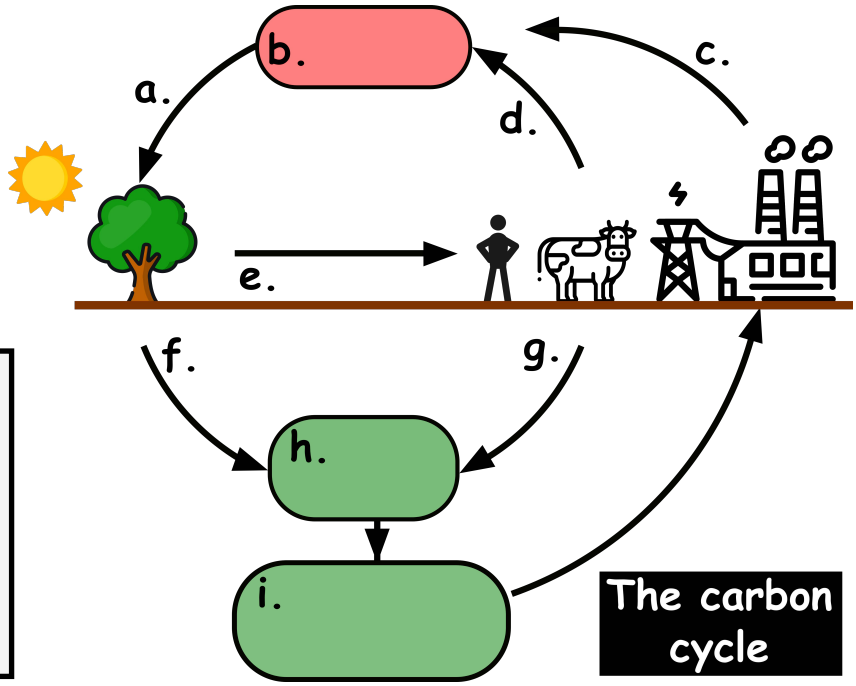
Questions on Earth's Limited Resources

Comprehension

1. What sort of life forms are all living things on earth?
2. What does the carbon cycle show?
3. How long does it take the fossil fuels to form?
4. As well as contributing to climate change, what else is wrong with the way we use earth's resources?
5. What is the raw material for plastics?
6. What else can oil be used for?
7. Where is too much plastic ending up?
8. Which two metals are used in batteries to power anything from a tablet to an electric car?
9. Where does most of the world's cobalt and lithium come from?
10. What isn't there enough of in many parts of the world?
11. How can wells become polluted?
12. What happens if more water is consumed than replaced by rainfall?
13. What is another word for drinkable water?
14. What can put our supply of water at risk?

Additional tasks

1. Label the **carbon cycle** using the diagram opposite to help.



The carbon cycle

2. Find the words relating to earth's limited resources in the word search below.

CARBONCYCLE CARBONDIOXIDE
PHOTOSYNTHESIS
FOSSILFUELS POPULATION
DEFORESTATION RESOURCES
PLASTIC BIODEGRADEABLE
LITHIUM COBALT POTABLE
WASTEFUL BATTERIES

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

3. Design a leaflet (A4 paper folded in half) informing people about earth's limited resources and how to use them wisely.
(*pg108 What to do? may help*)

Think about;

- Recycling
- Being less wasteful
- Burning less fossil fuels
- Deforestation
- Population size. What can be done?
- Richer countries helping poorer countries with clean water and sanitation (google what Bill Gates has done)

Questions on The Earth's Atmosphere and Climate Change

Comprehension

1. What is our atmosphere?
2. What are the two main gases in earth's atmosphere and what are their percentages?
3. How much has the population risen since the year 1800?
4. Where does a lot of our energy (even electricity) still come from?
5. What is a greenhouse gas good at?
6. What would happen to the heat without our carbon dioxide blanket?
7. Where does a lot of methane in the atmosphere come from?
8. Why has the amount of methane in the atmosphere increased?
9. What has the extra heat done to land and sea water?
10. What does this cause in some parts of the world?
11. What does it do in other parts of the world?
12. What's happening to the frequency of extreme weather?
13. What sort of vehicle could we switch to that would help?
14. Generating electricity through which methods would also help?

Additional tasks

1. Use the data in the table to plot the average global air temperature (°C) against year.

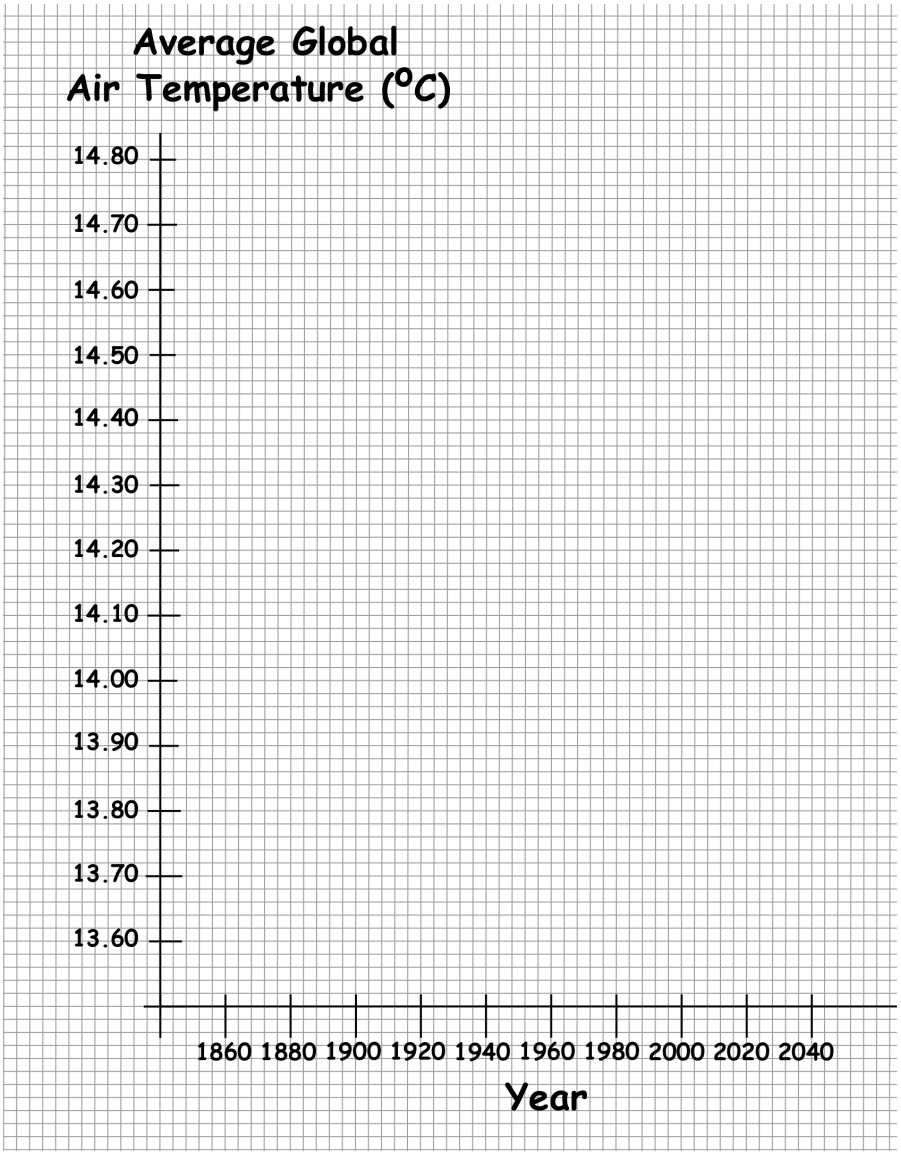
Year	1880	1900	1920	1940	1960	1980	2000	2020
Average global air temp (°C)	13.65	13.74	13.83	14.07	13.95	14.18	14.20	14.50

2 a. What is the 'general trend' (pattern) for the data in the table.

b. What happens between 1940 and 1980?

c. What sort of 'extra' data would make any trend clearer? (Think about range and frequency)

3. Complete the gap filling exercise on global warming. Choose from the words in bold below.



warmer, Water, carbon dioxide, fossil fuels, animal, rotting, light, greenhouse, methane, re-emitted, heat energy, gases, surface, back, extra

The two main _____ gases are _____ _____ and _____. Carbon dioxide comes mainly from burning _____ _____ . Methane comes mainly from _____ farming and _____ vegetation. _____ in the atmosphere also helps trap heat that would escape into space. The _____ energy from the sun is absorbed by earth's _____ heating it. This energy is _____back towards space. Instead of escaping, this _____ _____ is absorbed by greenhouse _____ which re-emit some of the heat _____towards earth. The _____ greenhouse gases from human activity mean that the earth is getting _____ too fast.

Questions on Reaction Rates and Catalysts

Comprehension

1. What do we mean, when we talk about rates?
2. Measuring how quickly which product is formed, can measure the rate of a reaction?
3. What could be the unit of how quickly this product is formed?
4. How else can a reaction rate be measured?
5. What does collision theory tell us?
6. What does more collisions per second mean?
7. How must particles hit each other for a reaction to happen (a successful collision)?
8. What does increasing the concentration mean?
9. If the particles move faster, what must have increased?
10. What's another way of saying increasing the surface area?
11. What does this do to the likelihood of a collision?
12. What are catalysts?
13. Why can you use catalysts again and again?
14. What do catalysts do to the energy that particles must hit each other with for a reaction to occur?
15. What is an enzyme?

Additional tasks

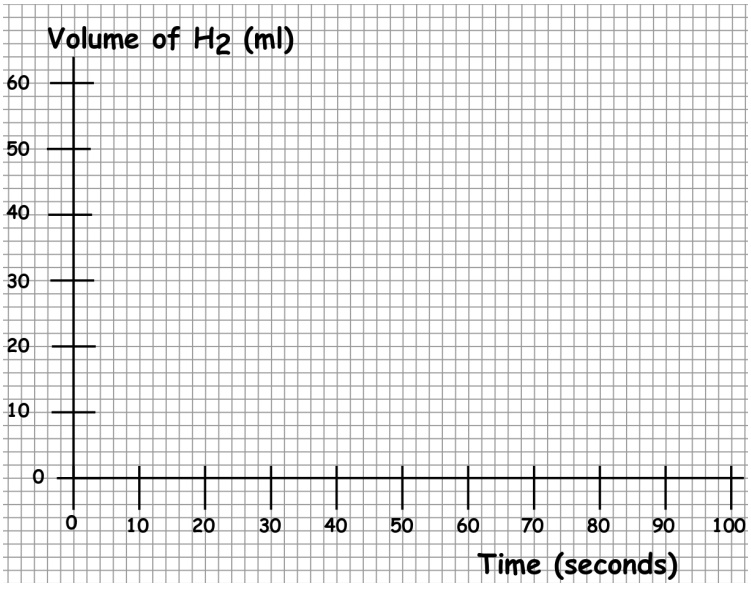
1. Match the terms and facts below and memorise.

Concentration	particles have less energy and move slower, collisions are less frequent (often)
High temperature	smaller area to hit and collisions are less likely
Low temperature	the amount of particles in a given volume
Low surface area	chemicals that speed up reactions without being used up
High surface area	particles have more energy and move faster, collisions are more frequent (often)
Catalysts	bigger area to hit and collisions are more likely

2. The table contains data for the amount of hydrogen gas released every 10 seconds when the **same** amount of magnesium is reacted with **two different** concentrations of hydrochloric acid **A** and **B.**

a. Plot both sets of data on the graph.

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100
A. Volume of H_2 (ml)	*0*	*10*	*20*	*30*	*38*	*45*	*50*	*53*	*54.5*	*55*	*55*
B. Volume of H_2 (ml)	*0*	*14*	*28*	*40*	*48*	*53*	*55*	*55*	*55*	*55*	*55*



b. How long does the reaction take to finish for **A** and for **B?**

c. Label one of the lines as **higher concentration** and the other as **lower concentration.**

d. How do we know from the **data** that the same amount of magnesium was used?

3. Put the following chemical reactions in order from **slowest** to **fastest**. *One of them is deliberately 'wrong' can you spot which one and explain why?*

RUSTING, A BROWNING APPLE, SPARKLER, BAKING A CAKE, EXPLOSION, ROTTING FOOD, CONCRETE SETTING, BURNING TOAST, A FIREWORK ROCKET, A MATCH, ICECREAM MELTING

Questions on Cost of Electricity and Power Ratings

Comprehension

1. What does the amount of energy an electrical appliance uses depend upon?
2. Power ratings are normally found as what on an electrical appliance?
3. What voltage is mains electricity supply in the UK?
4. What is the unit of power?
5. How many watts are there in 1kW?
6. How do you convert watts into kilowatts?
7. How do we calculate the energy consumed by an appliance?
8. What is the unusual unit of energy that we use when calculating the energy used by an electrical appliance?
9. Why don't we use the joule?
10. How many kWh would the kettle shown opposite use, if it was switched on for 1 hour?
11. How much does one kWh cost on the electricity bill shown?
12. Where are the meter readings taken from for an electricity bill?
13. How much is the average household electricity bill? (WHAT? box)
14. What are two of the energy hungry appliances in the house?

Additional tasks

1. Convert the following times into hours and write them as a decimal and as a mixed fraction.

A. 30 minutes	*B. 80 minutes*	*C. 600 minutes*	*D. 10 minutes*	*E. 120 minutes*
F. 90 minutes	*G. 15 minutes*	*H. 200 minutes*	*I. 20 minutes*	*J. 160 minutes*

2. Convert the following power values from watts to kilowatts.

A. 100 watts	*B. 1500 watts*	*C. 200 watts*	*D. 10,000 watts*	*E. 6000 watts*
F. 1000 watts	*G. 500 watts*	*H. 800 watts*	*I. 2,500 watts*	*J. 5,500 watts*

3. Complete the energy column by calculating how much energy in kWh each appliance uses.

Appliance	Energy (kWh)	Power (kW)	Time (hours)
Kettle		2.0	1.5
Shower		9.0	0.5
Iron		5.0	2.0
Xbox 1		0.11	10.0
Toaster		1.8	0.5
Sandwich maker		1.0	0.25
Washing machine		4.0	1.5
Vacuum cleaner		0.9	1.0
Tumble dryer		2.2	0.5

Electricity bill

Date	15 May	15 August	Kilowatt hours used (kWh)
Quarterly meter reading (3 months)	8400	10,000	
Electricity charges Standard tariff@	20 pence per kWh		*Total charges*
	@	20 p each	

4. Complete the electricity bill above by calculating how many kWh are used for the time period (quarter) and using the cost per kWh calculate the total charges (see opposite bill for help).
5. Arrange the following devices in order of which you think is the highest power rating (six) to the lowest power rating (one). Check your answers by **unscrambling** the name of the device to see what number is left.

e.g. Nintendo Wii ITWINWDONOENTI

Hair dryer	**SAIEHYXDRRRI**
PS3console	**TSCLEPOHNRE3SEO**
LED torch	**DCLEROONHTE**
Laptop Computer	**PATLTOWPO**
Hover mower	**OEFEHWIVMRVORE**
Trimmer for lawns	**FUORIUETRMM**

6. Which of the below are quarterly time periods? Like for a utility bill.

i) **1st May to 20th July**
ii) **28th Feb to 18th May**
iii) **10 December to 10th March**
iv) **16th June to 16th August**
v) **15th May to 15th September**
vi) **28th April to 28th July**

Questions on Energy Stores

Comprehension

1. How many different ways can energy be stored?
2. What type of energy do batteries store?
3. What are we doing when we recharge a battery?
4. How does an object gain GPE?
5. What increases the GPE an object has?
6. Apart from being stretched how else can objects store elastic potential?
7. What is nuclear energy released from?
8. What happens to a nucleus during fission and fusion?
9. How can you have stored magnetic energy?
10. What do positive and negative charges do to each other?
11. How do we transfer electric potential energy?
12. What is another word for heat?
13. When does an object store kinetic energy?
14. How can the kinetic energy of an object be increased?

Additional tasks

1. Match the energy type to its description and memorise.

Chemical potential energy	the energy an object has when stretched or squashed.
Gravitational potential energy	energy stored due to the attraction or repulsion of charges.
Elastic potential energy	the energy stored in chemical bonds.
Nuclear energy	energy of motion.
Magnetic potential energy	another word for heat, due to the vibration or motion of the particles of a substance.
Electric potential energy	the energy an object has by being raised above the ground.
Thermal energy	energy stored due to the attraction or repulsion of magnets.
Kinetic energy	energy stored by the nucleus of an atom.

2. Find the following **energy stores** and **flows** in the word search below.

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

CHEMICAL	*POSITIONCHANGE*	*ELASTIC*
NUCLEAR	*LIGHT*	*HEATFLOW*
THERMAL	*GRAVITATIONAL*	*RADIATION*
SOUND	*MAGNETIC*	*ELECTRIC*
EMISSION	*KINETIC*	*ELECTRICCURRENT*

3. Below are examples of where we would find or have a lot of a particular energy store. Write down the energy store next to the example.

a. A bottle of cooking gas _____

b. Helicopter hovering high in the sky _____

c. A bow and arrow fully pulled back _____

d. A radioactive element _____

e. The strip around a fridge door to keep it shut _____

f. A lightning storm _____

g. A speeding bullet _____

h. A sauna _____

Questions on Energy Transfers (flows)

Comprehension

1. When is energy most useful?
2. What's involved in bringing about energy transfers?
3. What does emission mean?
4. What type of energy does a battery store?
5. What happens to this energy when you switch on your torch?
6. What eventually happens to the light energy emitted by your torch?
7. Why does the ball store GPE?
8. What happens to the GPE as the ball falls?
9. How is the chemical energy store of your food transferred to elastic potential?
10. What does contract mean?
11. What type of energy increases when the elastic band is let go?
12. What type of energy decreases when the elastic band is let go?
13. What happens to the energy store of an object if you increase its height?
14. In increasing the height of an object what are chemical reactions able to do to muscles?

Additional tasks

1. Complete the table by matching the examples given below to the energy flows.

A catapult being released; A car speeding up; A falling yoyo; A solar cell powered by sunlight; A wind turbine; A rising yoyo; A car at constant speed; A tumble dryer; A kettle boiling water; A catapult being pulled back.

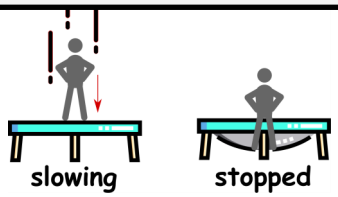
Examples	Energy flows
	Chemical potential to heat (explosion in engine) to kinetic energy
	Electric potential forces an electric current to flow producing heat
	GPE to kinetic
	Kinetic to GPE
	Elastic potential to Kinetic energy
	Kinetic energy to Electric potential
	Chemical potential to elastic potential
	Nuclear energy to light energy to Electric potential
	Electric potential forces an electric current to flow producing heat and kinetic energy
	Chemical potential to heat energy

2. What is wrong with these statements?

a. When water flows down a river it has more GPE.
b. A squashed tennis ball has less elastic potential.
c. Pushing repelling magnets closer decreases magnetic potential energy.
d. The sun's nuclear energy store is increasing.
e. A hot bath has less thermal energy than a cold one.
f. When a car slows down its kinetic energy increases.
g. A rubbed balloon stuck to the wall has no electric potential energy.
h. A used match has more chemical energy than an unused match

3. Write down which type of energy is **increasing** and which type is **decreasing** in the examples below.

i. A sky diver who has just leapt from a plane.
ii. A ball kicked up in the air.
iii. A burning candle.
iv. A battery powered set of LED lights.
v. A person slowing down as they land on a trampoline (see below).



