a

Draw and label a typical plant cell.

Which organelle is:

- the site of anaerobic respiration?

_____

- the site of protein synthesis?

_____

- the site of photosynthesis?

_____

b

How many chromosomes does:

- a human skin cell contain?

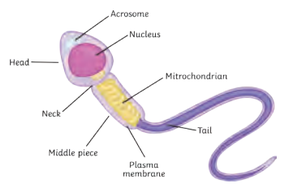
_____

- a human gamete contain?

_____

c

Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.



_____

_____

_____

_____

d

Draw and label the parts of a typical bacterial cell.

e

Why do cells undergo mitosis?

_____

What happens to the cell during:

- interphase?

_____

_____

- mitosis?

_____

_____

_____

_____

_____

_____

f

What are 'embryonic' stem cells?

_____

_____

Name 2 medical conditions that could be treated with embryonic stem cells in the future.

1. _____
2. _____

g

Describe how to prepare an uncontaminated culture of bacteria using the aseptic technique.

_____

_____

_____

h

Diffusion is:

The movement of water particles from a high water concentration to a lower water concentration across a partially permeable membrane. ☐

The spreading out of the particles of any gas, or liquid from an area of high concentration to an area of lower concentration. ☐

The movement of particles from a low concentration to a higher concentration. ☐

i

Name 3 substances that are transported into or out of animal cells by diffusion:

1. _____
2. _____
3. _____

j

List 5 important keywords from this unit.

1. _____
2. _____
3. _____
4. _____
5. _____

k

Describe an advantage of using therapeutic cloning to treat disease.

_____

_____

_____

l

Light microscopes have objective lenses.
What is the purpose of the objective lens?

_____

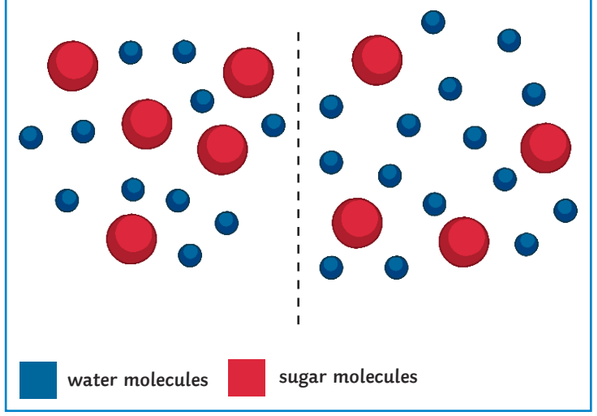
m

Name the tubes that transport water up the stem of a plant.

_____

n

On the diagram below, draw an arrow to show the direction of the net movement of water molecules.



water molecules sugar molecules

o

What is osmosis?

_____

_____

_____

o

My main areas for improvement in this unit are:

_____

_____

_____

a

Draw and label a typical animal cell.

Which organelle is:

- the site of aerobic respiration?

- controls the movement of substances in and out of the cell?

- contains the genetic information?

b

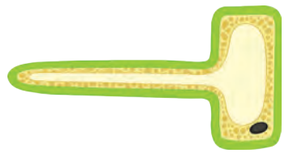
An elephant sperm cell contains 28 chromosomes. How many chromosomes would be in an elephant:

- liver cell?

- ovum?

c

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.



d

A bacterium can divide once every 20 minutes. A piece of chicken was contaminated with 5 bacteria; how many bacteria will there be on the chicken after 3 hours?

e

Describe how active transport is used by:

- plants

- animals

f

Describe 3 ways that exchange surfaces are adapted to their function.

1.

2.

3.

g

Describe 2 ways in which active transport is different to diffusion.

1.

2.

h

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

i

The unit 'centimetres' is written as 'cm'. What do each of the following units represent?

mm:

μm:

nm:

pm:

j

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

k

List 5 important keywords from this topic.

1.

2.

3.

4.

5.

l

Electron microscopes have better resolution than light microscopes. What does 'resolution' mean?

m

State 2 factors that affect the rate of diffusion.

1.

2.

n

Write each of the following numbers in standard form.

2500;

0.003;

4 200 000;

0.00000006;

o

Which has a bigger 'surface area to volume' ratio, an elephant or a mouse?

p

What is the equation for calculating the magnification of an image?

q

Why do some people object to embryonic stem cell research?

r

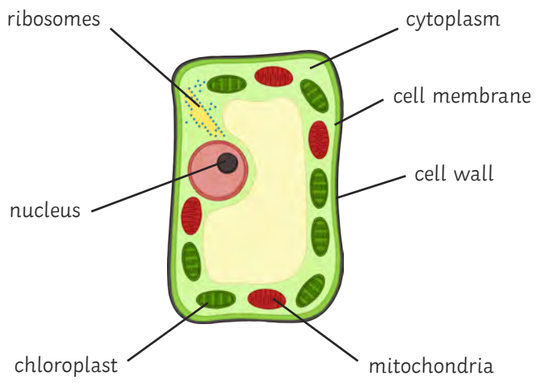
How do prokaryotic cells differ from eukaryotic cells?

s

My main areas for improvement in this unit are:

a

Draw and label a typical plant cell.



Which organelle is:

- the site of anaerobic respiration?

Cytoplasm

- the site of protein synthesis?

Ribosomes

- the site of photosynthesis?

Chloroplasts

b

How many chromosomes does:

- a human skin cell contain?

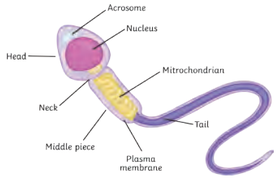
46 / 23 pairs (diploid)

- a human gamete contain?

23 single (haploid)

c

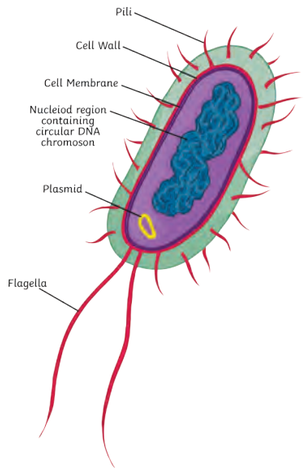
Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.



The acrosome contains enzymes to digest through the egg cell membrane.

d

Draw and label the parts of a typical bacterial cell.



e

Why do cells undergo mitosis?

To produce new cells for growth and repair.

What happens to the cell during:

- interphase?

The cell grows, increases the amount of organelles and replicates its DNA.

- mitosis?

1. Chromosomes line up at the centre of the cell and the copies are pulled apart by spindle fibres to opposite ends of the cell.

2. Nuclear membranes form around the chromosomes to make 2 nuclei.

3. Finally, the cell splits into two identical 'daughter' cells.

f

What are 'embryonic' stem cells?

Undifferentiated cells found in the early embryo.

Name 2 medical conditions that could be treated with embryonic stem cells in the future.

1. Diabetes

2. Spinal injuries/paralysis

g

Describe how to prepare an uncontaminated culture of bacteria using the aseptic technique.

1. Sterilise the Petri dish, inoculating loop, culture medium and working area to kill any unwanted microorganisms.

2. Lift the lid slightly to inoculate the plate and replace quickly to prevent microorganisms from the air getting in.

3. Secure the Petri dish lid with a small piece of tape.

h

Diffusion is:

The movement of water particles from a high water concentration to a lower water concentration across a partially permeable membrane. ☐

The spreading out of the particles of any gas, or liquid from an area of high concentration to an area of lower concentration. ☒

The movement of particles from a low concentration to a higher concentration. ☐

i

Name 3 substances that are transported into or out of animal cells by diffusion:

1. Oxygen

2. Carbon dioxide

3. Amino acids

j

List 5 important keywords from this unit.

1. Eukaryotic/Prokaryotic

2. Differentiation

3. Mitosis

4. Aseptic technique

5. Osmosis

k

Describe an advantage of using therapeutic cloning to treat disease.

The stem cells would have the same DNA as the patient, so would not be rejected by the body.

l

Light microscopes have objective lenses.
What is the purpose of the objective lens?

To form and magnify an image of the specimen.

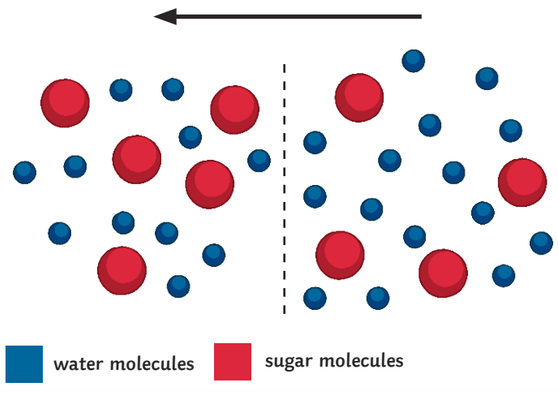
m

Name the tubes that transport water up the stem of a plant.

Xylem

n

On the diagram below, draw an arrow to show the direction of the net movement of water molecules.



o

What is osmosis?

The movement of water molecules from an area of high water concentration to an area of lower water concentration, across a partially permeable membrane.

o

My main areas for improvement in this unit are:

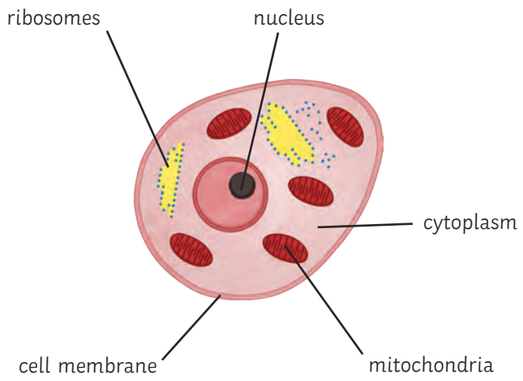
_____

_____

_____

a

Draw and label a typical animal cell.



Which organelle is:

- the site of aerobic respiration?

Mitochondria

- controls the movement of substances in and out of the cell?

Cell membrane

- contains the genetic information?

Nucleus

b

An elephant sperm cell contains 28 chromosomes. How many chromosomes would be in an elephant:

- liver cell?

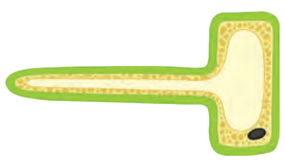
56

- ovum?

28

c

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.



Has a large surface area for the rapid absorption of water and mineral ions from the soil.

d

A bacterium can divide once every 20 minutes. A piece of chicken was contaminated with 5 bacteria; how many bacteria will there be on the chicken after 3 hours?

Time	Number
0	5
20	10
40	20
60	40.....etc
180	2560

e

Describe how active transport is used by:

- plants

To obtain mineral ions from the soil

- animals

To absorb nutrients (e.g.glucose), when they are at low concentrations, from the small intestine.

f

Describe 3 ways that exchange surfaces are adapted to their function.

1. Large surface area
2. Thin walls
3. Moist/good blood supply (animals)

g

Describe 2 ways in which active transport is different to diffusion.

1. Moves against a concentration gradient (low to high)
2. Requires energy

h

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

Found in the bone marrow. Can only turn into certain cell types, such as blood cells.

i

The unit 'centimetres' is written as 'cm'. What do each of the following units represent?

mm: millimetres

µm: micrometres

nm: nanometres

pm: picometres

j

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

Farmers can produce clones of a desired plant quickly and cheaply. Save rare species from extinction.

k

List 5 important keywords from this topic.

1. Diffusion
2. Active transport
3. Meristem
4. Magnification
5. Resolution

l

Electron microscopes have better resolution than light microscopes. What does 'resolution' mean?

The ability to distinguish between 2 points, so higher resolution produces a clearer image.

m

State 2 factors that affect the rate of diffusion.

1. Temperature
2. Concentration gradient

n

Write each of the following numbers in standard form.

2500; 2.5×10^{3}

0.003; 3×10^{-3}

4 200 000; 4.2×10^{6}

0.00000006; 6×10^{-8}

o

Which has a bigger 'surface area to volume' ratio, an elephant or a mouse?

Mouse

p

What is the equation for calculating the magnification of an image?

$$\text{Magnification} = \frac{\text{image size}}{\text{real size}}$$

q

Why do some people object to embryonic stem cell research?

They believe that all embryos have the potential to become a human being, so should not be used for experimentation.

r

How do prokaryotic cells differ from eukaryotic cells?

Bacterial cells are much smaller, they don't have a nucleus, they don't have mitochondria or chloroplasts.

s

My main areas for improvement in this unit are:

_____

_____

_____

a

Complete the table below.

Enzyme	Site of Production	Substrate	Products
amylase			glucose
pepsin		protein	
lipase	pancreas		

b

The diagram below shows the 'lock & key' model of enzyme function. Label the diagram using the following words:

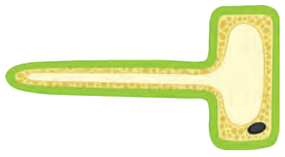
enzyme, active site, substrate, products, enzyme-substrate complex

c

Describe how to carry out the test for reducing sugars.

d

Describe how this root hair cell is adapted for the efficient uptake of water and mineral ions.