Questions on Energy Transfers (Continued)

Comprehension

1. Through what process is light emitted by the sun?
2. What does the light energy force a plant to do?
3. What energy store increases for a bicycle speeding up?
4. What energy store decreases for a bicycle speeding up **or** moving at a constant speed?
5. What happens to the tyres and moving parts when pedalling a bike?
6. What do you have to do to the air when riding a bicycle?
7. When you pedal a bicycle at constant speed why isn't your kinetic energy increasing?
8. What sort of energy does a bullet store?
9. How is the bullet forced from the gun?
10. What does this do to the thermal energy?
11. What's another name for the voice box?
12. What do we call the vibration produced by the voice box?
13. What eventually happens to the energy of the vibrations of a sound wave?
14. How much energy reaches the earth from the sun in one hour? (WHAT? box)

Additional tasks

1. Solve the clues to do with energy below.

1. If the kinetic energy of an object is increasing it must be? S _ _ _ _ _ _ _ U _
2. Objects have to push air out of the way when they move, this is called? A _ _ R _ _ _ _ _ _ _ _ _
3. Earth gets most of its energy from the? S _ _
4. The chemical energy of a battery decreases through the flow of an? E _ _ _ _ _ _ C _ _ _ _ _ _

2. Draw energy transfer diagrams (the same as pages 118/120) to show the **overall** energy flow for;

i. a car slowing down (remember the brakes get hot!)

ii. a smart phone (the same as a torch?).

iii. released after being pulled back on a swing

iv. squashing a bed spring

*v. a bullet fired straight up **after** leaving a gun*

vi. a car at constant speed

3. For fun and to get some idea of what you can do with a certain amount of energy, guess which numbers match to the energy use. Answers opposite.

10,000,000,000 J	**500,000J**	**2,500,000J**	**1J**	**240,000J**
120J	**8,800,000J**	**3,000,000J**	**100,000,000J**	**1800J**

1. Boil a kettle	**2.** Lift an apple from the floor to the table
3. An LED torch switched on for 10 minutes	**4.** Drive 100 miles in an electric car
5. Have a five minute shower	**6.** Get one person to the moon
7. Hair dry your hair (2 minutes)	**8.** Climb Mount Everest
9. Two minute phone call (smart phone)	**10.** Swim a mile

ANSWERS

6. 10,000,000,000 J 1. 500,000 J 5. 2,500,000 J 2. 117. 240,000 J
9. 120 J 8. 8,800,000 J 10. 3,000,000 J 4. 100,000,000 J 3. 1800 J

Questions on Conservation of Energy

Comprehension

1. What can't happen to energy?
2. Complete the sentence about conservation of energy, "All this means is..."?
3. What is another way of thinking of this?
4. If 100J of energy flows into a bulb, how much energy must flow out?
5. How often is this true?
6. What does this enable us to do?
7. What could we calculate about a space craft?
8. What does 1kg weigh?
9. What happens to the 10J of GPE when the bowling ball is dropped?
10. If you increase the length of an average elastic band by 10cm how much energy does it store?
11. What does dissipation mean?
12. Roughly how much energy does an 'AA' battery store?
13. Why is this energy really useful?
14. If I put the battery into a handheld fan and turn it on what will most of the energy be transferred into?
15. What causes the heat emitted by the fan?
16. Why does a Newton's cradle eventually stop?

Additional tasks

1. Write down **possible** or **not possible** next to the energy changes in the table using conservation of energy.

Energy changes	Possible / Not possible ?
A light bulb, 100J of electric current flow changes into 30J heat and 71J of light	
Stretching an elastic band, 0.25J of chemical energy changes into 0.25J of elastic potential	
Lifting a ball, 10J of chemical energy changes into 8J of GPE for the ball	
A falling bouncy ball, 2J of GPE changes to 1.9J of KE and 0.1J of heat	
A bouncy ball hitting the ground, 1.9J of KE changes into 1.9J of elastic potential	
A growing plant, 1000J of light energy changes into 800J of chemical and 100J of heat	
Mixing hot and cold drinks, the hot drink loses 20,000J, cold drink gains 18,000J	
Pushing two repelling magnets together, 0.05J of chemical energy changes to 0.05J magnetic potential energy	

2. Although energy is always conserved in an energy transfer, not all of the energy transferred ends up in the form we want. Energy that ends up in the form we don't want is called **wasted**. In the light bulb example opposite the 80 joules of heat is wasted because we want light from a light bulb. Identify the **useful (wanted)** and **wasted (unwanted) energy** in the examples below.

a. A hand held fan for cooling you down
b. A remote controlled toy car powered by an electric motor
c. Sliding down a slide at the park
d. A wind turbine
e. A candle
f. Watching TV
g. An electronic keyboard
h. A lift in a building powered by an electric motor
i. A loudspeaker
j. A smart phone

3. Complete the gap fill on wasted energy, use the following words in bold; **heat, useful, spread, wasted, wasted, friction, dissipated**

Often _____ energy, the energy we don't want, ends up being transformed into _____ energy. This heat energy becomes less and less _____, we say the energy has _____. It is now so _____ out we can't do anything useful with it. Energy is most often _____ as heat due to the flow of an electric current or because moving parts rub together and generate heat through _____.

Questions on Work and Energy

Comprehension

1. What does doing housework or homework require?
2. What is the work done equal to?
3. What do we need to know to calculate work?
4. Why does this make sense?
5. If you lift **two** apples weighing **1N** each, a height of **1metre,** how much work is done?
6. What is the unit of work and hence energy?
7. If when doing your homework you move your pen 4m, how much work have you done?
8. Often when you do work you are working against a force, what does that force try to do?
9. When you push your pen along the paper, what are you doing work against?
10. When you lift your clothes off the floor what are you doing work against?
11. What happens to some of the work you do (energy) when starting to push a chair?
12. Once the chair is moving at a steady speed what happens to the work done on the chair?
13. When pushing the chair on '**zero friction ice**' what happens to the work you do (energy transferred)?
14. If there is no friction or air resistance what can't the kinetic energy transfer into?
15. What happens if you push the chair for a greater distance?
16. What does power tell us? (WHAT? box)

Additional tasks

1. Solve the jumbled words to do with work and energy.

Letters	Description	Answer
OUELJ	The unit of work	
ANSRTERFRED	When work is done, energy is always ……..	
TREME	The unit of distance when calculating work	
CTIIORFN	What we often do work against	
ARGTIVY	Doing work against this increase GPE	
EHTA	Work against friction always transfers some energy to..	
IKETICN	If there is no friction or air resistance the work we do in pushing an object is equal to the …… energy gained	
TWENNO	The unit of force	

2. Calculate the work done (force x distance) in the following examples.

a. Sweeping the patio a force of 10N is applied over 15m.
b. Pushing a car, a force of 800N is applied for 12m.
c. Climbing the stairs, legs exert 600N for a height of 3m.
d. A cars brakes apply 2000N over 12m to stop.

a.
b.
c.
d.

3. An electric motor lifts people in an elevator between floors. Calculate the useful work done (here it is GPE, an increase in height) in lifting the people (force x distance) and then the energy wasted as heat. This is the difference between useful work done and energy consumed by motor.

Energy consumed by the motor (J)	Force from motor (N)	Distance / height lift rises (m)	Useful work done (J)	Energy wasted as heat (J)
2,500	1000	2		
37,500	6000	5		
87,500	5000	14		
60,000	8000	6		

Questions on Fuels and Energy Resources

Comprehension

1. How is most of the world's energy still generated?
2. What are the fossil fuels?
3. What were they formed from and how?
4. What does non-renewable mean?
5. Why does the kinetic energy of the steam decrease?
6. What does the generator produce?
7. How does the energy from the generator flow to our homes?
8. What can't we do to nuclear fuel?
9. Why is nuclear fuel also non-renewable?
10. What does a solar panel do?
11. What are the blades of a wind turbine connected to?
12. How does geothermal power work?
13. What does the up and down motion of a wave do to the air to produce electricity?
14. After trapping water behind a dam how does hydroelectric power generate electricity?
15. Why does burning fossil fuels contribute to global warming?
16. What is the problem with wave, solar and wind energy?
17. What is an advantage of renewables?
18. What is one of the problems with nuclear power?

Additional tasks

1. Solve the jumbled words below.

Letters	Description	Answer
ONBNAEWLEERNO	Energy resource that will run out	
CLUREAN EACRIONST	Nuclear power releases its energy through these	
HIANC	Country that generates most electricity from hydroelectric	
CIAD INRA	Burning fossil fuels contributes to ...	
IBNEUTR	Spins very fast like a jet engine and connected to a generator	
OTARRENEG	Transfers kinetic energy into electric potential	
IKETICN	Type of energy wind has	
BLOLAG IRAMGNW	Burning fossil fuels also contributes to ...	
BNAEWLEERO	Energy resource that won't run out	

2. Decide whether the statements below are **pros** (advantages) or **cons** (disadvantages) and match them to the renewable resources opposite .

a. sometimes birds accidentally get killed
b. there is a lot of energy washing up on our shores everyday
c. works best in hot countries
d. only practical in certain countries like Iceland
e. limited by having the right landscape to flood valleys
f. can generate on existing space like roofs
g. can be built out to sea
h. does not pollute and we live on an island so the potential is huge
i. once built they can generate electricity quickly by 'opening a tap'
j. some countries with the right landscapes can generate up to 30% of their electricity this way

3. **Biomass** is a renewable energy resource from **plant** or **animal material**. Complete the gap fill on two biomass uses.

photosynthesis, biomass, unleaded, fermented, burning, carbon dioxide, trees, global, corn, alcohol, fuel

An example of _____ is cutting down _____ and _____ them to generate electricity. The _____ _____released through burning is absorbed by the replanted trees through _____ so it is claimed not to contribute to _____ warming. Another example is growing _____ or sugar cane that can be _____ to make ethanol (_____). This alcohol can then be used as a _____ in vehicles. About 5% of _____ petrol is actually ethanol.

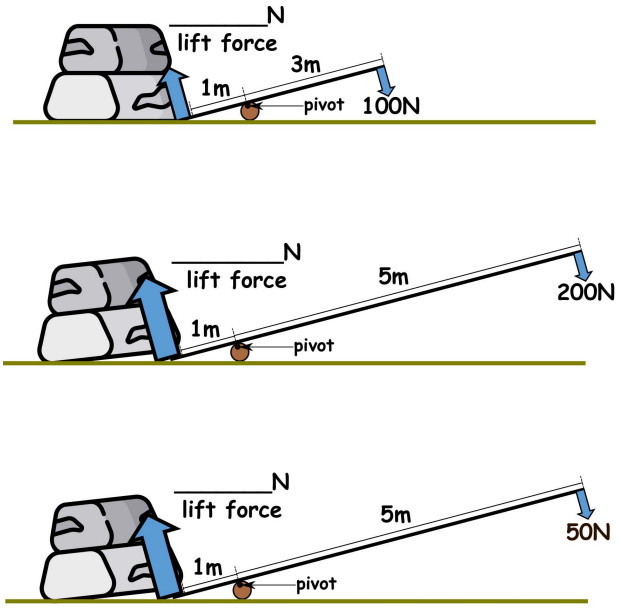
Questions on Simple Machines

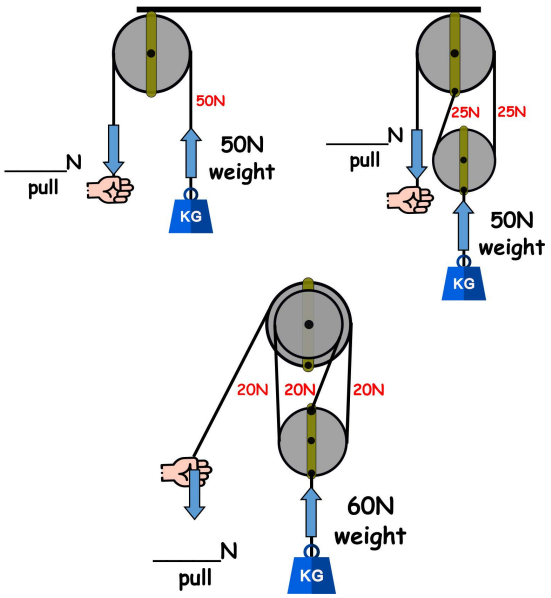
Comprehension

1. What does a machine do to a job?
2. What happens to the energy put into a machine?
3. What is the simple name for an inclined plane?
4. Why was a ramp used to get the mower into the car?
5. Although a ramp requires a smaller force what is greater when you use a ramp?
6. What would happen to the force needed to push the mower up the ramp if it was 2.4m long? (three times as far rather than twice)
7. What would the work done still be in this case?
8. What two words could be used to describe a lever?
9. What did ancient civilisations use levers for?
10. What are you most likely to use a lever for nowadays?
11. What fact do levers rely on to work?
12. What is the turning effect of a force called?
13. What is mechanical advantage?
14. Is there any mechanical advantage with the pulley on the left?

Additional tasks

1. Write down what the **lift force** is for the **force magnifiers** below and the **pull force** for **the pulleys** below. Use the examples opposite to help.





2. Unscramble these machines from their description.

Used for cleaning clothes	**SIIWCMEAHHNGAN**
Can be used for opening a tin of paint	**LERVE**
This machine makes getting around easier	**ELWEH**
This machine is really useful in the kitchen	**IHEDHASRWS**
Used to raise sails on sailing boats	**PLYUEL**
This machine is useful when you're hungry	**INETNPROE**
A machine good for splitting wood	**DEWGE**
This machine comes as a pair	**OCRSSSIS**
Good for moving heavy stuff	**HERWRBWEOLA**
A simple way of lifting objects	**NHWCI**
This machine works like a lever	**SPEAD**
Good for lifting heavy objects slowly	**RAPM**

3. Find the unscrambled machines below.

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

Questions on The States of Matter

Comprehension

1. When thinking about solids, liquids and gases what is very familiar?
2. What shape is a water molecule?
3. What do we draw to represent the atoms or molecules?
4. What are the forces of attraction (bonds) like in a solid?
5. What do the particles vibrate 'about' in a solid?
6. What happens to the particles when you heat a solid and what does this mean for the space they need?
7. How do the forces of attraction in a liquid compare to a solid?
8. What's the spacing of the particles like in a liquid?
9. What's the spacing of the particles like in a gas?
10. What normally happens to density as you move from the liquid state to the solid state?
11. Why is this?
12. What does anomaly mean?
13. What happens as water changes from liquid to solid?
14. Why does ice float on water?
15. What can happen to power lines in the summer?
16. How do thermometers work?
17. What do bridges have to allow for expansion and what do they look like?

Additional tasks

1. Match and memorise the words below.

Melting	changing from a liquid to a solid
Vapourising	reduction in size of a material usually when cooled
Condensing	increase in size of a material usually when heated
Freezing	changing from a solid to a liquid
Sublimation	changing from a gas to a solid without the liquid stage, opposite to sublimation
Deposition	changing from a solid straight to a gas without the liquid stage opposite to deposition
Expansion	changing from a gas to a liquid
Contraction	changing from a liquid to a gas

2. A student wants to make their own thermometer. They fill a test tube with coloured water and put a small tube through a rubber bung and place the bung in the test tube. They mark the water level **then** place the test tube in boiling water.

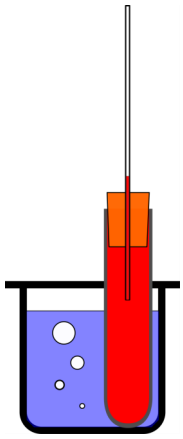
a. What will happen to the water level when the test tube is placed in boiling water?

b. Why does it happen?

c. When the red water is added to the test tube it is 20°C. What will be the temperature change when it is put into the boiling water?

d. How could the student use a ruler to make a scale on the tube?

e. What would happen to the water level if the test tube was put in ice water at 0°C and why?



3. In the boxes below draw **nine** particles to show a hot and cold solid and a hot and cold liquid. Remember the particles themselves don't change size!

cold solid

hot solid

cold liquid

hot liquid

Questions on Heat Energy and Temperature

Comprehension

1. What has heat energy?
2. Why does heat energy exist?
3. What does temperature tell us about the particles?
4. Which way does heat energy always flow?
5. What happens to the water if you climb into an ice cold bath?
6. What happens if you climb into a hot bath?
7. If we know the temperature of a gas what can we actually work out?
8. What do we measure temperature in usually?
9. Why is degrees Celsius convenient?
10. By looking at the liquid in a thermometer, how do we know how hot it is?
11. Many methods use the principle of measuring what?
12. How do most of these devices give a readout?
13. Why are probes sometimes used for measuring the temperature of cooked food?
14. What is internal energy due to?
15. We can just think of internal energy as what?
16. Why can we melt more ice cubes with a **warm** bath of water than a **hot** cup of tea?

Additional tasks

1. Write the temperature values next to the examples in the table below, choose from;
   0°C, 37°C, 100°C, 4°C, 30,000°C, 20°C, -15°C, 6000°C, 40°C.

Examples	Temperature (°C)
Human body temperature	
Average freezer temperature	
Boiling point of water	
Average fridge temperature	
Average room temperature	
Temperature of lightning	
A hot bath	
Surface of the sun	
Freezing point of water	

2. Choose from the words below to complete the following statements.

   fast, number, gain, Probes, movement, 1000 mph, temperature, resistance, mass, particles, lose, thermal, Celsius, Fahrenheit, attraction

- Another word for heat energy is _____ energy.
- If we know the temperature of a gas we can work out how _____ the particles are moving.
- Electronic thermometers often use a change in _____ to measure temperature.
- Digital thermometers show us a _____ for the temperature.

- Objects at the same _____ have more internal energy if they have more _____. This is because they will be made from more _____.
- In a cold bath you _____ heat energy.
- The usual unit of temperature is degrees _____.
- A less often used unit of temperature is degrees _____.
- Particles in a gas move at about _____ at room temperature .
- _____ are used for measuring the temperature of food.
- Internal energy is the energy a substance has due to the _____ of the particles and the _____ between them.
- In a hot bath you _____ heat energy.

3. On the Fahrenheit temperature scale **68°F** is equal to **20°C**. To work this out we use the equation;

   $°C = 5/9 \times (F-32)$

   So 68°F gives; 5/9 x (**68**-32) = 5/9 x 36 = **20°C**

   Convert the following temperatures from Fahrenheit to Celsius and check that they are roughly correct by looking at the thermometers opposite.

   A. 122°F B. 212°F C. 77°F
   D. 104°F E. 113°F F. 176°F

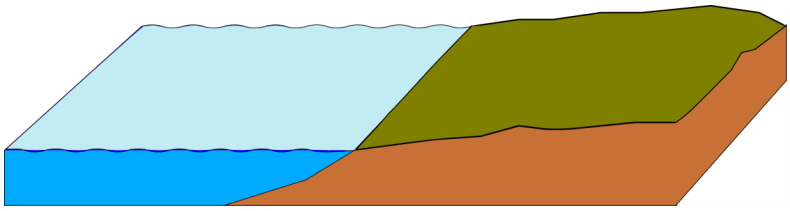
Questions on Heat Transfer

Comprehension

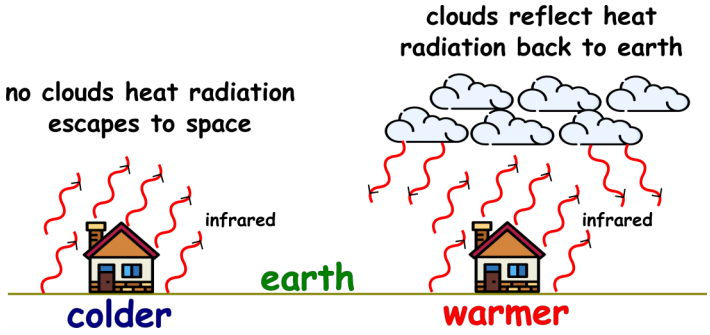
1. Which way will heat energy always flow?
2. Where does conduction happen best?
3. How does a metal often feel to touch?
4. Why is this?
5. Why wouldn't a wooden climbing frame feel cold?
6. In the human chain what happens to the person next to the tickled person and why?
7. If one end of a solid is heated what is passed on down the chain?
8. What do all objects emit?
9. What is heat radiation?
10. What sort of objects emit more heat radiation?
11. When thinking about heat radiation **only**, why do we get hot near to a fire?
12. What states of matter does convection happen in?
13. What happens to the density of air when it is heated?
14. What does this cause the warm air to do?
15. What is wind an example of?
16. Why are radiators badly named?