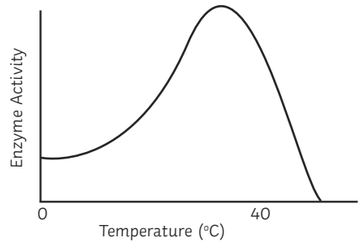
e

Place the following structures in order from smallest to largest:

cell, organ, nucleus, tissue, organism

f

Use the graph below to describe how temperature affects enzyme function.



g

Enzymes are described as being 'specific' to a substrate. What does this mean? Use a labelled diagram to help your explanation.

h

Describe how to test for protein

i

Bile is made in the liver and stored in the gall bladder. Explain how bile helps digestion.

j

Transpiration is:

- The movement of water molecules from a high water concentration to a lower water concentration across a partially permeable membrane. ☐
- The evaporation and diffusion of water from the leaves of a plant. ☐
- The movement of glucose molecules around the plant. ☐

k

Name 3 factors that affect the rate of transpiration.

1. _____
2. _____
3. _____

l

List 5 important keywords from this unit.

1. _____
2. _____
3. _____
4. _____
5. _____

m

Why are enzymes referred to as 'biological catalysts?

n

What is the function of phloem tissue?

o

From which part of the human digestive system is nutrients absorbed into the bloodstream?

p

Where in the plant is meristem tissue located?

q

The xylem tissue is composed of hollow tubes strengthened by lignin. What is the function of xylem tissue?

r

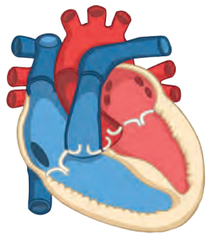
Describe how to test for starch.

s

My main areas for improvement in this unit are:

a

Label the following blood vessels on the diagram of the heart: aorta, vena cava, pulmonary artery, pulmonary vein.



b

Label the following parts on the diagram below: trachea, bronchi, bronchiole, alveolus.

c

Describe how smoking tobacco affects:

Adults

Unborn babies

d

Describe how the structure of an artery is related to its function.

e

In coronary heart disease, layers of fatty material build up inside the coronary arteries. Explain how this can lead to a 'heart attack'.

f

Stents can be used to treat coronary heart disease. Give one advantage and one disadvantage of using stents.

Advantage

Disadvantage

g

Describe 3 lifestyle factors that can impact a person's physical and mental wellbeing.

1.
2.
3.

h

Why does the left ventricle have a thicker, more muscular wall than the right ventricle?

i

Name the four main components of the blood and describe their function.

1.
2.
3.
4.

j

What is a 'carcinogen'? Give an example.

k

List 5 important keywords from this unit.

1.
2.
3.
4.
5.

l

Explain how an infection with a microorganism could lead to the development of other, non-communicable diseases.

m

Describe how a faulty heart valve will affect a person's health.

n

Describe 3 ways that the lungs are adapted for gaseous exchange.

1.
2.
3.

o

A problem with heart transplants is rejection of the donor heart. What is 'rejection'?

p

Name the group of cells that controls the resting heart rate.

q

What are 'statins'?

r

What is the difference between a benign and a malignant tumour?

s

My main areas for improvement in this unit are:

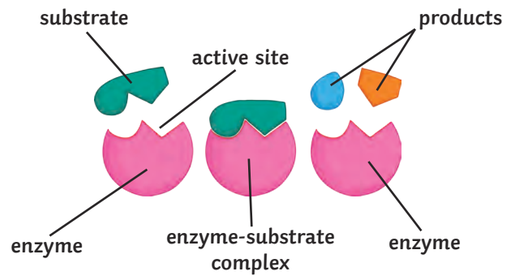
a

Complete the table below.

Enzyme	Site of Production	Substrate	Products
amylase	salivary glands/ pancreas	starch	maltose/ glucose
pepsin	stomach	protein	amino acids
lipase	pancreas	fats	fatty acids & glycerol

b

The diagram below shows the 'lock & key' model of enzyme function. Label the diagram using the following words:



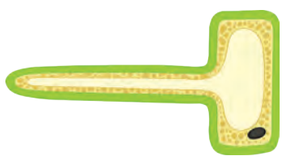
c

Describe how to carry out the test for reducing sugars.

1. Place the test sample into a test tube (about 2ml).
2. Add an equal amount of Benedicts reagent.
3. Heat in a water bath for 5 minutes.
4. The colour will change from blue to either green/ yellow/red depending on the amount of reducing sugar present.

d

Describe how this root hair cell is adapted for the efficient uptake of water and mineral ions.



They have a large surface area for the rapid absorption of water and mineral ions from the soil.

e

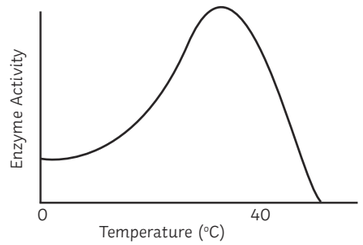
Place the following structures in order from smallest to largest:

cell, organ, nucleus, tissue, organism

nucleus, cell, tissue, organ, organism

f

Use the graph below to describe how temperature affects enzyme function.



Initially, as temperature increases, the rate of enzyme activity also increases, up to 40˚C, which is the optimum temperature. After 40˚C, as the temperature increases the rate of enzyme activity decreases.

g

Enzymes are described as being 'specific' to a substrate. What does this mean? Use a labelled diagram to help your explanation.

A diagram showing active site of enzyme has a complimentary shape to the substrate molecule. The active site of the enzyme has a unique shape, only a substrate with a complimentary shape can fit and bind to form an enzyme-substrate complex.

h

Describe how to test for protein

1. Place the test sample into a test tube (about 2ml)
2. Add an equal amount of Biuret reagent and mix.
3. The colour will change from blue to purple if protein is present.

i

Bile is made in the liver and stored in the gall bladder. Explain how bile helps digestion.

Bile neutralises stomach acid to raise the pH so protease enzymes can work.

It also emulsifies fats to give them a larger surface area for lipase to work, which speeds up digestion.

j

Transpiration is:

The movement of water molecules from a high water concentration to a lower water concentration across a partially permeable membrane. ☐

The evaporation and diffusion of water from the leaves of a plant. ☒

The movement of glucose molecules around the plant. ☐

k

Name 3 factors that affect the rate of transpiration.

Any 3 from;

Temperature, Light intensity, Air flow or Humidity.

l

List 5 important keywords from this unit.

1. _____
2. _____
3. _____
4. _____
5. _____

m

Why are enzymes referred to as 'biological catalysts?

They speed up useful chemical reactions in the body.

n

What is the function of phloem tissue?

To transport food substances (dissolved sugars) around the plant. This process is called translocation.

o

From which part of the human digestive system is nutrients absorbed into the bloodstream?

Small intestine.

p

Where in the plant is meristem tissue located?