Additional tasks

1. Label the diagram of the onshore breeze. Add your **own arrows** to show the movement of the air.



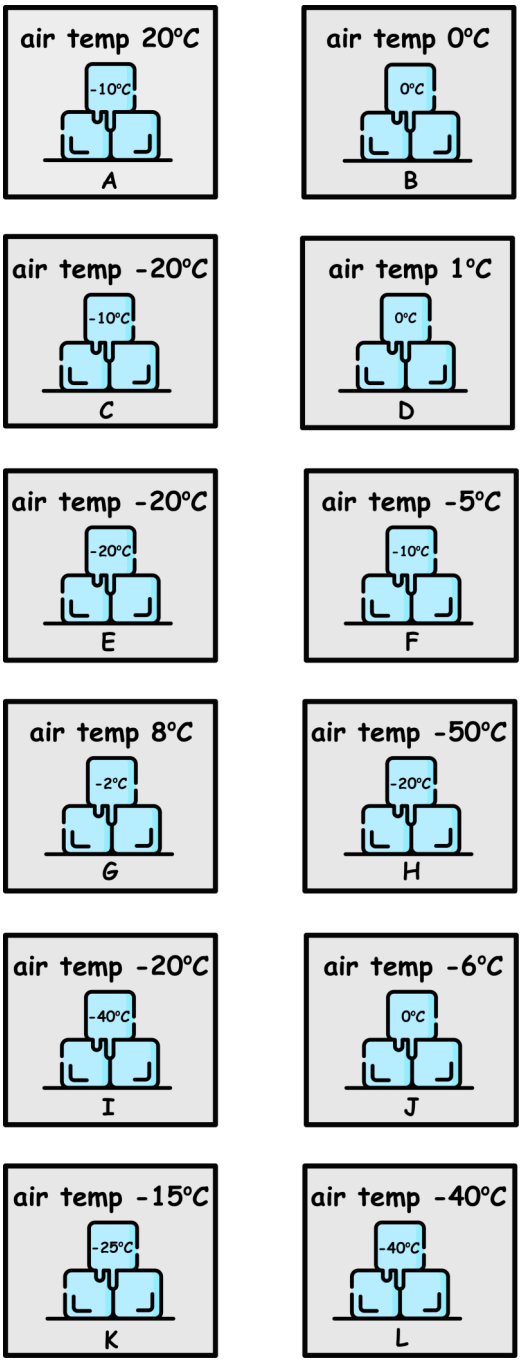
2. Complete the gap fill to explain what is happening below. Choose from the words in bold.



absorbed, day, infrared, heat, space, left, reflect, earth, warmer, blanket

At night, heat _____ by the earth during the _____ is emitted as _____ or _____ radiation. If the heat radiation escapes into _____ it is colder. That is what happens to the house on the _____. Clouds _____ heat radiation emitted from the _____ back down so the house on the right is _____. The clouds act like a _____.

3. State for the ice cubes **A** to **L** below whether they will **warm up**, **melt**, **cool** or **no change**.



Questions on Insulators and Insulation

Comprehension

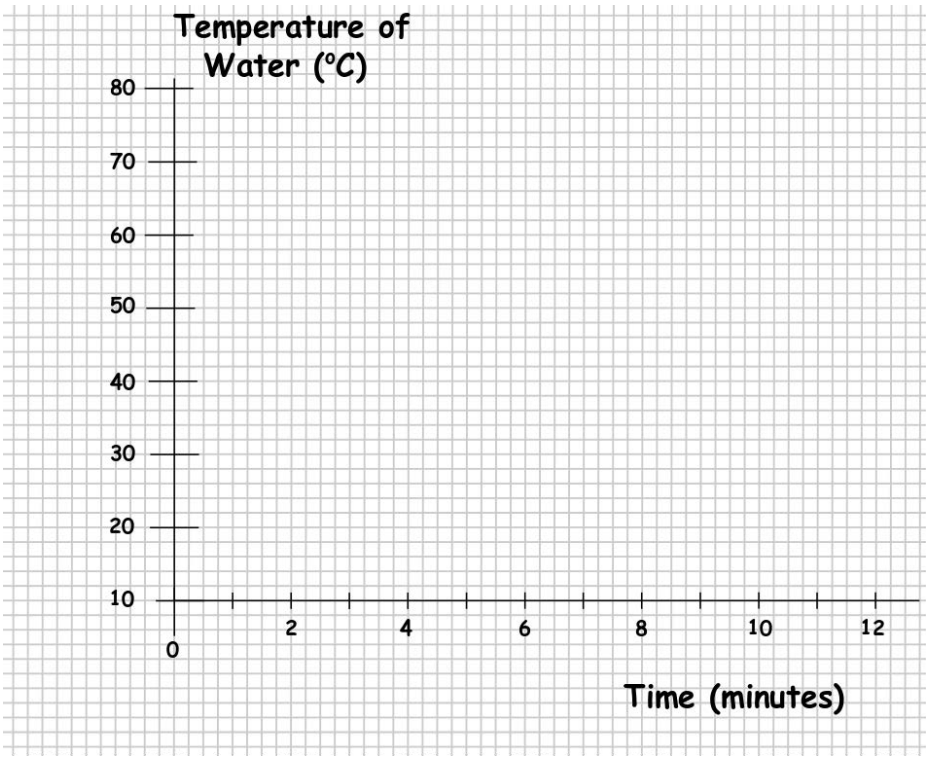
1. What is an insulator?
2. Which materials are good conductors of heat?
3. What are the bottom of frying pans often made from and why?
4. Why are the handles often made from wood or plastic?
5. What are some of the warmest coats insulated with and why?
6. Why do we want to slow down the loss of heat from our homes?
7. What are three effective methods of insulating the home?
8. In what similar way do they work?
9. How are convection currents prevented from circulating?
10. What are the modern insulating panels used in cavity walls made from?
11. What does the reflective foil do?
12. Why is this layer useful in hot countries during summer?
13. Why is argon often used in double glazing rather than air?
14. What is the purpose of insulating a fridge?
15. Why do spacecraft have insulating panels on the outside? (WHAT? box)

Additional tasks

1. Solve the clues on insulators and insulation.

1. The gas often used in double glazing? A _ _ _ _
2. What cavity wall and loft insulation rely on to insulate? T _ _ _ _ _ _ A _ _
3. The diagram of double glazing doesn't have a ? C _ _ _ _ _ W _ _ _
4. Best conductor listed in the table? C _ _ _ _ _
5. Fridges are insulated to stop _____ entering? H _ _ _
6. Brilliantly insulating bird feathers? D _ _ _
7. Trapped air stops _____ _____ circulating?
   C _ _ _ _ _ _ _ _ _ C _ _ _ _ _ _ _

2. A student carried out an experiment by measuring the temperature every two minutes of 150ml of hot water poured into beakers. One beaker had no insulation, one was insulated with bubble wrap and the third with cotton wool. Plot the results on the graph below, connect the points and label the lines.



3 a. What is the starting temperature of the water?

b. The water in which beaker cools quickest and why?

	Temperature of Water (°C)		
Time (mins)	No insulation	Cotton wool	Bubble wrap
0	80	80	80
2	65	70	74
4	56	62	68
6	48	54	64
8	42	48	60
10	38	43	57
12	35	40	54

c. The temperature in the room is 20°C, what temperature will the water eventually become in each beaker?

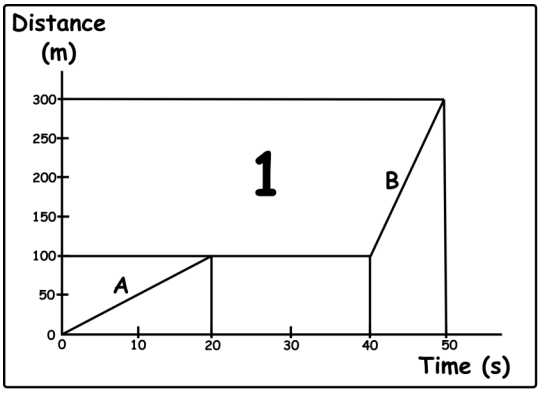
Questions on Speed

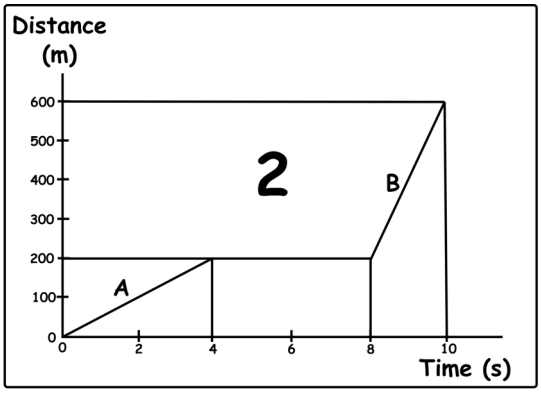
Comprehension

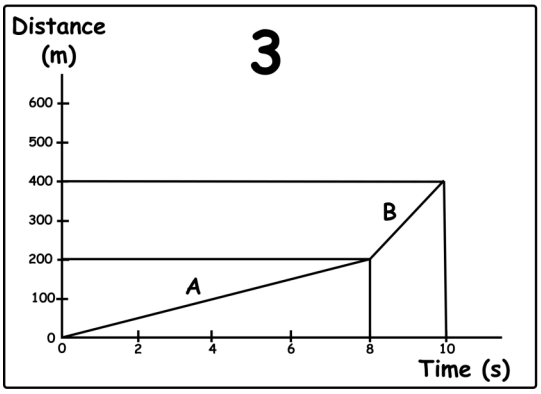
1. What is speed an example of?
2. What does speed tell us?
3. What is the 'scientific' unit for speed?
4. Which unit are we more used to?
5. Why does the word average appear in the equation?
6. When running 100m when do athletes normally reach their top speed?
7. What does the steepness (gradient) on a distance time graph tell us?
8. What's happening on the flat section of the graph?
9. How is the gradient (steepness) of the line found?
10. If you move 200m in 10 seconds how fast are you moving?
11. Between 20 to 25 seconds, how far does the object move?
12. What do speed cameras do and how do they do it?

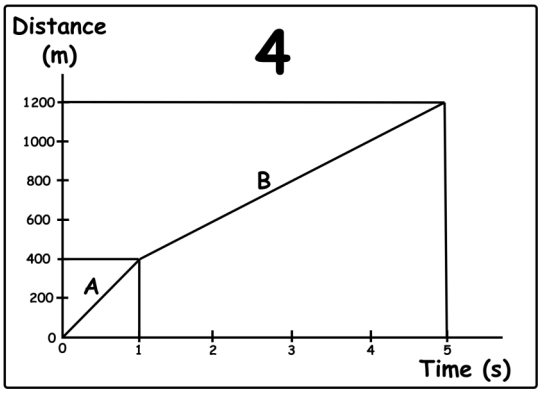
Additional tasks

1. Calculate the speed for sections **A** and **B** on the graphs below.





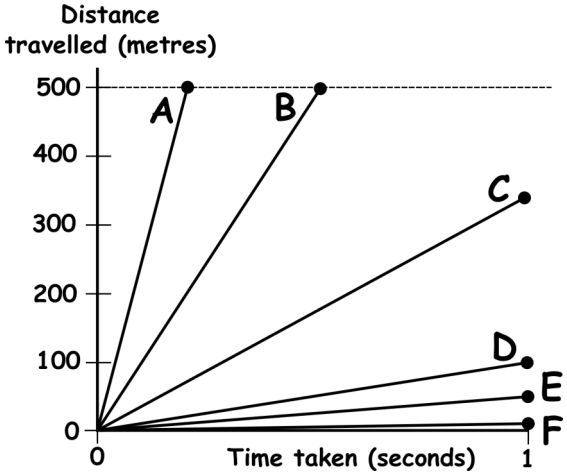




2. Use a calculator to find the speeds of the moving objects below in m/s, then multiply by 2.24 to convert to mph.

What's moving?	Distance travelled (m)	Time taken (s)	Speed (m/s)	Speed (mph)
Bugatti Chiron	272	2		
Skydiver	220	4		
Bus	108	6		
Peregrine falcon	320	3		
A Snail	1	78		
A Bullet	1609	1.8		

3. Choose from the six objects below to label lines **A** to **F** on the graph below.
Bullet, sound, bicycle, fast tennis serve, formula 1 car, a satellite



Questions on Relative Speed and more Distance Time Graphs

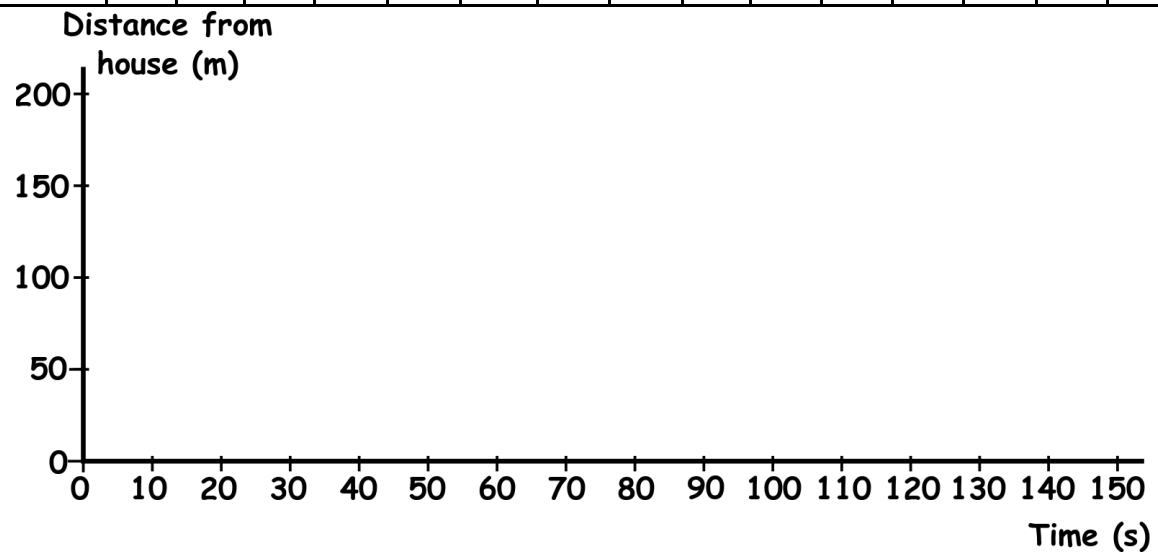
Comprehension

1. If we plot our distance from a starting point, what can we then do?
2. How long does it take the man to walk 100m?
3. How long did he stop for before running back to the start?
4. What was his walking speed if he walked 100m in 30 seconds?
5. What was his running speed if he ran 100m in 15 seconds?
6. How **don't** most objects move?
7. What usually happens?
8. What does the steepness (gradient) of a distance time graph tell us?
9. If a line is getting steeper what must an object be doing?
10. How does a line show slowing down?
11. What isn't a silly question?
12. When all the cars on a motorway are moving at the same speed what does the car next to you appear to be doing?
13. Is the car in question 12 'really' moving?
14. How do we normally think of our speed?
15. In **B** why are the red car and black car approaching each other at 40 m/s?
16. How do we work out how fast objects are approaching each other if they moving in the **same** direction?
17. How fast is the black car always moving across the ground?

Additional tasks

1. The table below shows the distance and time data for a boy running to the corner shop to buy an ice cream and walking home as he eats it. Plot the graph below and label the lines with, **running to shop, buying ice cream** and **walking home**.

Distance from house (m)	0	50	100	150	200	200	200	200	175	150	125	100	75	50	25	0
Time (s)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

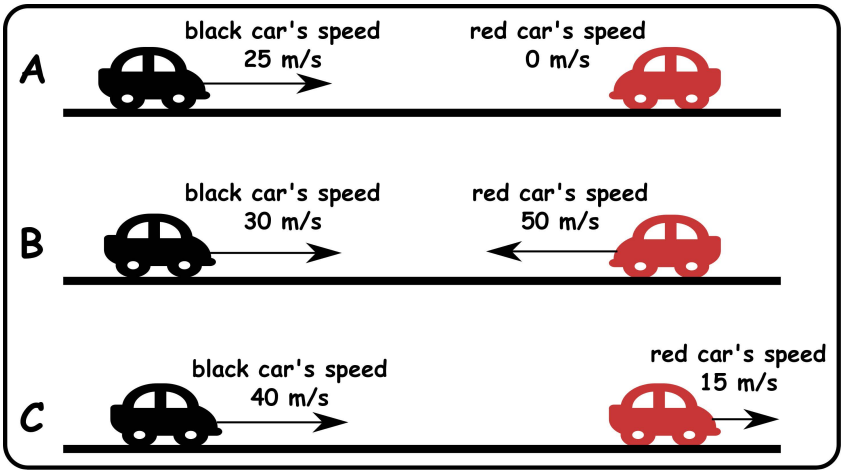


2. Calculate the **walking** and **running** speed for the boy's journey to the shop using the graph. Show your working out.

3 a. Calculate how fast the **black car** is approaching the **red car** in *A*, *B* and *C* opposite.

b. A cheetah is running at 70mph chasing a gazelle for dinner running away at 40mph. How fast is the cheetah approaching the gazelle?

c. A car gets on a dual carriage way the wrong way and has a head on collision with a car coming the other way. One car is travelling at 40mph and the other 60mph. At what speed do they approach each other?



Questions on Contact Forces

Comprehension

1. What is the size of a force measured in?
2. How are forces shown in diagrams?
3. What do we mean by contact forces?
4. What does a wall do if you push against it?
5. What do we call this force?
6. What is upthrust?
7. How must the upthrust compare to an object's weight for it to float?
8. Why does a helium balloon rise upwards?
9. Try to move an object along the ground and which way does friction always act?
10. Give two examples of friction being useful?
11. Why is a rusty bicycle chain difficult to pedal?
12. What can reduce friction?
13. What is another name for air resistance?
14. What does air resistance increase with?
15. How can air resistance be reduced?
16. How is tension created?

Additional tasks

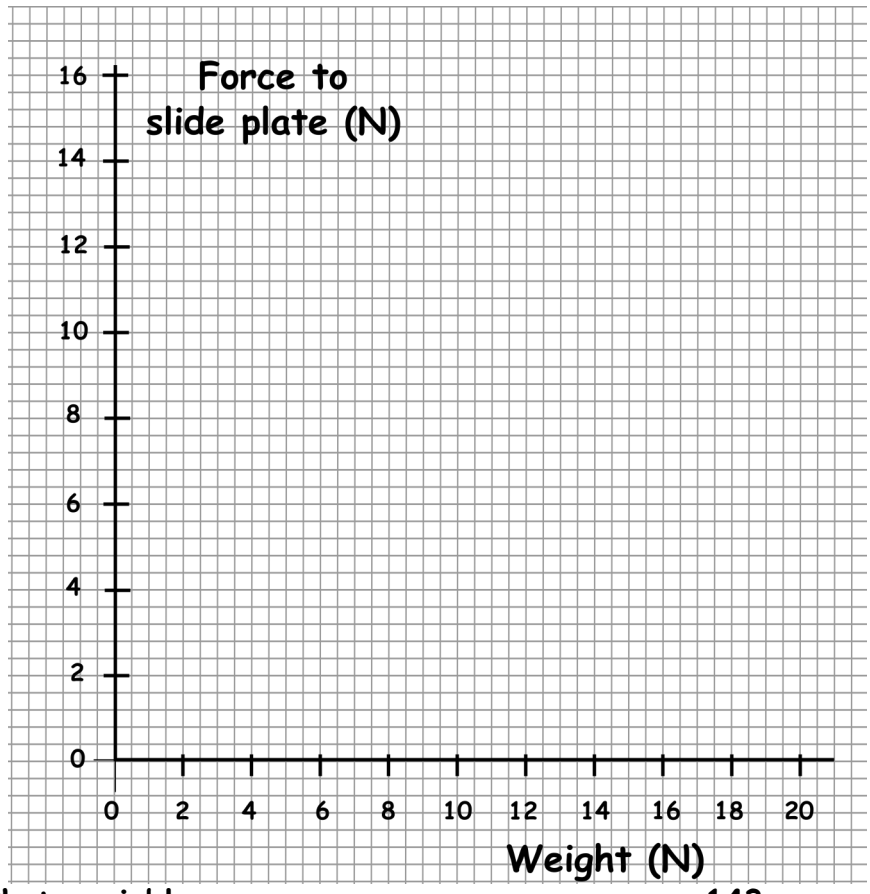
1. Match and memorise the meanings of the words below.

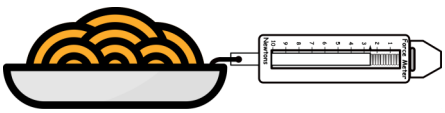
Reaction force	a force that tries to stop an object moving through air
Upthrust	using oil or grease to reduce friction between surfaces
Friction	a force created when an object is pulled, suspended by a rope, cable or string
Air resistance (drag)	a force that tries to stop an object moving over a surface
Tension	the force pushing back on an object
Lubrication	upward force on an object placed in a fluid

2. A student carries out an experiment to see how the force required to move a plate across a table varies with the amount of food on it. The student uses a force meter to measure how much force is required to pull the plate and measures the weight using a balance that reads in newtons. ***Plot the student's results on the graph.***

3a. Connect the points with a line.

Force to slide (N)	1.6	3.2	6.0	8.0	12.0	16.0
Weight (N)	2.0	4.0	7.5	10.0	15.0	20.0





b. The force required to make the plate slide is the same as friction. How does the weight affect friction?

c. The relationship produces a line through the origin (0,0). What do we call this? (see page 152)

d. What could be used to reduce the friction between the plate and table?

e. The experiment was done again on a table that had just been **polished** with **wax** AND is much **smoother**. How might this change the results?

f. Would these new results produce a steeper or shallower line on the graph?

Questions on Non-contact Forces

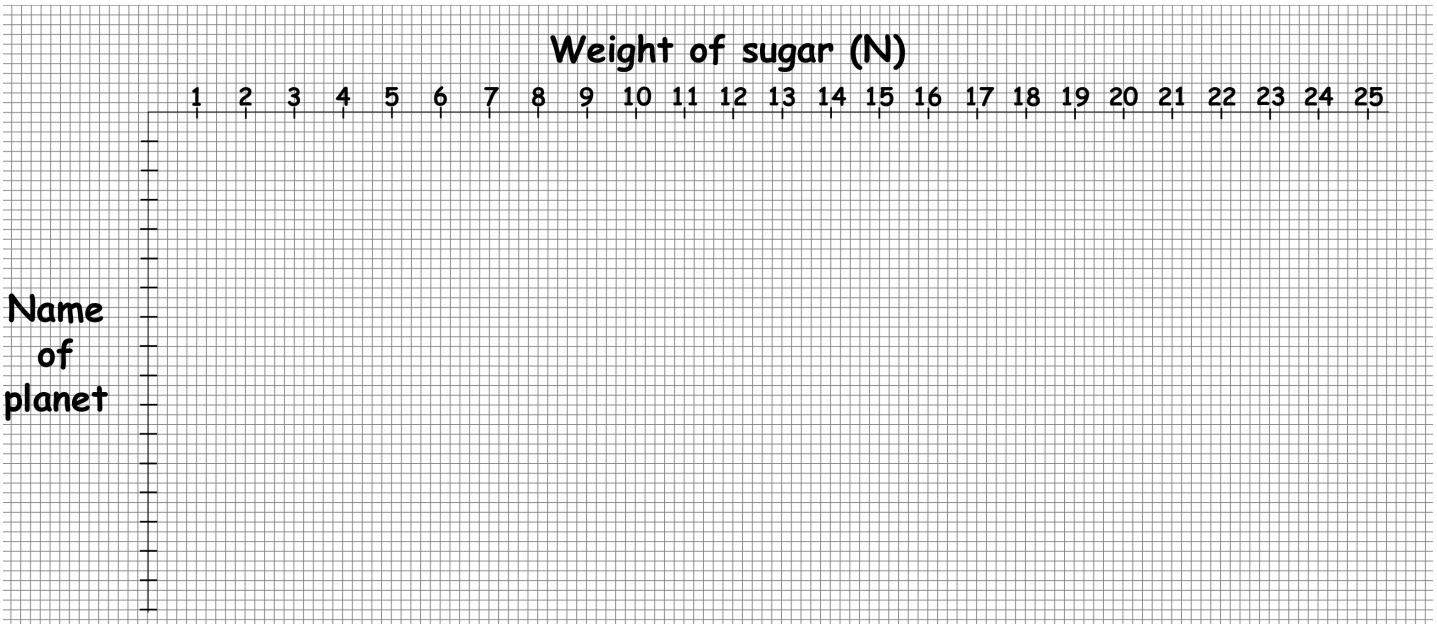
Comprehension

1. What is action at a distance a way of describing?
2. How are these forces more simply described?
3. What non-contact force do we feel all the time and what else does it do?
4. What does mass tell us and what's it measured in?
5. What does everything with mass do?
6. Why don't you feel the attraction of the person next to you?
7. Can gravity repel?
8. What size is the gravitational field strength on earth?
9. What is weight?
10. An object that feels the force of a magnetic field is said to be?
11. Permanent magnets always have a magnetic field, what else produces a magnetic field?
12. What are the three magnetic metals?
13. What do charges have around them?
14. Why can a charged ruler bend a stream of water?

Additional tasks

1. Draw a bar chart for the weight of a 1kg bag of sugar on the eight planets using the data below.

Planet	**Mercury**	**Venus**	**Earth**	**Mars**	**Jupiter**	**Saturn**	**Uranus**	**Neptune**
Strength of gravity (N/kg)	3.7	8.9	10.0	3.7	25	10.5	9.0	11.7
Mass of sugar (kg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Weight of sugar (N)	**3.7**	**8.9**	**10.0**	**3.7**	**25**	**10.5**	**9.0**	**11.7**



2. Write down **true** or **false** in brackets next to the following statements.

Mass is a force (_____) Gravity repels objects with mass (_____)
The unit of weight is the newton (_____) Mass is usually measured in stones (_____)
You weigh the same on earth as you do on the moon (_____) A feather has no weight (_____)
Gravitational field strength is measured in newtons (_____)
On Jupiter you'd be much heavier (_____)
A kilogram mass has the same mass anywhere (_____) Gravity only attracts (_____)
Gravity is the attraction between masses (_____) Mass is not a force (_____)
Mass tells us how many atoms we are made from (_____)
There is no gravity on the moon (_____) Mass is measured in kilograms (_____)

3. One boy said '*there is no gravity in space because I've seen Tim Peake floating in the space station*'. A girl says '*there must be gravity keeping the space station moving around the earth, like the earth moves around the sun*'. Write a sentence or two saying who you think is correct and why. Ask your teacher who is correct afterwards!

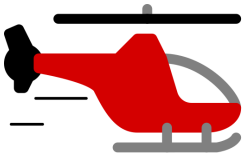
Questions on Balanced Forces

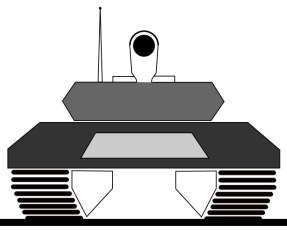
Comprehension

1. What do the arrows in the diagrams show us?
2. When an object has balanced forces acting on it what does this mean about the up and down and left and right forces?
3. What does this mean for the overall force on the object?
4. If forces are in the opposite direction what do we do with them?
5. If forces are in the same direction what do we do with them?
6. Why is the force to the left 5000N on the car?
7. What happens if the forces on an object are balanced?
8. Whose first law is this?
9. What happens to skydivers not long after opening their parachute?
10. Why is this?
11. Which forces are balanced for an aeroplane at constant speed?
12. What do helium balloons experience upthrust from?

Additional tasks

1. Draw arrows to show the balanced forces on the objects below. The helicopter, jet ski and a bike are **all at a constant speed**. All the rest are **stationary**. Labels needed will be; AIR RESISTANCE, LIFT, WEIGHT, WATER RESISTANCE, THRUST FROM ENGINE, PEDALLING FORCE, FRICTION, REACTION FORCE, UPTHRUST




2. Complete the gap fill on balanced forces. Choose from the words below;

air resistance, constant, overall, balanced, parachutist, weight, first, ground, equals, desk, upthrust, laptop, stationary

If the forces acting on an object are _____ it will either be moving at a _____ speed or _____. This is Newton's _____ law. A raindrop and a _____ fall at constant speed because _____ _____ is equal to their _____. There is no _____ force acting. A stationary bus has a reaction from the _____ that is equal to its weight. Float on your back and the _____ from the water _____the weight due to gravity pulling you down. The reaction from the _____ balances the weight of your stationary _____ when doing school work.

3. Write down **balanced** or **unbalanced** in brackets next to the following examples.

Jumping in the air (_____) A stationary cloud in the sky (_____)
A spider sitting in its web (_____) Bouncing on a trampoline (_____)
Swinging on a swing (_____) Releasing a stretched catapult (_____)
A Speck of dust falling towards the ground (_____)
Lying in bed (_____) Starting to sledge down a hill (_____)

Questions on Unbalanced Forces

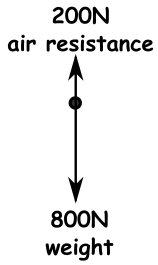
Comprehension

1. What happens to the motion of an object if the forces are balanced?
2. What happens if the forces are unbalanced?
3. What is the name of the overall force acting on an object?
4. What are the two main things that an object with a resultant force will do?
5. What does accelerate mean?
6. Which are the unbalanced forces in the diagram of the car?
7. Why can't the car accelerate forever?
8. When the driver of the drag car takes their foot off the accelerator, what disappears?
9. What produces the resultant force on the drag car?
10. Which direction does the resultant force act?
11. What does this do to the drag car?
12. What does Newton's 3rd law tell us?
13. Why do we only think about four forces when the ball is being kicked?
14. Complete the sentence.
    After the ball has been kicked and rolls along the ground, the **r**_ _ _ _ _ _ _ _ force from **f**_ _ _ _ _ _ _ , **s** _ _ _ _ it down to a stop.
15. What does the dropped ball do to the earth?

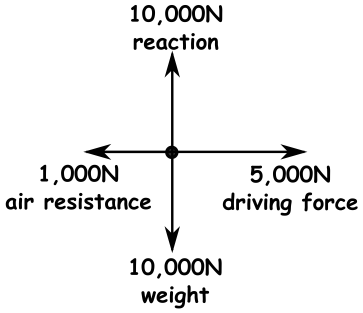
Additional tasks

1. Calculate the resultant force from the diagrams below by taking away the up and down and left and right forces. Say which direction the resultant force is acting.

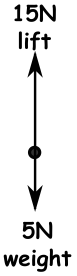
Sky diver just leapt



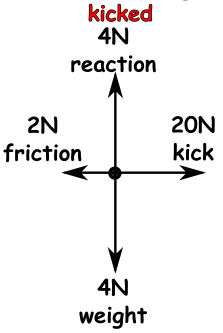
Car speeding up



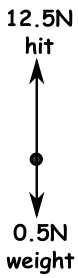
Drone ascending



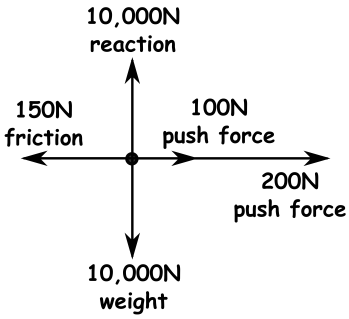
Football being kicked



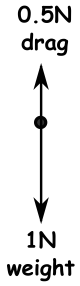
Tennis ball hit upwards



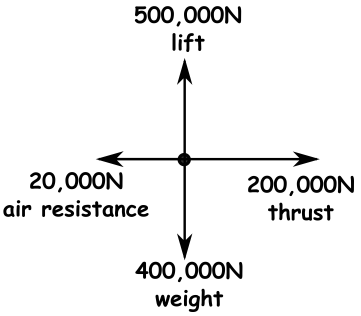
Two people pushing a car



A bouncy ball just dropped



Aeroplane taking off



2. Complete the sentences about resultant forces below. Choose from the words in bold.
   speeds up, lift, weight, air resistance, driving force, air resistance, weight, foot, opposite, slows, resultant force, opposite, decelerate

a. During take off, a plane _____ ___ until the _____ force from the **wings** is bigger than the _____.

b. Foot to the floor, a car will continue to speed up until the ____ _____ and friction is equal to the _____ _____ from the engine.

c. Drop a cup cake and it speeds up until the ____ _____ is equal to its _____.

d. Kick a ball and it only speeds up whilst your _____ is pushing it.

e. A Resultant force in the _____ direction to motion _____ objects down.

f. Brakes on a bike produce a _____ _____ in the _____ direction to motion to _____ (slow down) the bike.

3. Add force arrows to the parachutist, 1000N for weight (gravity) and 3000N for air resistance.

a. What will happen to the parachutist and why?

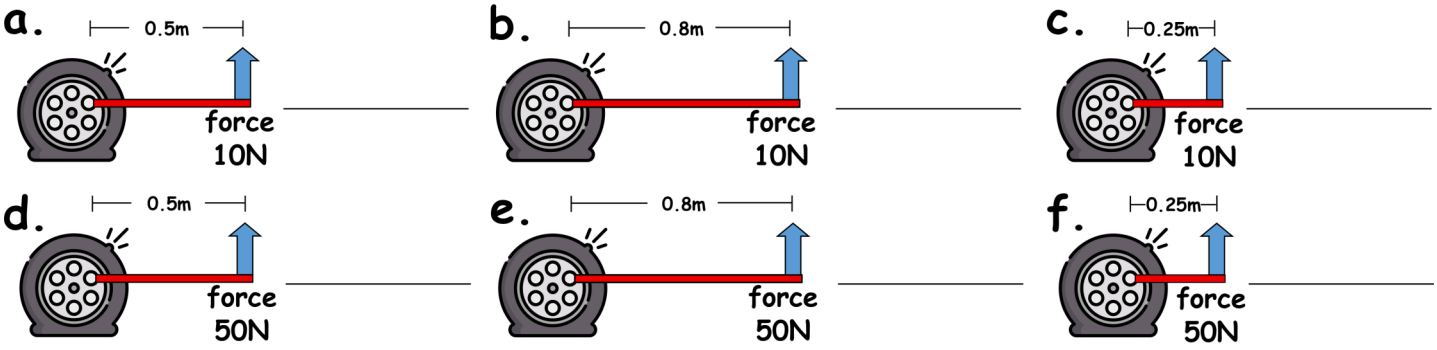
Questions on Moments

Comprehension

1. What do you have to do if you want to open the door by pushing near to the hinges?
2. Pushing on the handle requires a smaller force but greater what?
3. What is the turning effect of a force called?
4. How do you calculate the moment of a force?
5. Why wouldn't a shorter wheel brace undo tight wheel nuts?
6. Why do nail scissors have a long handle?
7. What is the scientific name for balanced moments?
8. What does it mean?

Additional tasks

1. Write down what the moment of the force is (force x distance from pivot) for the wheel braces below, remember the units, Nm, newton metres.

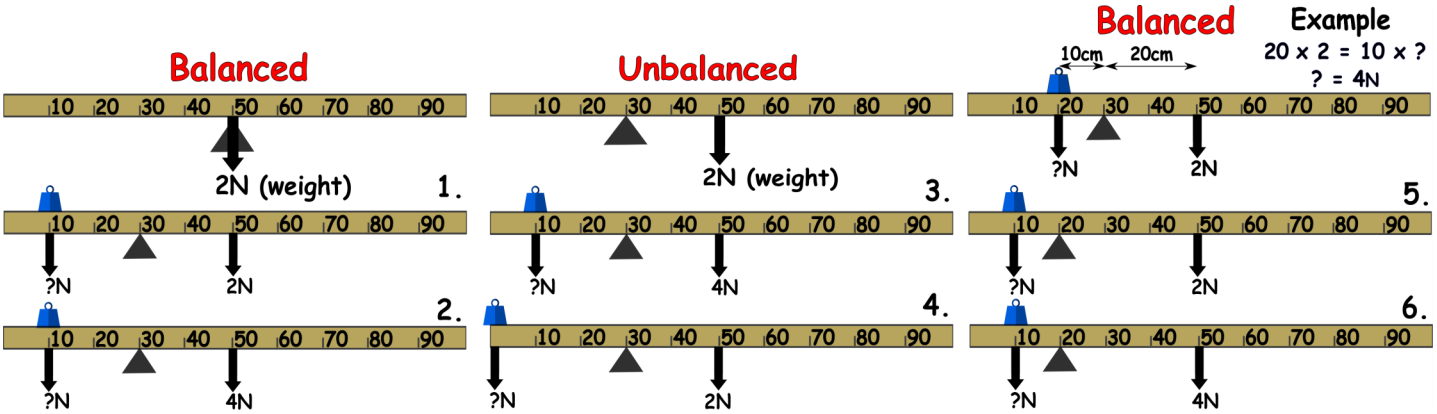


2. Write out what the clockwise and anticlockwise moments are for seesaws A-F and say if they are balanced or unbalanced.

A. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____
B. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____
C. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____
D. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____
E. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____
F. anticlockwise = _____ *balanced/unbalanced?*
clockwise = _____ _____

3. The weight of a metre ruler can create an unbalancing moment when it is **not** pivoted in the middle. The situation can be balanced by adding weights on the left of the pivot to balance the ruler's weight.

a. Calculate the **?** weight needed to balance rulers 1 to 6. Use the example to help.



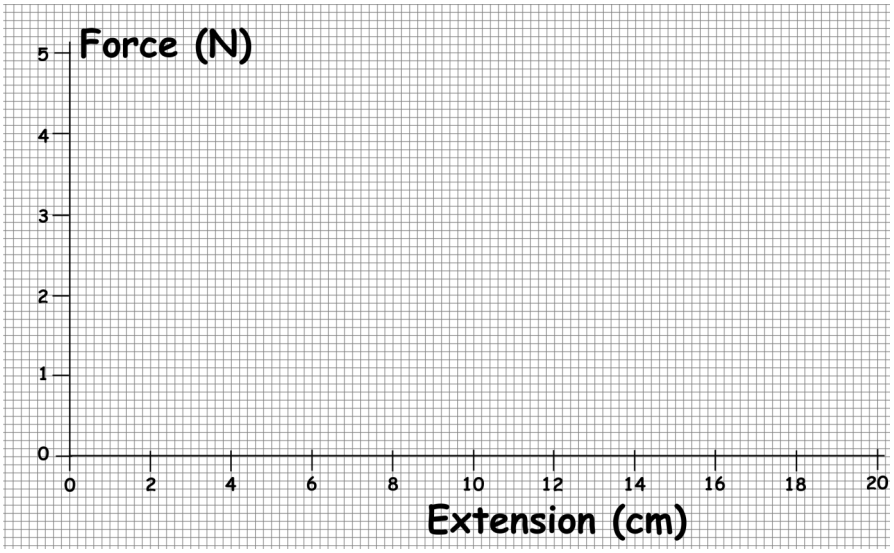
Questions on Hooke's Law

Comprehension

1. What happens the more you stretch an elastic band?
2. When you double or treble one quantity and the related quantity doubles or trebles, what is this called? (like force and extension)
3. If you plot a graph of this sort of relationship what does it look like?
4. What is another name for a spring balance?
5. Inside a force meter, what is it that stretches?
6. If you pick up an object with a force meter, what will the size of the force tell you?
7. If you pull objects along with a force meter, what can you investigate?
8. What do we call it when an object goes back to its original length when the force is removed?
9. What will most objects do?
10. Give two examples of where we see elastic behaviour?
11. What do we mean by the elastic limit?
12. If an object stays permanently stretched after the force is removed what do we call this?
13. Why is the graph for spring '**a**' steeper?
14. What does stiffness mean?

Additional tasks

1. Plot the results opposite on the graph below, draw a straight line and predict what extension 2.5 N and 4.5 N will produce by drawing across to your line and down.



2. Look at the numbers in the tables below and decide if the 'Y' values are **directly proportional** to the 'X' values for **A,B,C** and **D**.