Growing tips of roots and shoots.

q

The xylem tissue is composed of hollow tubes strengthened by lignin. What is the function of xylem tissue?

To transport water and dissolved minerals from the roots to the stem and the leaves. This is called the transpiration stream.

r

Describe how to test for starch.

Place the test sample into a test tube.
Add a few drops of iodine solution and mix.
The colour will change from orange to blue/black if starch is present.

s

My main areas for improvement in this unit are:

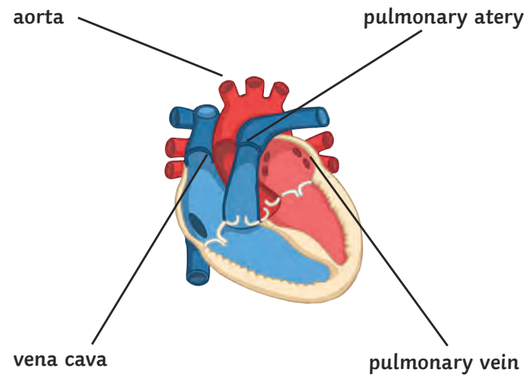
_____

_____

_____

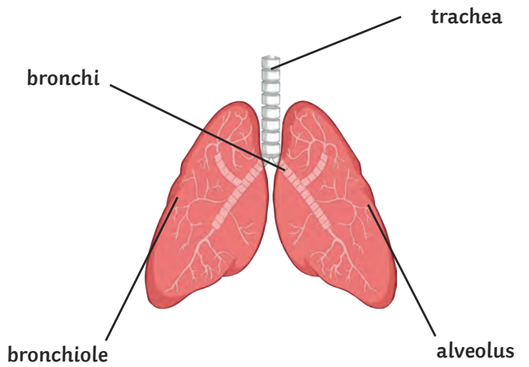
a

Label the following blood vessels on the diagram of the heart:



b

Label the following parts on the diagram below:



c

Describe how smoking tobacco affects:

Adults

Can cause lung disease, including cancer, and cardiovascular disease.

Unborn babies

Can result in low birth weight and premature birth.

d

Describe how the structure of an artery is related to its function.

Thick layers of muscle for strength and elastic fibres so that they can spring back to help withstand high blood pressure.

e

In coronary heart disease, layers of fatty material build up inside the coronary arteries. Explain how this can lead to a 'heart attack'.

The layers of fatty material block the coronary arteries and restrict blood flow to heart muscle cells.. This results in a lack of oxygen and the heart muscle cells stop respiring which can lead to a heart attack.

f

Stents can be used to treat coronary heart disease. Give one advantage and one disadvantage of using stents.

Advantage

Patients recover quickly and they are effective for a long time.

Disadvantage

There is a risk of the patient developing a blood clot near the stent, which can lead to a heart attack.

g

Describe 3 lifestyle factors that can impact a person's physical and mental wellbeing.

Any 3 from: Diet, exercise, stress, smoking, drinking alcohol.

h

Why does the left ventricle have a thicker, more muscular wall than the right ventricle?

The left ventricle has to pump blood at high pressure so that it can reach all body cells. Whereas, the right ventricle only has to pump blood to the lungs.

i

Name the four main components of the blood and describe their function.

1. Red blood cells – transport oxygen.
2. White blood cells – defend against pathogens.
3. Platelets – help to clot the blood.
4. Plasma – liquid part of the blood, carries many substances e.g. glucose, hormones.

j

What is a 'carcinogen'? Give an example.

Substance/chemical that causes cancer e.g. the chemicals in cigarette smoke.

k

List 5 important keywords from this unit.

1. _____
2. _____
3. _____
4. _____
5. _____

l

Explain how an infection with a microorganism could lead to the development of other, non-communicable diseases.

Infection with some viruses can lead to the development of cancer (e.g. HPV infection and cervical cancer). Also, infection with pathogens can sometimes trigger allergic reactions and worsen asthma.

m

Describe how a faulty heart valve will affect a person's health.

Breathlessness, fatigue, tiredness.

n

Describe 3 ways that the lungs are adapted for gaseous exchange.

Any 3 from: Large surface area, Moist lining, Thin walls or good blood supply.

o

A problem with heart transplants is rejection of the donor heart. What is 'rejection'?

When the body's immune system (white blood cells) attacks and destroys the donor heart muscle cells.

p

Name the group of cells that controls the resting heart rate.

Pacemaker

q

What are 'statins'?

Drugs that reduce the amount of LDL cholesterol in the blood and so reduce the build up of fatty deposits in the coronary arteries.

r

What is the difference between a benign and a malignant tumour?

A benign tumour remains in one place and doesn't invade other tissues in the body – not usually dangerous. A malignant tumour spreads to other parts of the body when cells break off and travel in the bloodstream to form secondary tumours.

s

My main areas for improvement in this unit are:

_____

_____

a

Write a definition for each type of disease and give two examples.

communicable disease: _____

_____

_____

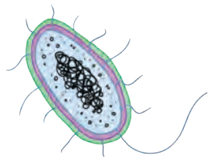
non-communicable disease: _____

_____

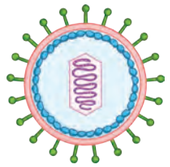
_____

b

Label the pathogens below that cause infectious diseases.

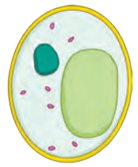


_____



_____

_____



_____

c

Name three ways that pathogens are spread and give at least one example.

1. _____

2. _____

3. _____

d

How do pathogens cause disease? Fill in the gaps.

_____ reproduce rapidly by _____ _____. They may produce _____ that damage tissues and make us feel ill.

_____ take over the cells of your body. They live and rapidly _____ inside. This causes cell damage.

e

Simple hygiene measures are one of the most effective ways of preventing the spread of pathogens.

List five ways we can be more hygienic below:

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

f

List three other methods for preventing the spread of pathogens.

1. _____

_____

2. _____

_____

3. _____

_____

g

Salmonella

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

h

Measles

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

i

Tobacco Mosaic Virus

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

j

Gonorrhoea

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

k

HIV

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

l

Malaria

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

m

Rose Black Spot

What type of pathogen is it caused by?

_____

What are the symptoms?

_____

_____

How is it spread?

_____

_____

What can we do about it?

_____

_____

a

Explain how your skin prevents microorganisms getting into your body.

b

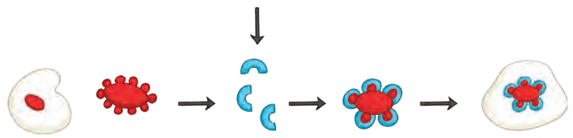
Explain how the respiratory system is adapted to reduce the entry of microorganisms.