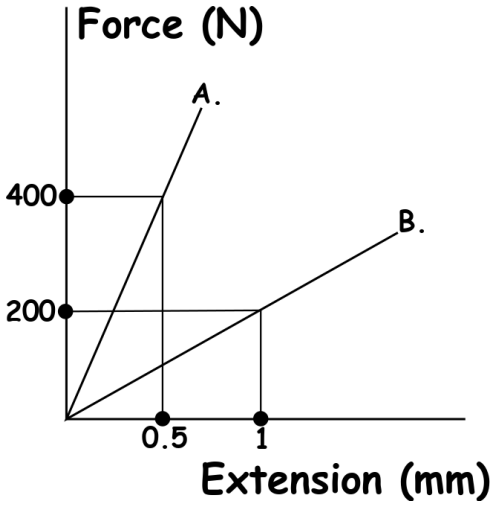
A.	
X	Y
1	2
2	4
3	6
4	8

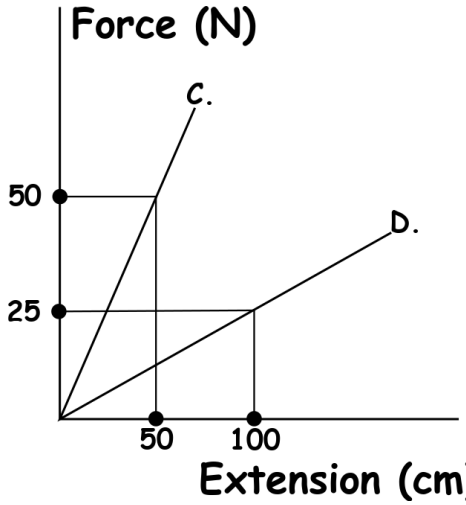
B.	
X	Y
1	6
2	8
3	10
4	12

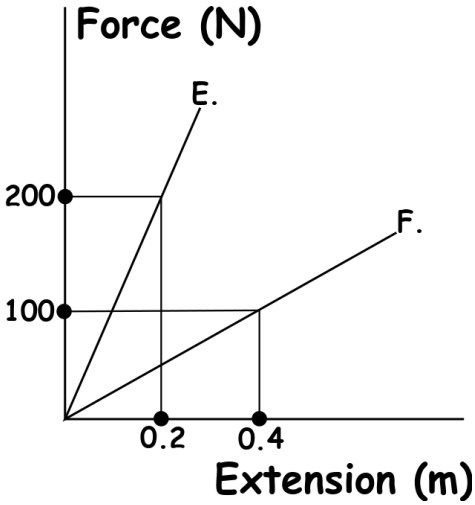
C.	
X	Y
2	10
4	20
6	30
8	40

D.	
X	Y
1	4
2	7
3	10
4	13

3. Use the force and extension values **in the table below the graphs** to work out which line **A** to **F** matches the numbers in the table.







Line?						
Force	400N	25N	12.5N	100N	800N	150N
Extension	2mm	25cm	50cm	0.125mm	0.8m	0.6m

Questions on Gas Pressure

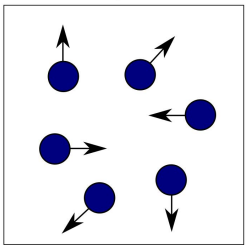
Comprehension

1. What happens if you push air from your lungs into your mouth space?
2. What happens to the pressure inside your mouth?
3. Why does the air rush out when you open your mouth?
4. When does the air stop rushing out?
5. Where does the force come from for gas pressure?
6. In what way do the gas particles move around inside a container?
7. How is pressure defined?
8. Which direction does gas pressure act?
9. How many ways are there to increase the pressure of a gas?
10. What makes them easy to understand?
11. What happens when you pump up a tyre?
12. What does this do to how often the collisions occur?
13. What does heating the gas up do to the particles?
14. What's another way of saying reduce the space for the particles?

Additional tasks

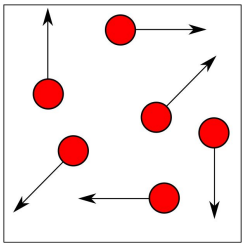
1. Label the boxes containing particles with the words **low** and **high**, then write the following statements next to the correct box. ***Particles move fast, particles collide with the walls less often, particles move slow, particles collide with the walls more often, particles exert less force, particles exert more force***

_ _ _ temperature
_ _ _ pressure



Statements

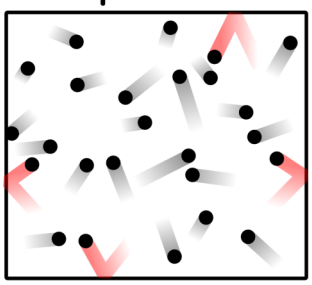
_ _ _ _ temperature
_ _ _ _ pressure



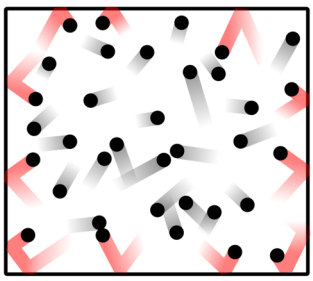
Statements

2. Compare 'boxes' **A.** and **B.** below and explain which you think has the highest pressure and why?
Compare 'boxes' **C.** and **D.** and explain which you think has the highest pressure and why?

A. Less particles

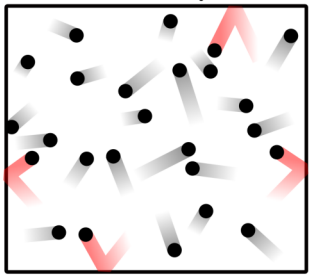


B. More particles

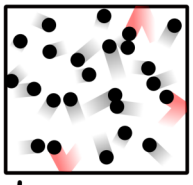


Same temperature

C. More space



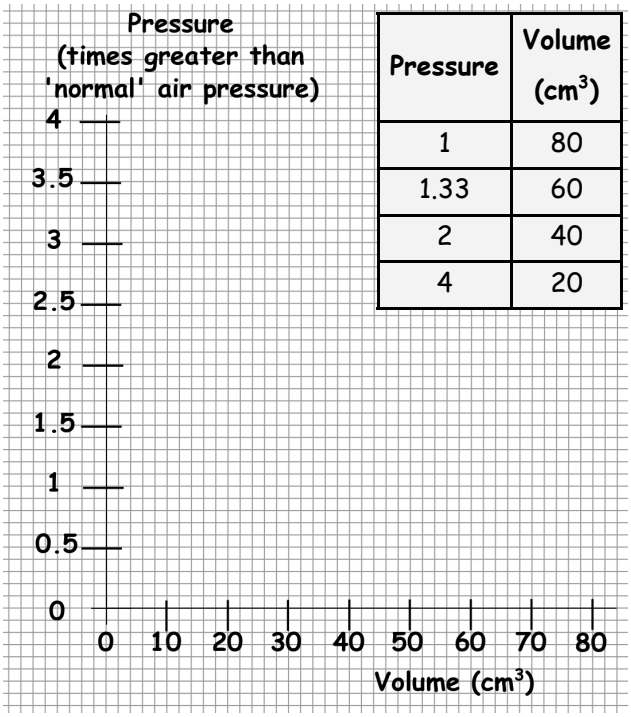
D. Less space



Same temperature and same number of particles

3. Plot the pressure and volume values for compressing a gas like in the pump shown opposite. Draw a smooth line through the points. Explain what the graph shows.

Pressure	Volume (cm^3)
1	80
1.33	60
2	40
4	20



Questions on Atmospheric Pressure

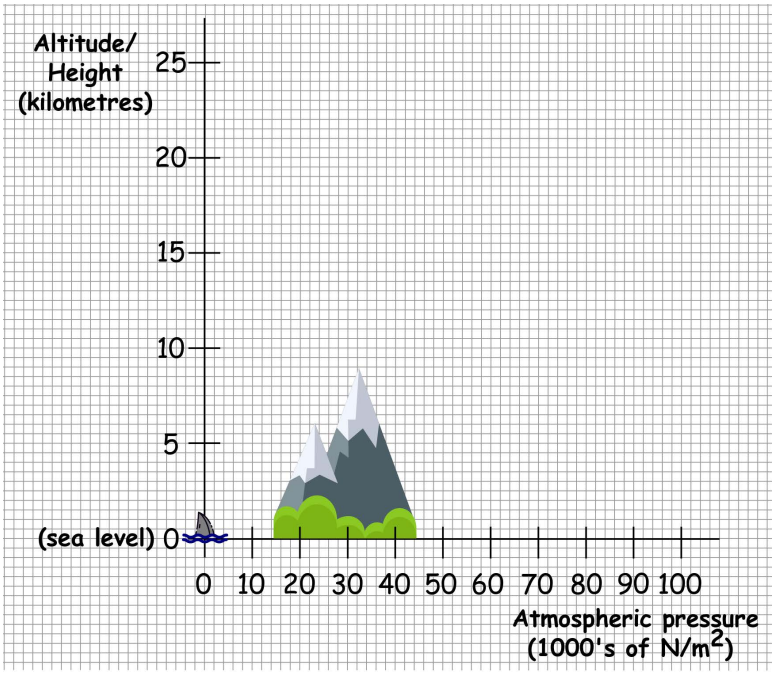
Comprehension

1. Why can it be confusing to talk about atmospheric pressure?
2. Why is atmospheric pressure similar to being in bed?
3. How high are the layers of air above us?
4. What is the weight of air that is pushing down on $1m^2$?
5. What is this weight about the same as?
6. Why don't we normally feel the huge atmospheric pressure of 100,000 N/m^2 ?
7. What happens to the number of air particles as you go higher up?
8. Why do high altitude climbers wear breathing apparatus?
9. If the air pressure at sea level is 100,000 N/m^2, what is it up Mount Everest?
10. When do we see the effects of the large forces involved in atmospheric pressure?
11. When the collapsing can fills with steam, why doesn't the pressure rise?
12. What happens to the steam that was pushing outwards when the lid is replaced and the can cooled?
13. Why does the can get crushed?
14. By pumping the air out of the hemispheres and closing the tap, what does this mean for the 'push balance'?

Additional tasks

1. Plot the points from the table and draw a smooth curve to show how atmospheric pressure changes with height. Use the grid opposite.

Atmospheric pressure (1000s of N/m^2)	Altitude/ Height (kilometres)
100	0 (sea level)
50	5
30	10
16	15
9	20
5	25



2. Complete the gap fill on atmospheric pressure. Choose from the words below.

higher, decreases, less, pressure, oxygen, thinner, volume, surface, lower, 70, higher, boils

Atmospheric pressure _____as you move _____ up in the atmosphere. This is because in a certain _____ of air there are _____ particles. Climbers sometimes need to carry _____ tanks when ascending high mountains because the air is _____ which means there is less oxygen. Water _____ at a higher temperature when the pressure on top of the water's surface is _____ this is used to cook foods quicker in a _____ cooker. When the pressure above the _____ of water is lower water boils at a _____ temperature. Water boils at about ___ degrees Celsius on top of Mount Everest because of the lower pressure.

3. Write **true** or **false** in brackets next to the statements on atmospheric pressure.

Gravity stops our atmosphere escaping into space (_____) Air weighs nothing (_____)
Our atmosphere is made mainly from nitrogen and oxygen (_____)
Air can't be frozen (_____) Vacuum cleaners don't suck, air gets 'pushed' in due to a difference in air pressure (_____) 1000 litres of air 'weighs' 1.3 kilograms (_____)
Most of earth's atmosphere is within 10 miles of the surface (_____)

Questions on Pressure in Water

Comprehension

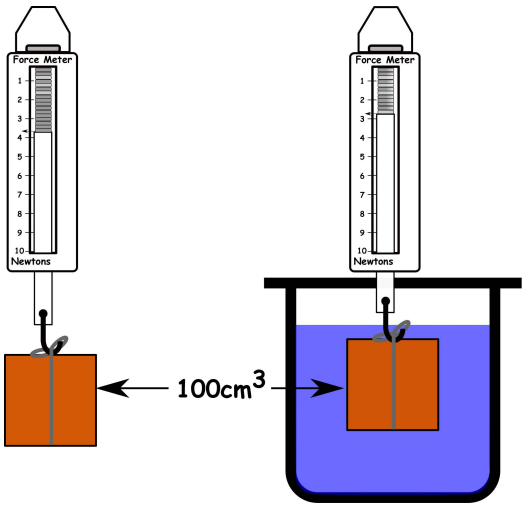
1. What force makes a float rise to the surface?
2. What will any object in a fluid experience?
3. What happens if the upthrust is less than an object's weight?
4. What can be used to show that the pressure of water increases with depth?
5. Why is this?
6. This increased pressure leads to a greater?
7. How is this shown with the pressure can?
8. What causes upthrust?
9. What happens to the force on the sides of objects?
10. What will a submerged object do to the water?
11. In diagram **A** what is the water trying to do to the space taken up by the cube?
12. How much water would the ice cube displace if it was pushed under water?
13. What did Archimedes notice?
14. Even if an object sinks, it still feels lighter because of upthrust, what do we call this?
15. Why is ice unusual?
16. Why do huge ships float?

Additional tasks

1. Complete the table to say whether the example will float (yes/no) and whether it will displace its own weight in water.

Example	Density (g/cm^3)	Floats (yes/ no?)	Displaces its own weight in water (yes/ no?)
Beeswax	0.96		
Aluminium	2.7		
Baking powder	0.72		
Brick	2.0		
Coal	1.5		
Potassium	0.86		
Steel	7.82		
Butter	0.86		
Pencil Rubber	1.1		
Sand	1.6		

2. A boy lifts several objects with string attached to them using a force meter. He records their weights. All have a volume of $100cm^3$.



2. (continued) He then measures the apparent weight (the new reading on the force meter) when submerged in water.

His results are recorded in the table below.

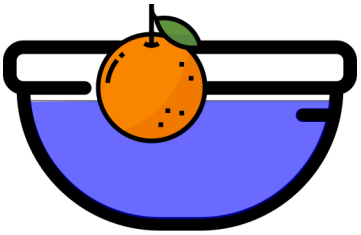
a. Calculate the upthrust in each case (weight – apparent weight). What do you notice in each case and why is this?

Material	Weight (N)	Apparent weight in water (N)	Upthrust (N)
Aluminium	2.7	1.7	
Steel	7.8	6.8	
Brick	2.0	1.0	
Copper	8.8	7.8	
Glass	2.5	1.5	
Coal	1.5	0.5	

3. A student drops a clementine orange into a bowl of water and notices that it floats. The student decides that they want to eat the orange so peel it. Before eating it the student wonders if the orange will still float so drops it into the water after it is peeled. It sinks this time!

a. What does this mean for the density of the orange peeled and unpeeled?

b. How might you explain this? (clue; it has to do with the orange peel and air)



Questions on Pressure on Solid Surfaces

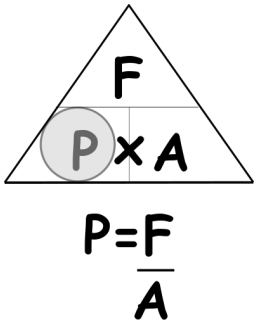
Comprehension

1. What is produced when two solid surfaces come into contact?
2. What two factors affect the size of this pressure?
3. What is the usual unit of pressure?
4. Why use cm^2 rather than m^2 to begin with?
5. How many times bigger is the pressure under stiletto heels compared to trainers?
6. What do stiletto heels often leave in the floor?
7. Why are they terrible for walking in mud?
8. When do knives cut well?
9. Why is this?
10. What does the small area tip enable a drawing pin to do?
11. Why does the weight of a tank need to be spread over a wide area?
12. What is one of the adaptations of a polar bear?
13. What does this stop them doing?
14. What do humans do to stop this happening?
15. What would happen if we tried to sit on one nail?
16. Why are we able to sit on a bed of nails?

Additional tasks

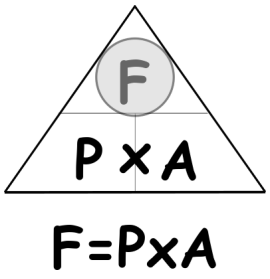
1. Calculate the **pressure** in the table below (divide force by area).

Example	Force (Newtons)	Area (cm^2)	Pressure (N/cm^2)
Knife edge	5	0.02	
Tank tracks	300,000	25,000	
Drawing pin tip	10	0.005	
Polar Bear's paws	5000	800	
Under a **car** tyre	2500	100	
Razor blade	5	0.001	
A punch	400	30	
Pressure of a human bite	500	8	



2. Calculate the **force** in the table below for the slightly different examples (multiply pressure by area).

Example	Force (Newtons)	Area (cm^2)	Pressure (N/cm^2)
Knife edge (blunt)		0.06	133.33
Tank tracks		25,000	10
Drawing pin tip (blunt)		0.01	2000
Polar Bear's paws (cub)		100	6.25
Under a **truck** tyre		250	30
Razor blade (blunt)		0.008	3000
A punch		25	15
Pressure of a human bite		6	50



3. Complete the gap fill on pressure. Choose from the words below.

weight, area, force, pressure, force, concentrated, bigger, always, penetrates, backpacks, wider, bigger, sharp

The equation for pressure is _____ divided by _____. This means that for a given _____ the bigger the area the smaller the _____ or the smaller the area the _____ the pressure. Also for a given area the _____ the force the bigger the pressure this will _____ be true. You always hit a nail into wood _____ end first. This means that when you hit the nail, the force at the sharp end is _____ on a small area and the high pressure means the nail _____ the wood. The straps on _____ are always wide so the _____ of the backpack is spread over a _____ area and the straps don't dig in due to a high pressure.

Questions on Waves and their Properties

Comprehension

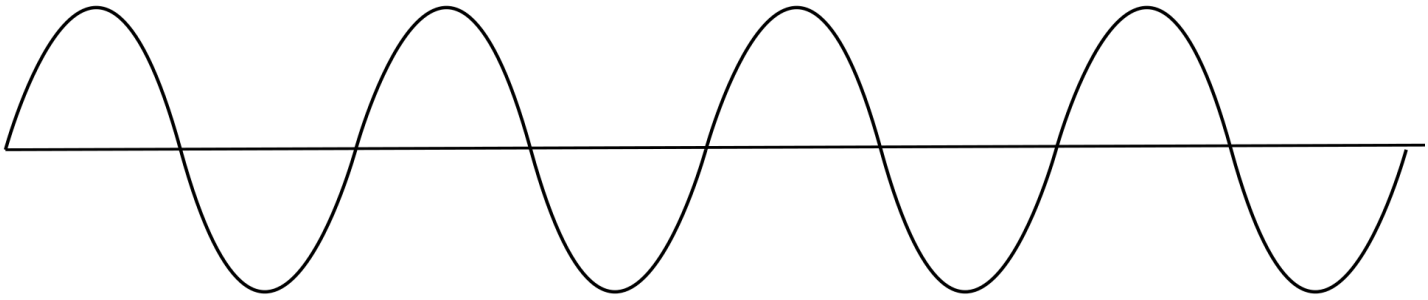
1. When we wave our hands what do we do?
2. What are the waves on the surface of water called?
3. When we say waves have common properties what do we mean?
4. What's the name for the up and down or back and forth motion that makes a wave?
5. As well as transferring energy, reflecting and refracting what else can waves do?
6. What are the names of the two types of wave motion?
7. Which type of wave is light and sound?
8. What is the top of a wave called?
9. What is the wavelength?
10. What do we call the distance from the centre line (rest position) to the peak?
11. What does this tell us about the wave?
12. What does the frequency tell us and what is its unit?
13. How do the particles move compared to the direction of travel for transverse waves?
14. What causes the air particles to produce a higher pressure in a sound wave?
15. What's an important difference between longitudinal and transverse waves?
16. What can cause interference on a TV or radio?