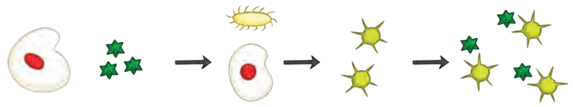
c

Explain how the digestive system is adapted to reduce the entry of microorganisms.

d

Describe each role of a white blood cell and explain how it protects you against disease.





e

Tick the correct boxes.

	Treats Symptoms	Kills Bacteria	Kills Viruses
painkillers			
antibiotics			

f

Define the following terms:

vaccine: _____

antigen: _____

antibody: _____

herd immunity: _____

g

Describe how vaccinations prevent illness.

1. _____

2. _____

3. _____

h

Fill in the missing words:

The use of _____ has greatly reduced the deaths from infectious _____ diseases. However, the evolution of strains that are _____ to antibiotics is a concern.

_____ are specific which means they _____.

i

State where the following drugs were discovered.

the heart drug digitalis: _____

the painkiller aspirin: _____

the antibiotic penicillin: _____

Who discovered penicillin?

_____

Why is it difficult to discover new medicines?

j

Where do most new drugs now come from?

What has to happen before a drug can be used?

1. _____

2. _____

3. _____

k

Describe each process of drug testing.

preclinical testing: _____

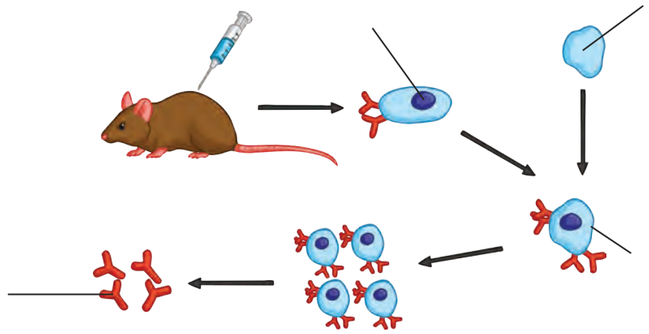
clinical trials: _____

double-blind trials: _____

a

Label the diagram with the following keywords:

- lymphocyte
- monoclonal antibodies
- hybridoma
- tumour cell



b

Monoclonal antibodies are specific. What does this mean?

c

Why are monoclonal antibodies less widely used than intended when they were first developed?

d

Describe five ways in which monoclonal antibodies can be used.

1.

2.

3.

4.

5.

e

Explain how monoclonal antibodies can be used to treat cancer.

f

List seven ways that you can tell if a plant is diseased.

1.

2.

3.

4.

5.

6.

7.

g

Give three ways to identify plant diseases.

1.

2.

3.

h

Give an example of a plant disease caused by each type of pathogen below.

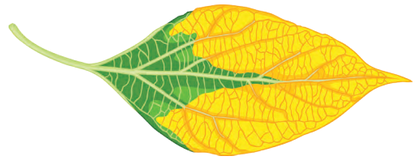
virus:

fungus:

insect:

i

This plant has an ion deficiency.



Identify which ion is deficient.

Explain how this ion deficiency causes the condition in the diagram.

j

Name three mechanical adaptations that plants have to protect themselves against herbivores.

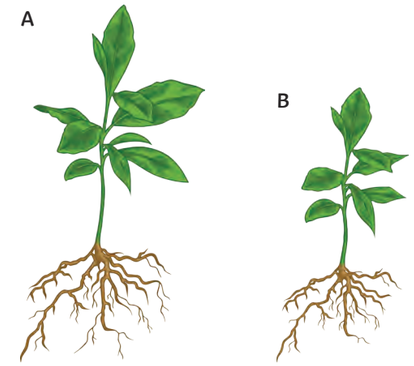
1.

2.

3.

k

Plant B has an ion deficiency.



Identify which ion is deficient.

Explain how this ion deficiency causes the condition in the diagram.

l

Name three physical defence responses that help a plant to defend against microorganisms.

1.

2.

3.

m

Name two chemical plant defence responses.

1.

2.

a

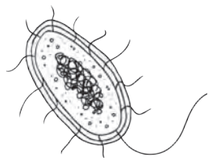
Write a definition for each type of disease and give two examples.

communicable disease: **Caused by pathogens and can be passed from one person to another. Possible examples: measles, salmonella, gonorrhoea, HIV, tobacco mosaic virus, rose black spot, malaria.**

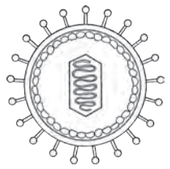
non-communicable disease: **Can not be passed on from one person to another. Possible examples: heart disease, diabetes, cancer.**

b

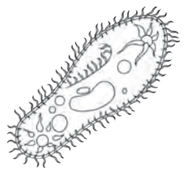
Label the pathogens below that cause infectious diseases.



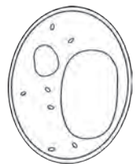
bacteria



virus



protist



fungi

c

Name three ways that pathogens are spread and give at least one example.

1. **By air: cold, flu, tuberculosis.**
2. **By direct contact: malaria, STDs, HIV.**
3. **By water: cholera, salmonellosis.**

d

How do pathogens cause disease? Fill in the gaps.

Bacteria reproduce rapidly by **binary fission**. They may produce **toxins** that damage tissues and make us feel ill.

Viruses take over the cells of your body. They live and rapidly **reproduce** inside. This causes cell damage.

e

Simple hygiene measures are one of the most effective ways of preventing the spread of pathogens.

List five ways we can be more hygienic below:

1. **Washing hands after going to the toilet, before cooking or eating and after contact with animals or sick people.**
2. **Using disinfectants on surfaces.**
3. **Keeping raw meat away from food that is eaten uncooked.**
4. **Coughing or sneezing into a tissue.**
5. **Keeping agricultural machinery, and people using it, clean to prevent the spread of plant diseases.**

f

List three other methods for preventing the spread of pathogens.

1. **Keep infected individuals in isolation.**
2. **Destroy the vectors that carry pathogens.**
3. **vaccination**

g

Salmonella

What type of pathogen is it caused by?
bacteria

What are the symptoms?
Fever, abdominal cramps, vomiting and diarrhoea.

How is it spread?
Eating undercooked food or food contaminated from contact with raw meat, e.g. raw chicken.

What can we do about it?
Poultry are vaccinated to control the spread.

g

Measles

What type of pathogen is it caused by?
virus

What are the symptoms?
A fever and red rash on the skin. Can be fatal if there are complications.

How is it spread?
By air - the inhalation of droplets from coughs and sneezes.

What can we do about it?
There is no treatment, so young children are vaccinated against it.

h

Tobacco Mosaic Virus

What type of pathogen is it caused by?
virus

What are the symptoms?
Mosaic discolouration of the leaves which reduces photosynthesis and affects the growth of the plant.