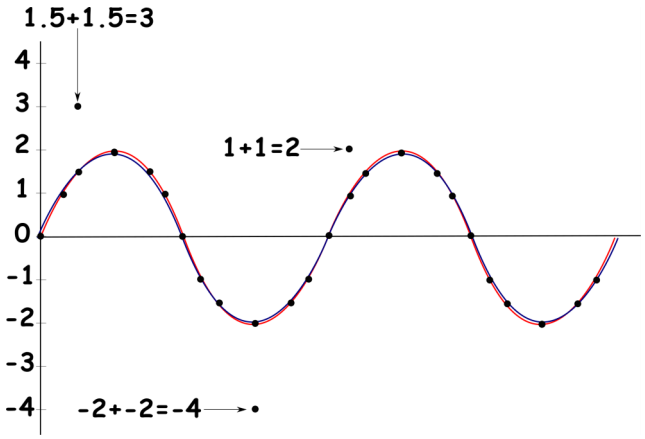
Additional tasks

1. Match and memorise the meanings of the words below.

Peak	waves where the vibrations are at right angles to wave travel, e.g. light
Trough	distance from centre line (rest position) to peak or trough
Amplitude	waves adding or cancelling when they meet
Wavelength	waves where the vibrations are parallel to wave travel, e.g. sound.
Frequency	top of the wave
Transverse waves	number of wavelengths that pass per second
Longitudinal waves	distance from peak to peak
Interference	bottom of the wave

2. Label the wavelength, amplitude, peak and trough **in more than one** place on the transverse wave below.





3. The 'dots' on the waves (red and blue) are the height of the waves at those points. The two waves meet so add together. Add the two values for each dot on the wave and plot it at the right height. Three have been done for you.

   Join the dots to show what the new wave looks like (it's just like wave a and wave b opposite).

Questions on Sound

Comprehension

1. How is sound made?
2. What changes the sound we hear?
3. How can we describe sounds?
4. What is another word for loudness?
5. What do loud sounds carry a lot of?
6. What can loud sounds do to our ear drums?
7. What is the unit for the loudness of sound?
8. What do we mean by high pitched sound?
9. What do we mean by frequency and what is the unit?
10. How can sound travel from place to place?
11. What do we mean by 'the medium' when talking about sound?
12. What substances does sound travel fastest in and why?
13. What happens to the sound of a vibrating object in a bell jar with all the air pumped out?
14. Why can't the vibrations be passed on?

Additional tasks

1. Match and memorise the words and their meanings below.

Vibration	the number of vibrations per second
Amplitude	the substance sound travels through
Medium	the unit of frequency
Frequency	the to and fro or back and forth motion that produces sound
Hertz (Hz)	the unit for the loudness of sound
Decibels (dB)	the size of the vibration

2. Unscramble the words from the clues to reveal the 'sound' words below.

High frequency so high ……. (**ITEPDCH**)

Also called volume (**OUSLENSD**)

If this is big the sound is loud (**MPDAUIELT**)

What sound travels through (**MDMEUI**)

The study of sound (**COCAISSUT**)

The unit of frequency (**THZER**)

This produces sound (**IBOVIANRT**)

Sound can't travel through this (**VCMAUU**)

Unit of loudness (**ECLDEBSI**)

This causes low pitched sounds (**OFNLEQYWUREC**)

This causes high pitched sounds (**IHNHEEYGUFRQC**)

A bass drum produces this sort of sound (**OPELHTDWCI**)

Sound travels fastest in (**SLSODI**)

The number of vibrations per second (**RECFNUYQE**)

3. Decide if the following examples are usually loud sounds or quiet sounds and say if you think they would be high pitched or low pitched.

- An erupting volcano
- Squeaky brakes
- The wind rustling leaves
- A lion's raw
- A female opera singer
- A referee's whistle
- Drilling a hole in the wall
- A honey bee hovering
- A bird chirping

4. Put the following mediums in order of what sound would travel through fastest to slowest.

a. Sound travelling through treacle

b. Sound travelling through a helium balloon

c. Sound travelling through the ground

Questions on Picturing Sound

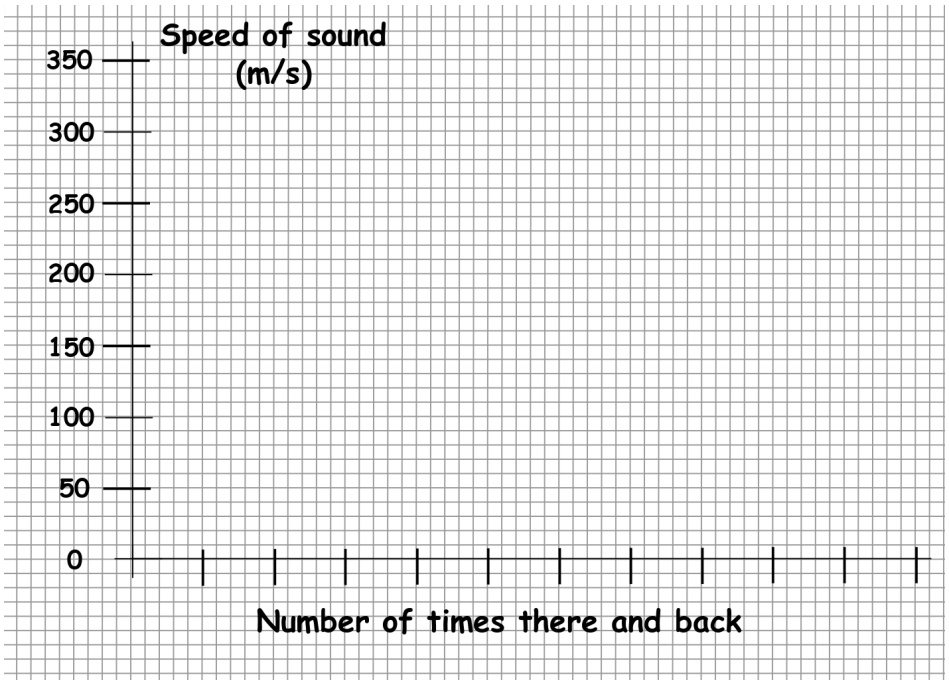
Comprehension

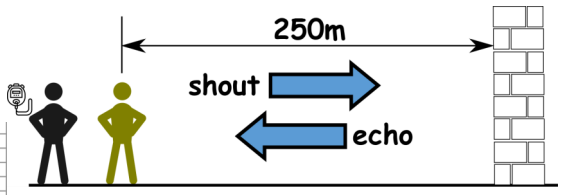
1. The energy of a sound wave travels outwards in all directions, but what does not move from place to place?
2. What kind of wave is a sound wave?
3. How can we detect the vibration of a sound wave?
4. What do microphones convert sound waves into?
5. What do we use to display sound waves?
6. How can we tell a sound is loud by looking at the trace on an oscilloscope?
7. How can you tell by looking at a trace that a sound is high pitched?
8. If the pitch is high what else must be high?
9. What does it mean when the peaks of a wave are more spread out?
10. What do we call it when sound bounces off an object?
11. When you shout towards a building 340m away why do you hear your echo 2 seconds later?
12. Why would someone inside hear the sound?

Additional tasks

1. Two students stand 250m away from the gym wall. One student shouts and when he hears the echo shouts again. The other student times how long it takes the sound to go there and back between shouts for a different number of times. They then calculated the speed of sound. Plot six bars on the chart below for each speed value.

Number of times there and back	1	2	3	4	5	6
Distance (m)	500	1000	1500	2000	2500	3000
Time (seconds)	2.0	3.3	4.7	6.1	7.5	8.9
Speed (m/s)	**250**	**300**	**320**	**330**	**330**	**340**





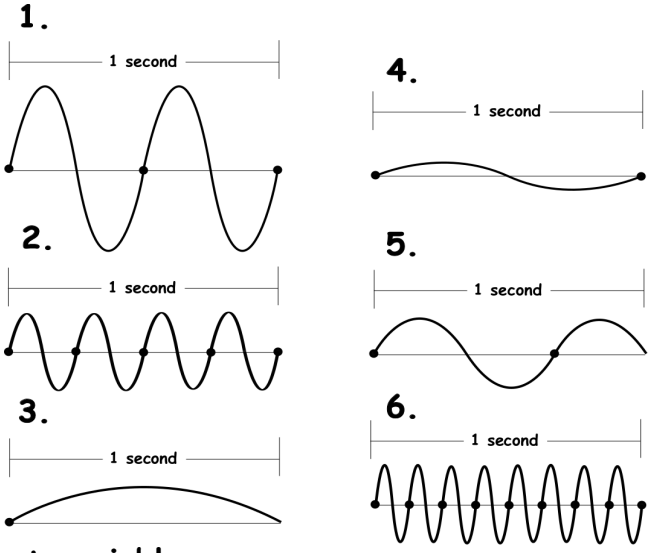
2 a. The diagram bottom left shows six wave traces of sounds with different frequencies and amplitudes (loudness). Complete the table for the frequency of each wave, remember frequency is the number of waves in one second **so count the waves!**

Wave number	Frequency (waves per second, Hz)
1	
2	
3	
4	
5	
6	

b. Which is the ***highest pitch***, ***lowest pitch***, ***loudest*** and ***quietest*** out of waves **1** to **6** ?

c. A student puts a buzzer in a box connected to a battery. The student has six layers of cotton wool to cover the box and an oscilloscope with a microphone that shows the amplitude of the sound on the display.
Explain how the student could investigate how the number of layers of cotton wool affect the loudness of the sound? Think about;

- What to change? What to keep the same? What to measure?



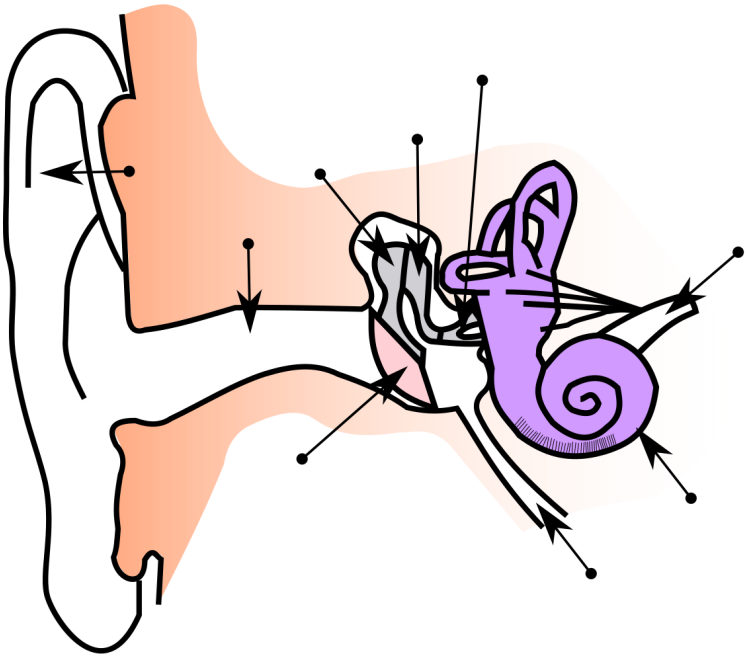
Questions on Hearing and Using Sound

Comprehension

1. What are the two main ways to detect sound?
2. What do both methods do?
3. What does the pinna help direct the sound down?
4. What is the ear drum like?
5. What does the sound wave do to the ear drum?
6. What are the ossicles?
7. How do these bones amplify the vibration?
8. What does the cochlea contain?
9. How do the electrical impulses get to the brain?
10. What does range mean?
11. How does a moth's large hearing range help it?
12. What are frequencies above 20,000Hz called?
13. How do bats find their prey?
14. How does a bat know if the prey is close?
15. How is ultrasound used to build a picture of an unborn baby?
16. Why is ultrasound used by physiotherapists?

Additional tasks

1. Label and memorise the diagram of the ear below.



2. Complete the gap fill on echolocation.

echolocation, hear, emitting, echo, frequency, closer, Longer, 20,000Hz

Ultrasound is sound of _____ above _____. Humans can't _____ ultrasound.

Bats, dolphins, submarines and ships use ultrasound for _____.

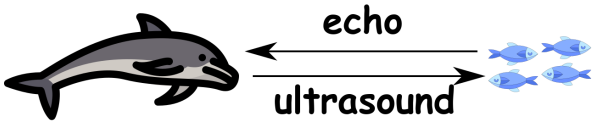
This means _____ ultrasound and listening for how long it takes the _____ to return.

Shorter echo times mean an object is _____ . _____ echo times means an object is further away.

3. The speed of sound in water is **1500m/s,** this means that an object 1500 metres away will have an echo time of 2 seconds. One second for the sound to get there and one second for the sound to get back. In each of the examples in the table calculate the **distance** to the object. Use the example below. Reminder, the speed of sound in water is **1500m/s**.

EXAMPLE

echo time = 4 seconds



distance to fish = speed x (echo time/2)
= 1500 x 4/2
= 3000m

Example	Echo time (seconds)	Distance (m)
A Ship testing the depth of water	0.6	
A whale hunting squid	8	
A submarine detecting a ship	6	
A dolphin hunting a shoal of herring	1	
A bat hunting moths **speed of sound in air = 340 m/s**	0.2	

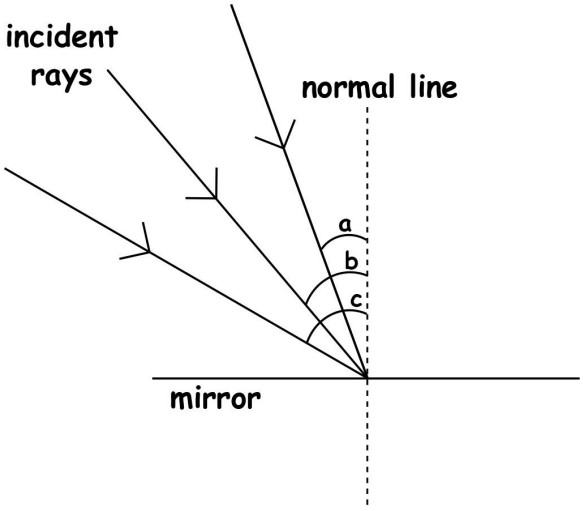
Questions on Light and Reflection

Comprehension

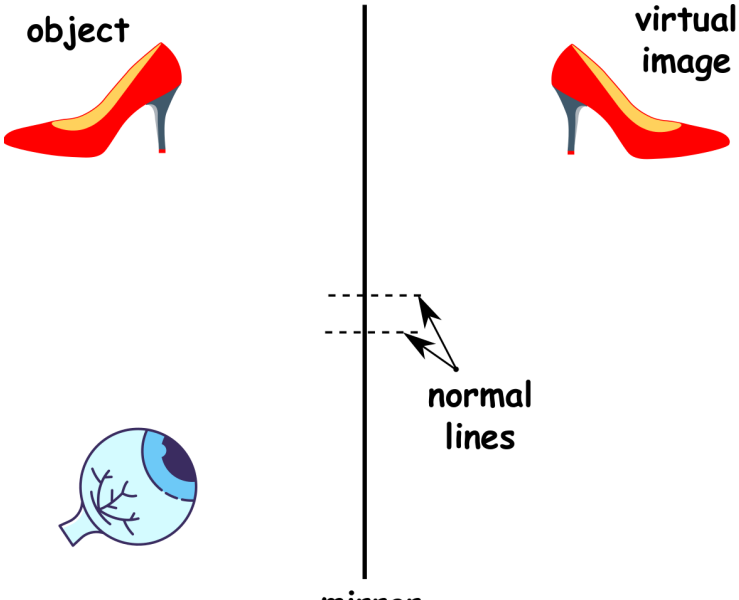
1. How does light travel?
2. When we want to investigate how light is going to behave, what do we use?
3. How far does light travel in one second?
4. What do we call a material that light passes through?
5. What can light do to a translucent material?
6. What does the law of reflection tell us?
7. What do we use to show the law of reflection?
8. Complete the following sentence describing the law of reflection.
   The angle of ***i*** _ _ _ _ _ _ _ _ *is* ***e*** _ _ _ _ ***t*** _ *the angle of* ***r*** _ _ _ _ _ _ _ _ _ .
9. What is the normal line?
10. What sort of surface is the law of reflection true for?
11. To see an object what must light do?
12. When light is shone on the person's spot, in which direction will the reflected light travel?
13. How many rays do we use to show the image produced?
14. Why does the brain 'see' the spot behind the mirror?
15. How far behind the mirror does the image appear to be?

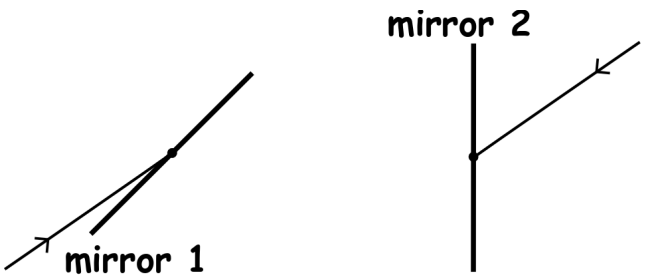
Additional tasks

1. Using a protractor measure the angles **a**, **b** and **c** below and draw in the reflected rays.

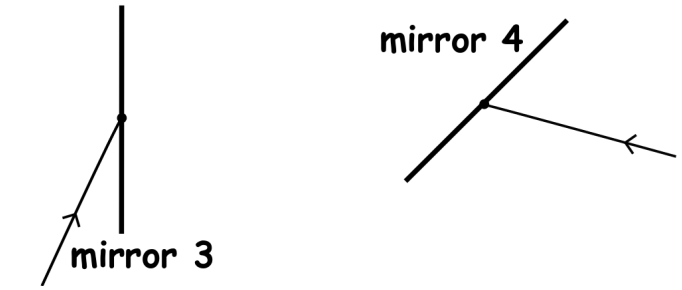


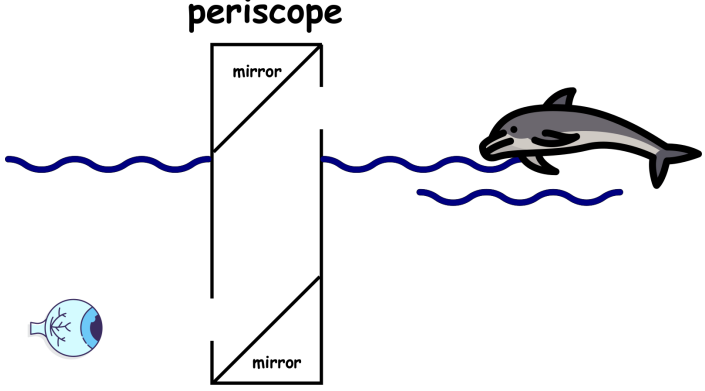
2. Complete the ray diagram (as shown opposite) to show how a virtual image of the stiletto heel is formed.





3. Draw in a **dashed normal line** for each of the mirrors **1** to **4**. Measure the angle of incidence and draw in the reflected ray at the correct angle.
4. Show the path of a ray of light from the dolphin into the eye to demonstrate how a periscope works.