How is it spread?
Direct contact between diseased plant material and healthy plants. Insects can also act as vectors.

What can we do about it?
TMV resistant strains. Good hygiene and pest control.

i

Gonorrhoea

What type of pathogen is it caused by?
bacteria

What are the symptoms?
Thick yellow or green discharge from the vagina or penis and pain on urinating.

How is it spread?
sexual contact

What type of pathogen is it caused by?
Treat with antibiotics. Use a barrier method of contraception.

j

HIV

What type of pathogen is it caused by?
virus

What are the symptoms?
Initially causes a flu-like illness. Damages the immune system so that it can't deal with other infections or cancers.

How is it spread?
Sexual contact or exchange of bodily fluids, such as blood.

What can we do about it?
Antiretroviral drugs help to stop the virus attacking the immune system. There is no cure or vaccine.

k

Malaria

What type of pathogen is it caused by?
protist

What are the symptoms?
Recurrent fever - can be fatal.

How is it spread?
Mosquitoes act as a vector, passing the protist to the human bloodstream when they feed on the blood.

What can we do about it?
Preventing the vectors (mosquitoes) from breeding. Using mosquito nets and repellents to avoid being bitten. Taking antimalarial drugs.

l

Rose Black Spot

What type of pathogen is it caused by?
fungus

What are the symptoms?
Purple or black spots develop on the leaves. Leaves turn yellow and fall off prematurely which reduces photosynthesis, affecting the growth of the plant.

How is it spread?
Spores are carried by water or wind.

What can we do about it?
Use fungicides to treat the plant.
Remove and destroy affected leaves.

a

Explain how your skin prevents microorganisms getting into your body.

It acts as a barrier to prevent pathogens reaching the tissues beneath. Platelets quickly form scabs to seal any cuts.

It produces antimicrobial secretions to kill pathogens.

It is covered with microorganisms that act as an extra barrier to entry.

b

Explain how the respiratory system is adapted to reduce the entry of microorganisms.

The lining of the nose produces mucus and is full of hairs to trap particles in the air that may contain pathogens.

The lining of the trachea and bronchi produce mucus which is moved to the back of the throat by the cilia projections of epithelial cells.

c

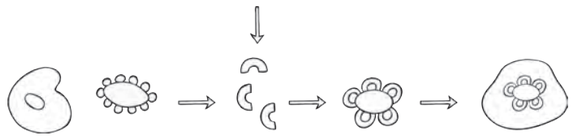
Explain how the digestive system is adapted to reduce the entry of microorganisms.

The stomach produces hydrochloric acid that destroys pathogens.

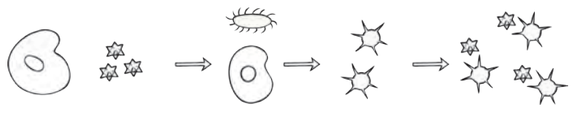
d

Describe each role of a white blood cell and explain how it protects you against disease.

Some white blood cells ingest pathogens, digesting and destroying them.



Some white blood cells produce antibodies which are chemicals that target specific pathogens and destroy them. An antibody only works for one type of pathogen.



Some white blood cells produce antitoxins that counteract the toxins released by pathogens.

e

Tick the correct boxes.

	Treats Symptoms	Kills Bacteria	Kills Viruses
painkillers	✓		
antibiotics		✓	

f

Define the following terms:

vaccine: **Dead or inactivate form of a disease-causing microorganism.**

antigen: **Unique protein on the surface of cells.**

antibody: **Produced by white blood cells to recognise specific antigens.**

herd immunity: **When vaccination of a significant proportion of the population provides protection for individuals who are not immune.**

g

Describe how vaccinations prevent illness.

1. **Introduce small quantities of dead or inactive virus;**
2. **this stimulates white blood cells to produce antibodies;**
3. **if the live pathogen enters the body, the white blood cells recognise it and respond quickly so you don't get ill.**

h

Fill in the missing words:

The use of **antibiotics** has greatly reduced the deaths from infectious **bacterial** diseases. However, the evolution of strains that are **resistant** to antibiotics is a concern.

Antibiotics are specific which means they **only work against certain bacteria**.

i

State where the following drugs were discovered.

the heart drug digitalis: **foxglove**

the painkiller aspirin: **willow**

the antibiotic penicillin: **Penicillium mould**

Who discovered penicillin?

Alexander Fleming

Why is it difficult to discover new medicines?

You need to find a chemical that kills bacteria without damaging human cells.

j

Where do most new drugs now come from?

Synthesised by chemists in a lab, but they might still start from a chemical extracted from a plant.

What has to happen before a drug can be used?

1. **Test whether the drug is effective against the disease.**
2. **Check that the drug is not toxic.**
3. **Work out what dose to use.**

k

Describe each process of drug testing.

preclinical testing: **This happens in a laboratory using cells, tissues and animals.**

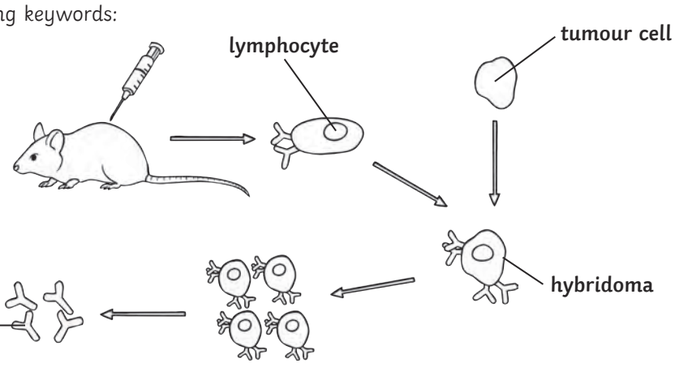
clinical trials: **To use healthy volunteers and patients. Starting off with very low doses to check for side effects. If it is safe it is tested on patients.**

double-blind trials: **These tell you how effective a medicine is. Neither the patient or the doctor know whether the patient has been given a placebo or the real drug.**

a

Label the diagram with the following keywords:

- lymphocyte
- monoclonal antibodies
- hybridoma
- tumour cell



b

Monoclonal antibodies are specific. What does this mean?

They only bind to one antigen. This means they can be used to target a specific chemical or cell in the body.

c

Why are monoclonal antibodies less widely used than intended when they were first developed?

They create more side effects than expected.

d

Describe five ways in which monoclonal antibodies can be used.

1. **For diagnosis, such as in pregnancy tests.**
2. **For measuring the levels of chemicals (such as hormones) in the blood.**
3. **For detecting pathogens.**
4. **For research, to identify or locate specific molecules in cells or tissues.**
5. **To treat some diseases.**

e

Explain how monoclonal antibodies can be used to treat cancer.

The antibody can be bound to a radioactive substance, a toxic drug or a chemical which stops cells growing and dividing. It delivers the substance to the cancer cells and because it is specific to the cancer cells, it doesn't harm other cells in the body.

f

List seven ways that you can tell if a plant is diseased.

1. **stunted growth**
2. **spots on leaves**
3. **areas of decay/rot**
4. **growths**
5. **malformed stems or leaves**
6. **discolouration**
7. **pests**

g

Give three ways to identify plant diseases.

1. **Reference a gardening manual or website.**
2. **Identify the pathogen in a laboratory.**
3. **Use a testing kit containing monoclonal antibodies.**

h

Give an example of a plant disease caused by each type of pathogen below.

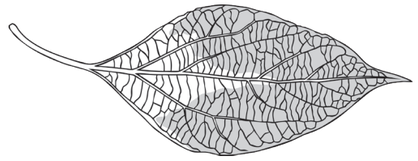
virus: **tobacco mosaic virus**

fungus: **black spot**

insect: **aphids**

i

This plant has an ion deficiency.



Identify which ion is deficient.

magnesium

Explain how this ion deficiency causes the condition in the diagram.

Magnesium is needed to make chlorophyll. The leaves become yellow because there isn't enough chlorophyll. This is called chlorosis. Plant growth will slow down because the plant cannot photosynthesise fully.

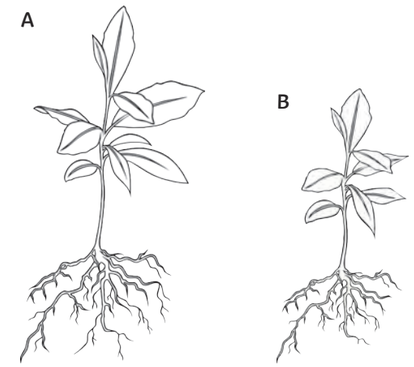
j

Name three mechanical adaptations that plants have to protect themselves against herbivores.

1. **Thorns and hairs to deter animals.**
2. **Leaves that droop or curl when touched.**
3. **Mimicry to trick animals.**

k

Plant B has an ion deficiency.



Identify which ion is deficient.

nitrate

Explain how this ion deficiency causes the condition in the diagram.

Nitrate ions affect protein synthesis. They help a plant to convert the sugars made in photosynthesis into proteins needed for growth. This means if there isn't enough nitrate, the plant will have stunted growth.

l

Name three physical defence responses that help a plant to defend against microorganisms.

1. **cellulose cell walls**
2. **Tough waxy cuticle on leaves.**
3. **Layers of dead cells around stems (bark on trees) which fall off.**

m

Name two chemical plant defence responses.

1. **antibacterial chemicals**
2. **poisons to deter herbivores**

a

Draw and label an atom. Include labels for the following: neutron, proton, electron.

True or false?

1. The radius of an atom is 0.1nm.
2. Most of the mass is in the shell of the atom.

b

Fill in the table to show the charges and mass of the components of an atom.

Name	Charge	Relative Mass
proton		
neutron		
electron		

What is the overall charge of an atom?

positive

negative

no charge

c

A compound is 2 or more **e**_____, chemically **j**_____.

Which of the following are compounds?
Put a ring round them.

oxygen, salt water, magnesium oxide, sodium chloride, nitrogen

Why have you circled the ones you have?

_____

_____

d

What are the symbols for the following elements.

Element	Symbol
oxygen	
lithium	
sodium	
potassium	
helium	
carbon	
magnesium	

e

Complete the following diagram for sodium, include the atomic number and the atomic mass number.

Na

What is the mass number?

How do you calculate neutron number?

f

Isotopes are elements with a different number of **n**_____ but the same number of **p**_____, e.g. carbon 12 and carbon 14.

How can you use isotopes to calculate the relative atomic mass? Write down the equation.

Relative atomic = sum of (_____)
mass (Ar)

g

Complete and balance the following equations.

$Mg + O_2 \rightarrow$ **MgO**

$Be + S \rightarrow$ **BeS**

$Be + F_2 \rightarrow$

$K + Cl_2 \rightarrow$

h

Mixtures

Write the definition of a mixture. Give two examples.

_____

_____

_____

_____

_____

i

Name the compounds and the elements they contain.

NaCl - **sodium chloride, sodium and chlorine**

MgO - _____

MgS - _____

FeS - _____

j

What is the ratio of the elements in the following compounds?

e.g. CaO = 1:1

NaCl =

$MgCl_2$ =

lithium fluoride =

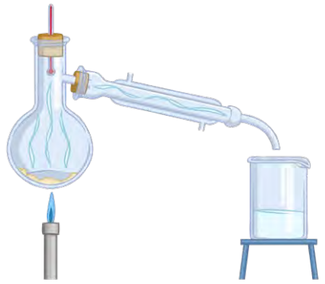
K_2O =

sodium hydroxide =

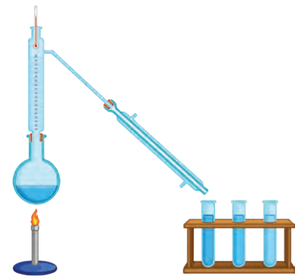
k

Separating Mixtures

What are the following separation techniques?



D_____



F_____ **D**_____

What separation technique would you use to separate out different inks in pens?

C_____

How can salt be collected using the process of crystallisation?

_____

_____

Sand and water can be separated by using a process called **F**_____

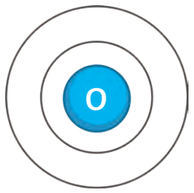
Describe in 4 steps how to collect salt from rock salt.

1. _____
2. _____
3. _____
4. _____

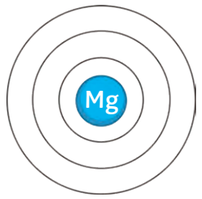
a

Complete the electronic structure diagrams for:

oxygen



magnesium



b

What are the following gases?

A _ _ _ n, N _ _ n, X _ _ _ n, R _ _ _ n

Describe why the noble gases are so unreactive.

Keywords: full, electrons, shell.

_____

_____

_____

The boiling points of the noble gases **increase/decrease** as you go down the group. (delete the wrong answer).

Can you explain your answer?

_____

_____

c

Describe what happens to the reactivity of the alkali metals as you go down the group.

_____

Why?

_____

_____

Complete the word and symbol equation for sodium reacting with water:

sodium + water ➔ sodium hydroxide + _____

Na +_____ ➔ NaOH + _____

d

List 3 halogens

c_____, **f**_____, **i**_____,

How many electrons do they have in their outer shell? Circle the correct answer.

a) 1 b) 7 c) 8

Describe how the reactivity changes as you go down the group.