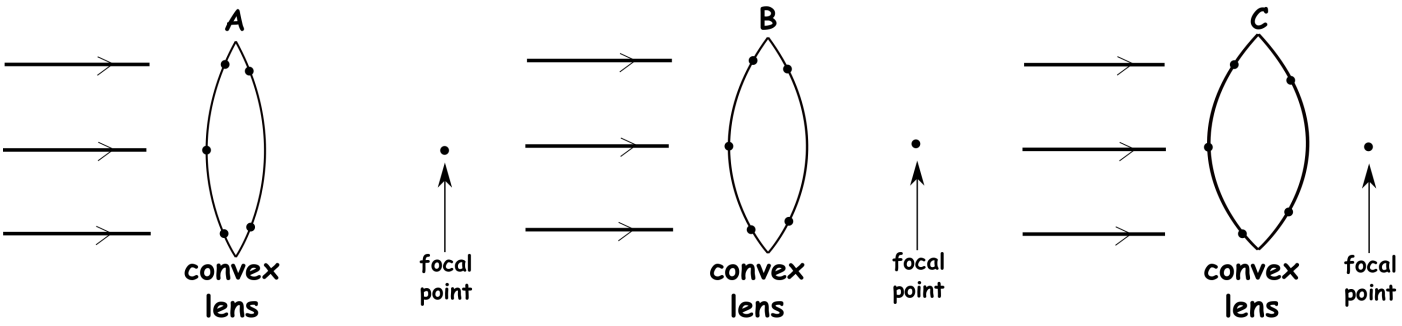
Questions on Refraction, Lenses and the Eye

Comprehension

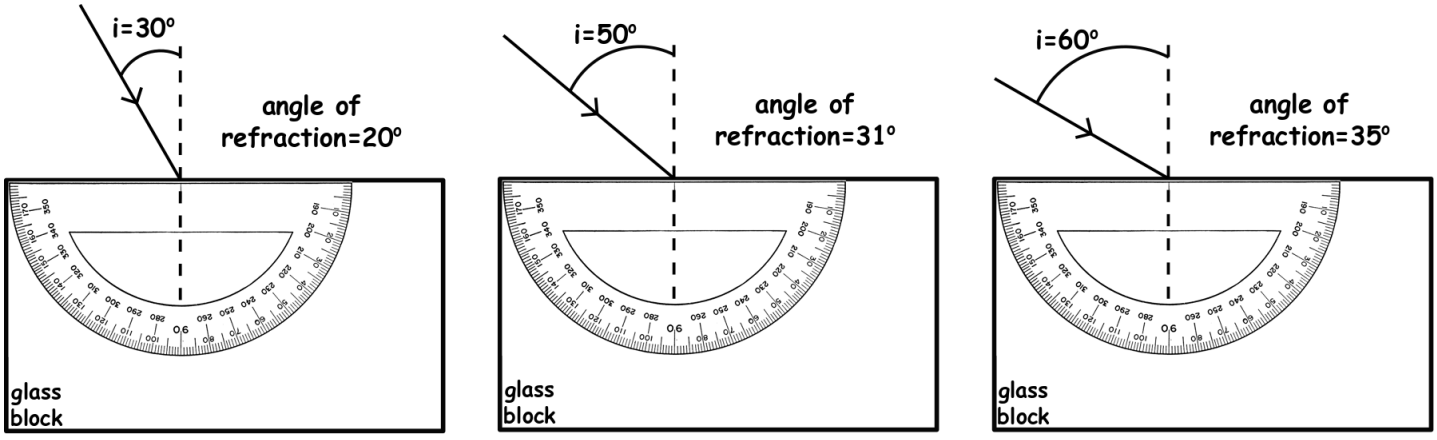
1. How do sound waves in air, water waves and waves on a string transfer energy?
2. What **doesn't** light need to travel?
3. What is another word for the emptiness of space?
4. What happens when light hits earth's atmosphere?
5. What can the slowing down of light cause?
6. What is this called?
7. If light hits the glass block at a 0° angle (head on) what doesn't happen?
8. If light hits the glass block at another angle, what happens to its path?
9. What happens to light's path as it leaves the glass block?
10. What sort of lens does your eye have and what is it able to do?
11. Where do parallel rays of light pass through after being refracted by the lens?
12. What is myopia?
13. How can myopia be corrected?
14. What does a diverging lens do to light rays?
15. Refraction can cause objects to seem to be....?

Additional tasks

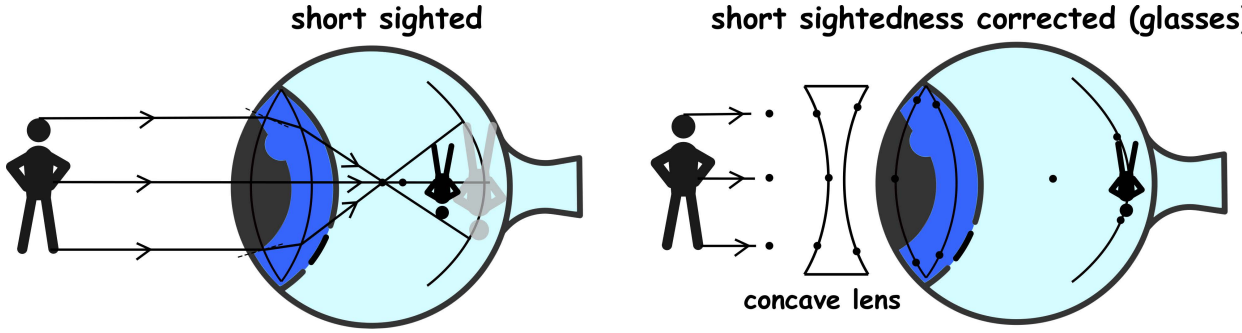
1. Complete the ray diagrams below by 'joining the dots'. **A**, **B** and **C** show how the focal point changes with lens thickness.



2. Draw in the refracted ray at the correct angle to show the ray passing through the glass block (as shown opposite). The ray leaves the block **parallel** to the incident ray. Draw a normal line where it is about to leave the glass block and show it leaving at the correct angle (i.e. 30°, 50° and 60° from the normal on the opposite edge).



3. The right hand diagram shows how a concave lens can be use to correct short sightedness. Complete the path of the three rays showing how short sightedness can be corrected. Join the dots!



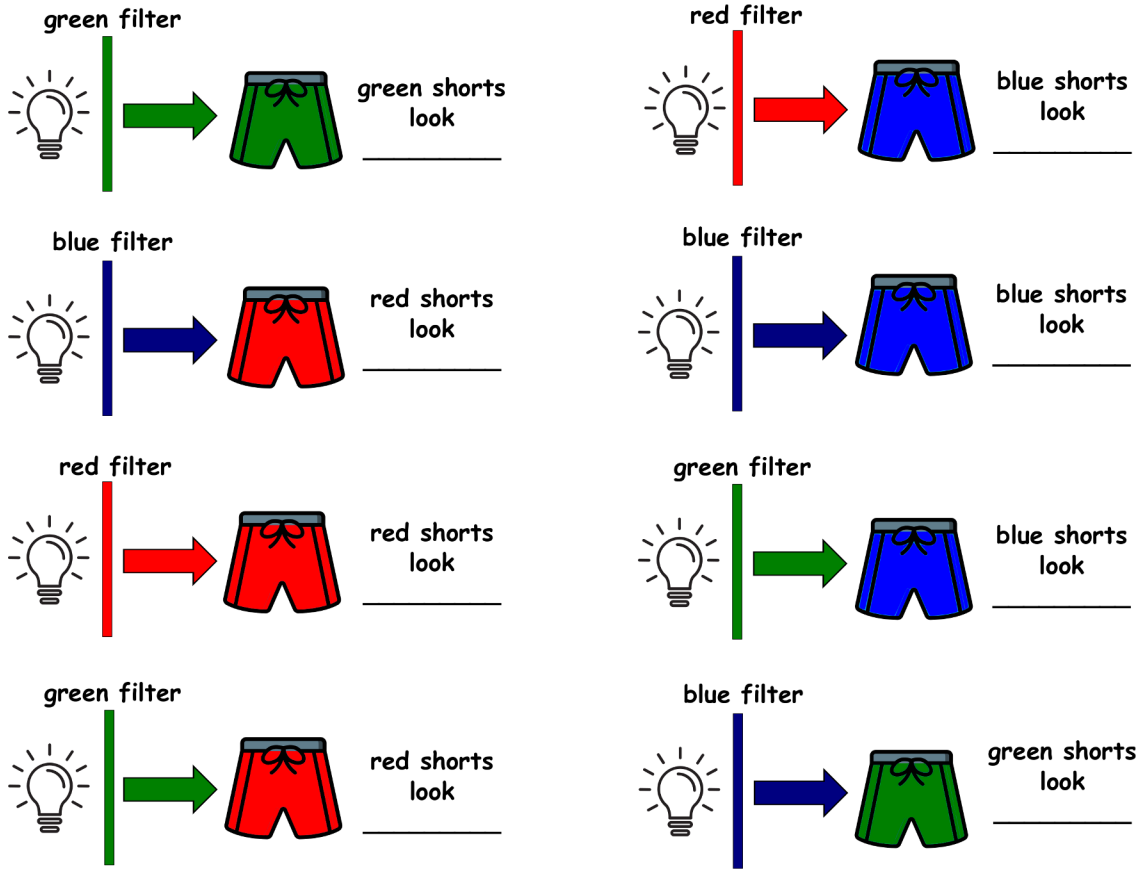
Questions on Dispersion and Colour

Comprehension

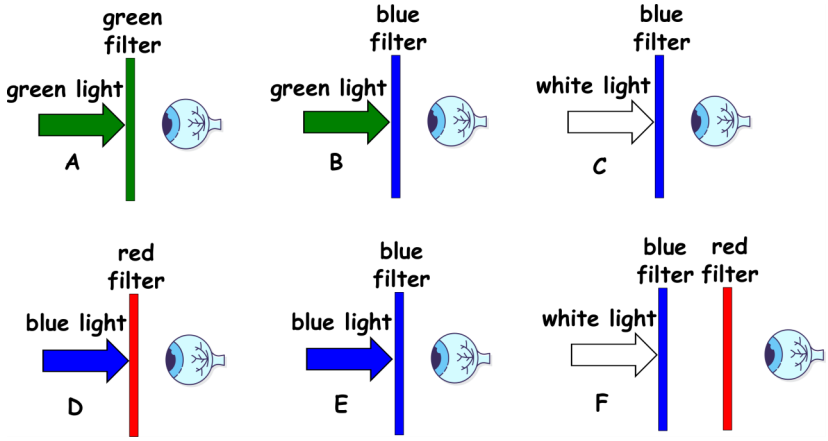
1. What do rainbows show?
2. What do we call light that contains all the colours of the visible spectrum?
3. What is a useful memory aid for the colours in the visible spectrum?
4. What did Sir Isaac Newton place in the path of a light ray entering his room?
5. Using another prism what are you able to do to the spectrum produced?
6. Why does dispersion happen?
7. Why does an object look a particular colour?
8. What does a red T-shirt do to all colours apart from red?
9. Why do the socks look white?
10. Why do objects look black?
11. What colour light does a green filter allow through?
12. Why do green shorts look black under blue light?

Additional tasks

1. Write down what each of the coloured shorts will look like under the different coloured light.



2. State what colour the eye will see in examples **A** to **F** below.



3. Think of your own mnemonic for the colours of the visible spectrum.
An example of a well known one is;

Richard **O**f **Y**ork **G**ave **B**attle **I**n **V**ain

Red, Orange, Yellow, Green, Blue, Indigo, Violet

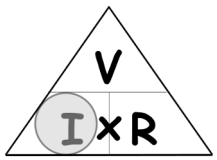
Questions on Electric Circuits

Comprehension

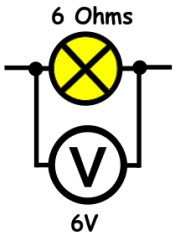
1. What do electric circuits allow?
2. Why is electricity so useful?
3. When can electricity increase a chemical energy store?
4. What do electrons need to get them moving?
5. What is the flow of electrons like?
6. What's another name for voltage?
7. What does voltage tell us?
8. What is the unit of voltage and what do we measure it with?
9. What is a current?
10. What does the size of a current tell us?
11. What does the current carry?
12. What is the unit of current and what is it measured with?
13. What does resistance tell us?
14. What is its unit and what is the symbol for resistance?
15. What component has a very high resistance?
16. What does increasing the resistance do to the current?

Additional tasks

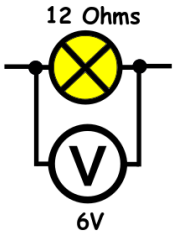
1. Use current = voltage ÷ resistance to calculate the current in each case.



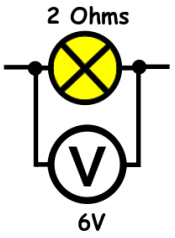
$$I = \frac{V}{R}$$



I = _____



I = _____



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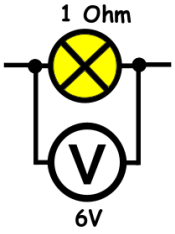

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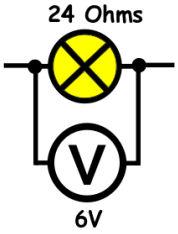
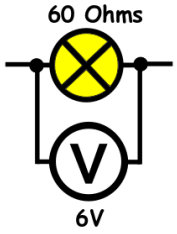


I = _____



I = _____

2. Complete the gap fill below. Choose from the words;
bigger, fixed, smaller, bigger, inversely, smaller

If the voltage has a _____value then as the resistance gets _____, the current gets _____. Or as the resistance gets _____, the current gets _____.
This relationship is called being _____ proportional.

3. Find the 'circuit words' below in the word search opposite.

POTENTIALDIFFERENCE	VOLTAGE
CURRENT	RESISTANCE
ELECTRONS	BATTERY
VOLTMETER	AMPS
OHMS	VOLTS
CIRCUIT	FLOW
AMMETER	CHEMICALREACTION

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

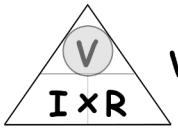
Questions on Series Circuits

Comprehension

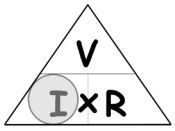
1. What does series mean?
2. How many important facts are there to learn about series circuits?
3. What happens to the voltage in a series circuit?
4. Where can the ammeter be connected in a series circuit?
5. How are voltmeters always connected?
6. Why does no current flow in circuit 1?
7. Why does the bulb in circuit 2 get 6V?
8. How much harder is it for the current to flow in circuit 3 compared to circuit 2?
9. Why do the bulbs in circuit 3 get 3V?
10. What is the total resistance of circuit 4?

Additional tasks

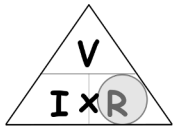
1. Calculate the voltage **across** the bulbs below (multiply current by resistance).



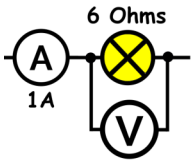
V=IxR



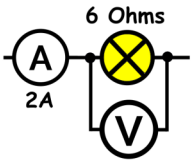
$I = \frac{V}{R}$



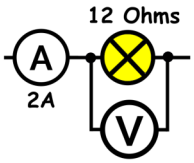
$R = \frac{V}{I}$



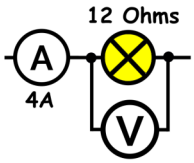
V = _____



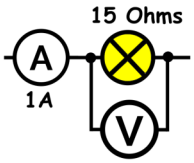
V = _____



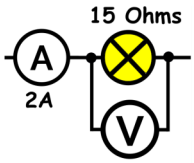
V = _____



V = _____

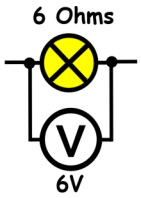


V = _____

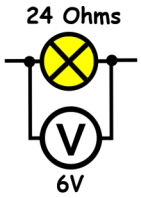


V = _____

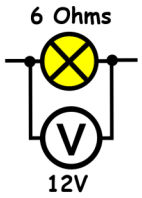
2. Calculate the current **through** the bulbs below (divide voltage by resistance).



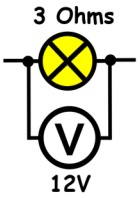
I = _____



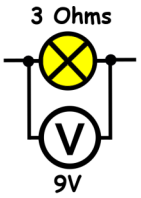
I = _____



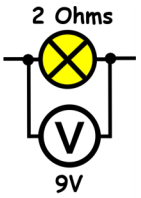
I = _____



I = _____

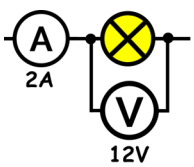


I = _____

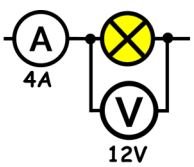


I = _____

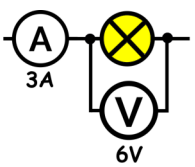
3. Calculate the resistance **of** the bulbs below (divide voltage by current).



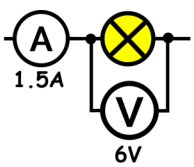
R = _____



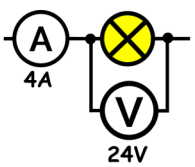
R = _____



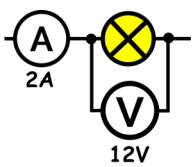
R = _____



R = _____



R = _____



R = _____

Questions on Parallel Circuits

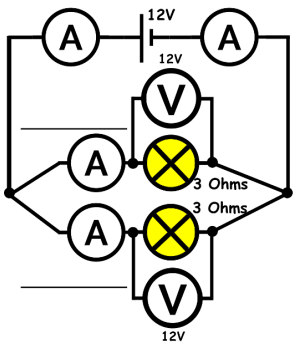
Comprehension

1. What makes a parallel circuit different from a series circuit?
2. What does this mean that the current can do?
3. What is this just like?
4. What do more paths do to how easily the current flows?
5. The current splits at junctions, how do we know the total current?
6. How do we know what the voltage across each branch is in the example circuits?
7. Why is the **total current** in circuit one 4A?
8. Why is the current bigger in circuit 2 compared to circuit 1?
9. Why does the 1.5 ohm bulb have 4A of current flowing through it?
10. What does dividing voltage by total current tell us?

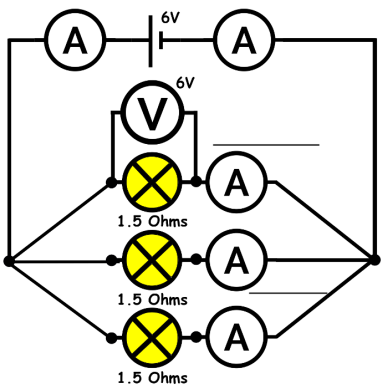
Additional tasks

1. Use I = V/R to calculate the current along **each** branch and **total** current for circuits **1**,**2**,**3** and **4** below.

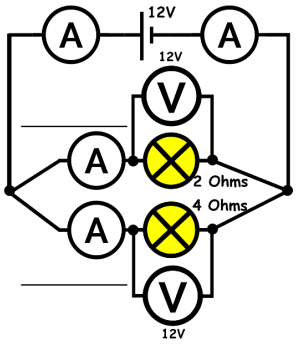
1. _____



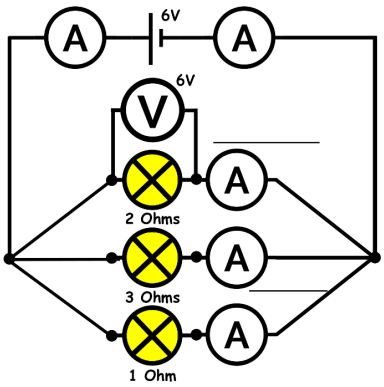
2. _____



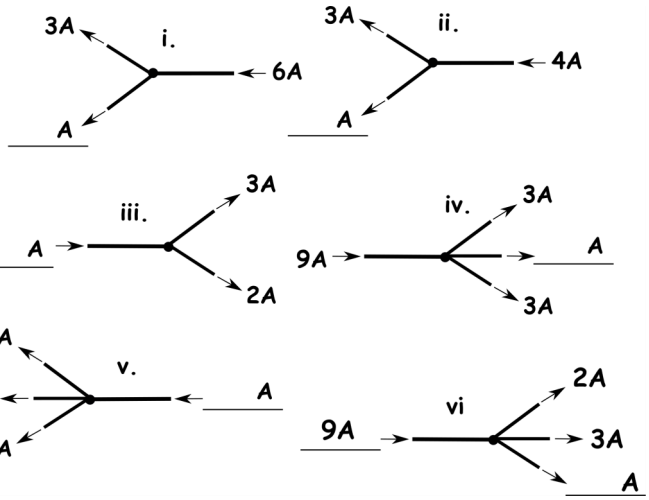
3. _____



4. _____



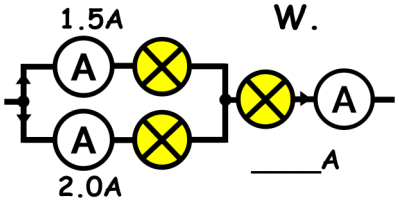
2. Use the fact that the current into and out of a junction is the same to write down the missing currents in **i**,**ii**,**iii**,**iv**, **v** and **vi** below.

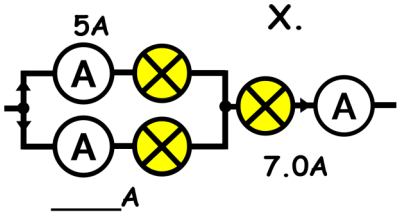


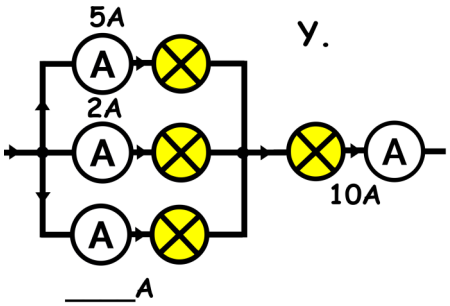
3 a. Write down the missing currents in circuits **W**, **X**, **Y** and **Z**.

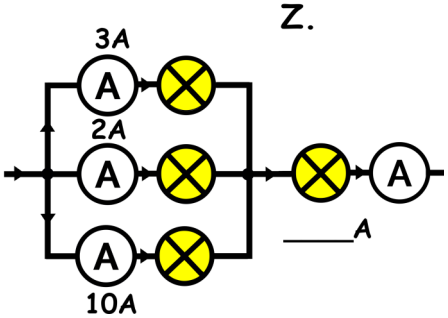
b. In circuit **W**, out of the two **parallel bulbs** which has the highest resistance and why? Top or bottom?

c. In circuit **X**, out of the two **parallel bulbs** which has the highest resistance and why? Top or bottom?









Questions on Electric Fields

Comprehension

1. What do electric charges have around them?
2. What happens if a charge enters another electric field?
3. How can this happen?
4. What does the diagram show?
5. The forces electric fields exert are what kind?
6. What is the diagram of a KG mass experiencing earth's gravitational field just like?
7. What do oppositely charged particles do to each other?
8. Which direction do electric field lines point for positive charges?
9. What can strong electric fields do?
10. During storms what can cause the build up of charge in clouds?
11. What doesn't air normally do?
12. What is thunder?

Additional tasks

1. Choose from the words below to match to the statements.

Electric fields, attract, gravitational fields, repel, magnetic fields, air

Normally doesn't conduct _____

Opposite charges _____

Magnetic materials experience forces in _____

Like charges _____

Charges experience forces in _____

Masses experience forces in _____

2. Underneath each of the adjacent charges write down whether they will attract or repel.

a_____ b_____ c_____ d_____ e_____ f_____

3. Complete the gap fill. Choose from the words below.

balloons, repel, force, close, electric, attract, field, atoms, inwards, inside, static, stands, electric, outwards

All charges have _____fields around them. The electric field lines point _____ for positive charges and _____for negative charges. If a charge is _____ another electric field (not its own), then it experiences a _____. If two charges are _____ enough they experience the force of each other's electric field. This means two close positive charges will repel and two close negative charges will _____. Close positive and negative charges will _____ when in each other's electric _____. It is the force from electric fields that holds _____ and molecules together so it also holds us together! Electric fields are responsible for the effects of _____electricity, when your hair _____on end, getting an _____ shock and sticking _____ to walls.

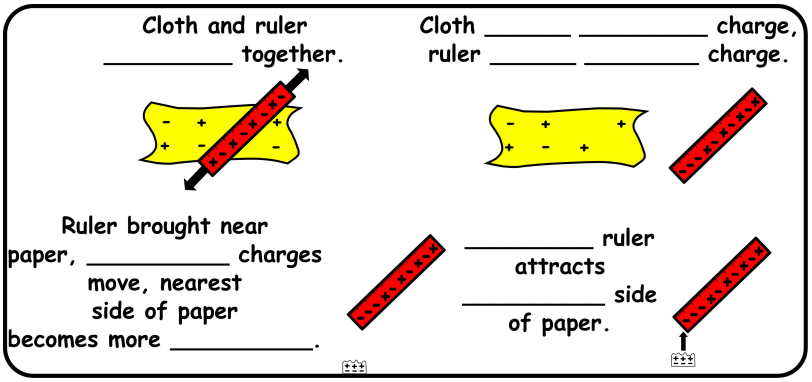
Questions on Static Electricity

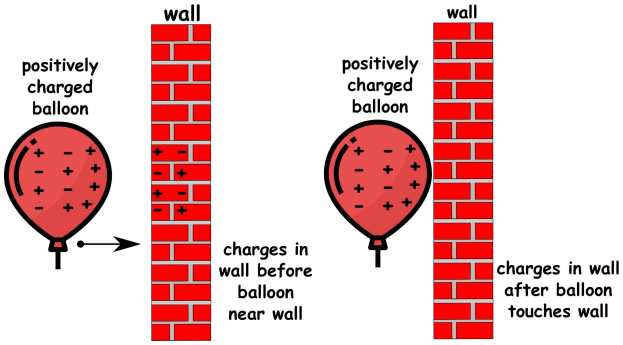
Comprehension

1. When might you get a shock from static electricity?
2. What is the name of the negative charges that atoms have?
3. What can these charges do?
4. What can increase this effect?
5. Why does an object become positive if it loses electrons?
6. What happens to the cloth when it is rubbed with a ruler? (diagram)
7. What happens to the charges in the paper when the positive ruler is brought near? (diagram)
8. What increases as the charge on an object increases?
9. What happens if the voltage of the car becomes large enough?
10. When we touch a car that is charged what do we create for the excess charge?
11. What happens as this charge flows through us?
12. What does a Van de Graaff Generator make possible?
13. If you stand on an insulator and touch the dome what happens?
14. Why do the strands of hair stand up and repel each other?

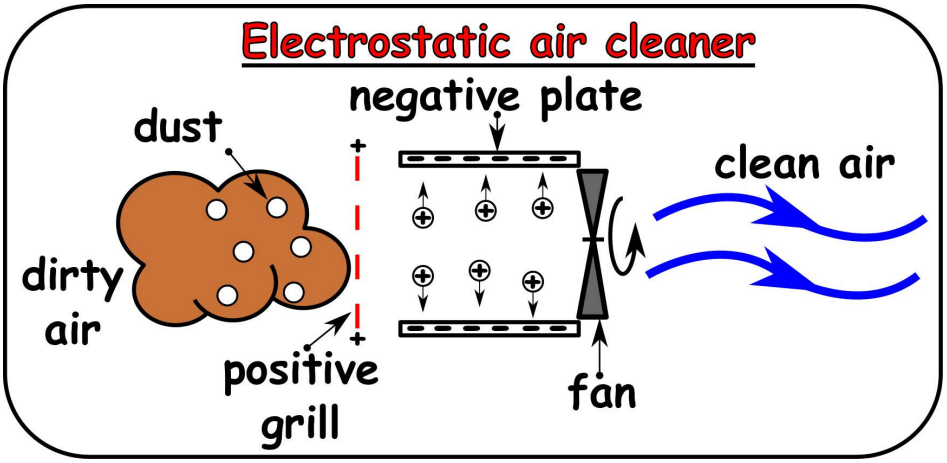
Additional tasks

1. The red polyethene ruler below gains negative charge when rubbed with a cloth. Complete the gaps to explain what is happening. Use the opposite page to help.





2. A balloon is rubbed and one 'side' of the balloon becomes more positive. The balloon is brought near to a wall and sticks to the wall. Draw the **new arrangement** of the charges in the wall after the balloon sticks to the wall (look opposite for help).



3. Complete the gap fill below explaining how an **electrostatic air cleaner** works.

Choose from the words in bold and look at the diagram to help.

negatively, dust, positive, Clean, brushing, charged, attracted, stick, lose

Dirty air containing _____ particles is blown over a _____ grill. This makes the neutral dust particles positive because they _____ electrons. The now positively _____ dust particles pass between _____ charged plates. The positive dust particles are _____ to the negative plates and _____ to them. _____ air leaves the other end of the air cleaner. The plates can be taken out and cleaned by _____ the dust off.

Questions on Magnetic Fields

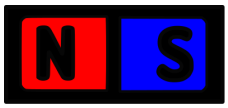
Comprehension

1. It's lucky for us that earth has what?
2. What are the names of the three magnetic metals?
3. What is a nice way to observe the magnetic field around a bar magnet?
4. What do the magnetic field lines continue to do through the magnet?
5. What happens if you cut a magnet in half?
6. The magnetic field lines leave the north pole then what?
7. State what like and opposite magnetic poles do to each other?
8. What happens when a north and south pole of a magnet come together?
9. An iron paper clip is not normally what?
10. What does the paper clip become when picked up by a permanent magnet?
11. Where does earth's magnetic field come from?
12. What does the needle of a plotting compass do with the earth's magnetic field?

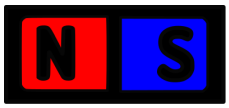
Additional tasks

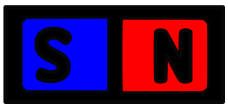
1. Practise drawing the shape of the magnetic field around a single bar magnet and pairs that are repelling, use pencil in case of mistakes.

MAGNET ON ITS OWN



TWO MAGNETS REPELLING



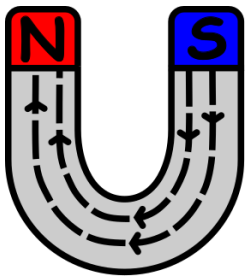


2. Write underneath the magnets below whether they will attract or repel.

3. Write **yes** or **no** next to the whether the following items can be picked up by a **permanent magnet**.

Item	Can pick up?
Paper clip	
Plastic ruler	
Permanent magnet	
Rubber	
Nickel coin	
Paper	
Iron nail	
Plotting compass	
Aluminium Can	
Chewing gum	
Piece of wood	
Cobalt cube	

4. Try drawing the magnetic field lines around a horse shoe magnet. The same rules apply, field lines come out of the north and into the south. Inside they flow from south to north as shown, same as a 'normal' magnet.



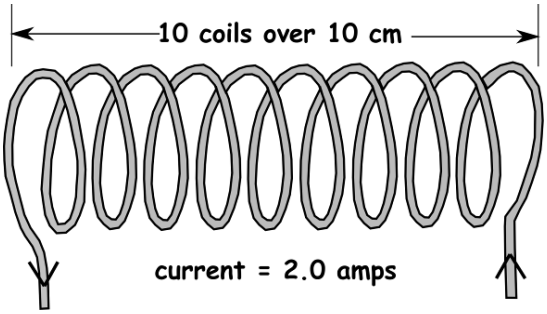
Questions on Electromagnetism

Comprehension

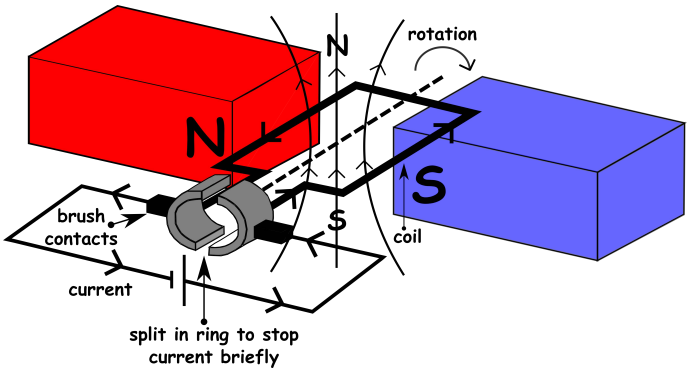
1. What also produces a magnetic field?
2. What can we do with this magnetic field that can't be done with a permanent magnet?
3. What shape magnetic field does a straight wire carrying a current produce?
4. What is the magnetic field ***like*** for a loop of wire carrying a current?
5. What does the magnetic field of a solenoid look like?
6. What does increasing the current do to the strength of the magnetic field?
7. If we add an iron core to the solenoid, what do we make?
8. Electromagnets can be made strong enough to do what?
9. What safety device are they used in?
10. What do electric motors do?
11. What happens when a current flows through the coil of an electric motor?
12. When the poles line up what does the split in the ring do?

Additional tasks

1. The solenoid below has a current of 2.0 amps and 10 coils of wire over 10cm. Complete the table to say whether the magnetic field will be **stronger**, **weaker** or the **same** with the changes given below.



Coils	Current	Magnetic field Stronger/ Weaker/ Same
10 coils over 10cm	3.0 amps	
20 coils over 20cm	2.0 amps	
5 coils over 10cm	2.0 amps	
10 coils over 10cm	0.5 amps	
40 coils over 10cm	2.0 amps	
20 coils over 10cm	2.5 amps	
6 coils over 10cm	1.0 amp	



3. Use the **logic of opposites** i.e. swap magnets over, motor turns the other way, change current direction, motor turns the other way. To complete **same way/ other** way column. Use the current column to decide if the motor turns **faster, slower** or the **same speed**.

Magnets' position	Current	Faster/ Slower/Same	Same way/ Other way
same as above	**smaller** than above **same direction**		
north south swapped over	**same size** as above **same direction**		
same as above	**bigger** than above **same direction**		
same as above	**bigger** than above **opposite direction**		
north south swapped over	**bigger** than above **same direction**		
north south swapped over	**same size** as above **opposite direction**		

2. Complete the gap fill on how a loudspeaker works. Choose from the words below.

phone, magnetic, output, current, magnetic, pulls, field, coil, changes, forces, vibrate, direction

A speaker works because an electric current makes a _____ field. Two magnetic fields can exert _____ on each other. The coil of a loudspeaker is connected to the _____of a source like a _____ jack. This forces a _____ to flow in the speaker _____ that changes _____. The current in the coil makes a _____ field. As the current flows back and forth, the permanent magnet of the loudspeaker pushes or _____ on the magnetic _____ from the coil as it _____. This forces the speaker to _____to and fro in time with the music. This produces the sound we hear.

Questions on The Day, the Year and the Seasons

Comprehension

1. What happened to the earth about 4.5 billion years ago?
2. What does the earth's tilt cause?
3. How long does it take the earth to spin round once?
4. When 'our bit' of the earth is facing away from the sun is it daytime or night time?
5. What keeps the earth in its orbit?
6. What shape is an ellipse?
7. How long does it take the earth to orbit the sun?
8. During summer in the **northern hemisphere**, which way is earth tilted?
9. What do the torches show for winter in the northern hemisphere?
10. In the southern hemisphere when it is summer, what happens to the same amount of light?
11. When is the sun's path more directly overhead?
12. Looking from above the north pole which way does the earth rotate?
13. In which direction does the sun always rise and set?
14. At the north pole in winter what can't you see during daytime?

Additional tasks

1. Match and memorise the meanings of the useful terms below.

Equinox	the half of earth north of (above) the equator
Solstice	the half of earth south of (below) the equator
Equator	every fourth year in which an extra day is added to February because the earth takes 365 and 1/4 days to orbit the sun not 365
Northern hemisphere	spring 21st March and autumn 22nd September, when **day** and **night** are **equal** length (12hrs of day and 12hrs of night)
Southern hemisphere	**summer solstice** is the **longest day**, 21st June. **winter solstice** is the **shortest day,** 21st December
Leap year	an imaginary line drawn around the centre of earth half way between the north and south pole

2. Plot a bar chart of the average hours of daylight for each month in Britain.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Hours of daylight	8	9	11	13	15	16	16.5	16	14	11	10	8

3. Match the statements to the correct answers.

When it's summer in the northern hemisphere	**360º**
The sun is lower in the sky during	**it's summer in the southern hemisphere**
The angle of the earth's tilt is	**summer**
In one day the earth rotates	**it's winter in the southern hemisphere**
When it's winter in the northern hemisphere	**23.5º**
The sun is more directly overhead during	**winter**

4. During the summer at the north pole it stays light 24 hours of the day. During the winter it stays in full darkness all day long. Write about what you think this would be like and what would be the pros (advantages) and cons (disadvantages).

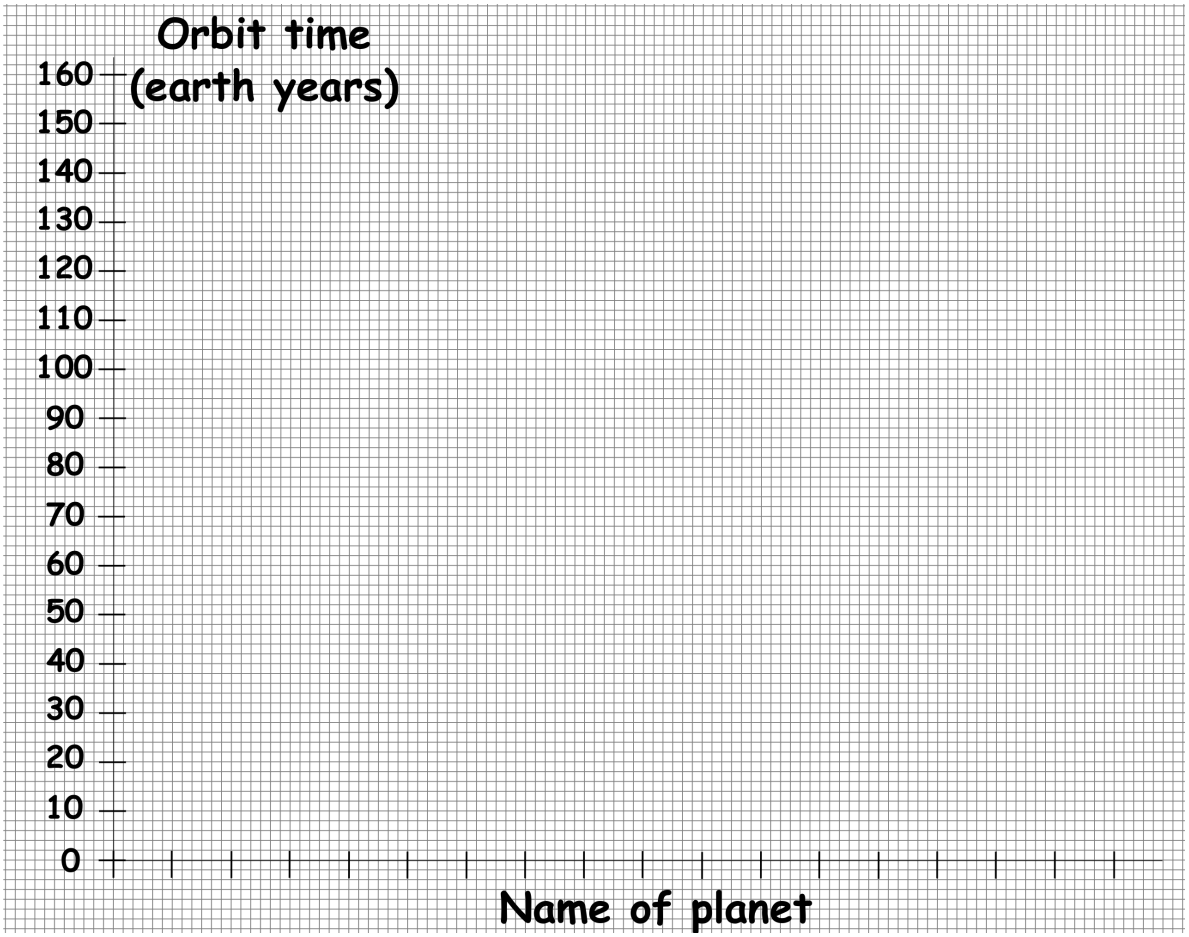
Questions on Our Solar System, Galaxies and the Universe

Comprehension

1. What is at the centre of our solar system?
2. Why is the sun's gravity strong enough to keep the planets in their orbits?
3. What is the shape of the planets' orbits?
4. What is a satellite?
5. What happens to the amount of time needed to orbit the sun as you move further away?
6. Use the mnemonic to write out the order of the planets that starts closest to the sun.
7. What is the name of the galaxy we are in?
8. Where does our galaxy get its name from?
9. How many stars are there in the Milky Way?
10. What is a light year?
11. What is the name of our nearest major galaxy?
12. What is the universe?

Additional tasks

1. Plot a bar chart below of orbit time in earth years for each planet. You will need eight bars at the correct height for the eight planets.



2. Put the following objects in order of size starting with smallest first.

THE MILKY WAY GALAXY, JUPITER, INTERNATIONAL SPACE STATION, THE SUN, OUR SOLAR SYSTEM, THE UNIVERSE, THE MOON, THE EARTH

3. Write **true** or **false** next to the following statements to do with space.

A light year is a measurement of speed (_____) The Milky Way doesn't rotate (_____)
There are only a few man-made satellites orbiting earth (_____) The sun is a star (_____)
There has been a manned mission to Mars (_____) No one lives in the space station (_____)
Our nearest star is Alpha Centauri (_____) The moon has no air on it (_____)
Andromeda's our nearest galaxy (_____) There are billions of galaxies in the universe (_____)
Pluto is classed as a dwarf planet (_____) An ellipse is like a squashed circle (_____)
It takes 365 days for earth to orbit the sun (_____) Venus is closest to the sun (_____)
Scientists don't know what most of the universe is made from (_____)