Keywords: reactive, nucleus, distance, less

_____

_____

_____

_____

Write balanced symbol equations for the following reactions:

bromine + potassium iodide

chlorine + sodium iodide

fluorine + potassium chloride

e

Underline the properties of metals and circle the properties of non-metals:

strong, low density, malleable, dull, good conductors of heat and electricity, high melting and boiling point, brittle, not good conductors of electricity.

f

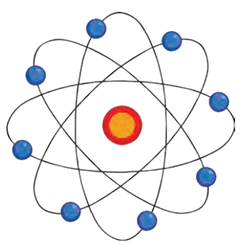
James Chadwick discovered the...

(underline the correct answer)

proton

neutron

electron



g

Complete the following dot and cross diagrams for:

NaCl

MgO

h

Complete word equations for the following reactions:

e.g. sodium + chlorine ➔ **sodium chloride**

lithium + iodine ➔

potassium + bromine ➔

i

How are the groups arranged in the periodic table?

_____

_____

How can you tell that the alkali metals are very reactive?

Hint: Think about the number of electrons in the outer shell.

_____

_____

How can you tell the noble gases are unreactive?

_____

_____

j

Describe the plum pudding model of the atom.

Draw a diagram.

_____

_____

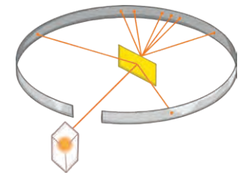
Why did scientists believe this model?

_____

k

Describe what the alpha scattering experiment showed scientists.

Keywords: alpha, gold, positive, gold, scattered particles



_____

_____

_____

l

Niels Bohr discovered that

_____

_____

Why did Mendeleev leave gaps in the periodic table?

_____

_____

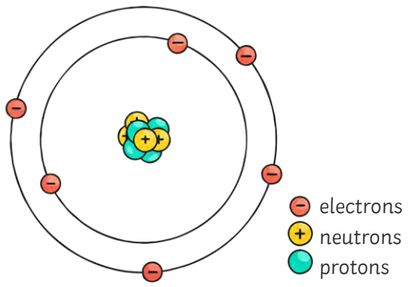
What happened to some of the gaps he left?

_____

_____

a

Draw and label an atom. Include labels for the following: neutron, proton, electron.



True or false?

1. The radius of an atom is 0.1nm. **True**
2. Most of the mass is in the shell of the atom. **False, most of the mass is in the centre**

b

Fill in the table to show the charges and mass of the components of an atom.

Name	Charge	Relative Mass
proton	+1	1
neutron	0	1
electron	−1	1

What is the overall charge of an atom?

No charge

c

A compound is 2 or more **elements**, chemically **joined.**

Which of the following are compounds?
Put a ring round them.

oxygen, salt water, **magnesium oxide**, **sodium chloride**, nitrogen

Why have you circled the ones you have?

They have 2 or more elements in the word equation.

d

What are the symbols for the following elements.

Element	Symbol
oxygen	**O**
lithium	**Li**
sodium	**Na**
potassium	**K**
helium	**He**
carbon	**C**
magnesium	**Mg**

e

Complete the following diagram for sodium, include the atomic number and the atomic mass number.

23 mass number

Na

11 atomic number

What is the mass number?
Total number of protons and neutrons.
How do you calculate neutron number?
Atomic mass – proton number

f

Isotopes are elements with a different number of **neutrons** but the same number of **protons**, e.g. carbon 12 and carbon 14.

How can you use isotopes to calculate the relative atomic mass? Write down the equation.

$$Ar = \frac{\text{sum of (isotope abundance x isotope mass number)}}{\text{sum of abundances of all the isotopes.}}$$

g

Complete and balance the following equations.

$2Mg + O_2 \rightarrow$ **$2MgO$**

$Be + S \rightarrow$ **BeS**

$Be + F_2 \rightarrow$ **BeF_2**

$2K + Cl_2 \rightarrow$ **$2KCl$**

h

Mixtures

Write the definition of a mixture. Give two examples.

Two or more elements together, not chemically joined and can be easily separated.

Salt water, sand and water

i

Name the compounds and the elements they contain.

NaCl - **sodium chloride, sodium and chlorine**

MgO - **magnesium oxide, magnesium and oxygen**

MgS - **magnesium sulfide, magnesium and sulfur**

FeS - **iron sufide, iron and sulfur**

j

What is the ratio of the elements in the following compounds?

e.g. CaO = 1:1

$MgCl_2$ = **1:2**

K_2O = **2:1**

NaCl = **1:1**

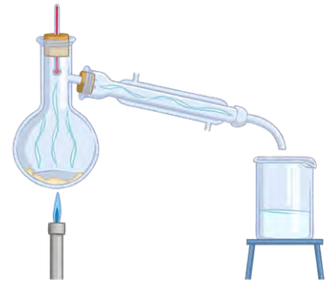
lithium fluoride = **1:1**

sodium hydroxide = **1:1:1**

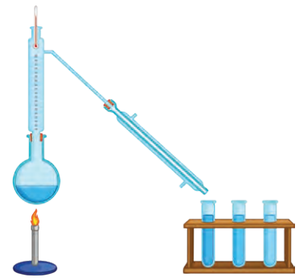
k

Separating Mixtures

What are the following separation techniques?



Distillation



Fractional distillation

What separation technique would you use to separate out different inks in pens?

Chromatography

How can salt be collected using the process of crystallisation?
By heating up a mixture of salt and water, the water will evaporate and leave the salt in the bowl.

Sand and water can be separated by using a process called **filtration.**

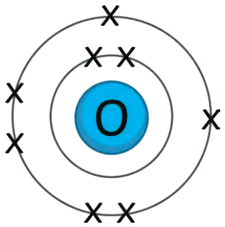
Describe in 4 steps how to collect salt from rock salt.

1. **Grind the mixture;**
2. **Add water and stir;**
3. **Filter the mixture;**
4. **Evaporate the salt water and salt is left over.**

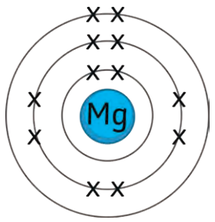
a

Complete the electronic structure diagrams for:

oxygen



magnesium



b

What are the following gases?

argon, neon, xenon, radon

Describe why the noble gases are so unreactive.

Their outer shell is full of electrons.

The boiling points of the noble gases **increase** as you go down the group.

This is because there are more forces to bond the atoms together, therefore more energy is required to break the bonds.

c

Describe what happens to the reactivity of the alkali metals as you go down the group.

It increases

Why?

The number of electrons increases. They are further away from the nucleus. There is less pull on the outer electrons so the atom is more likely to loose an electron.

Complete the word and symbol equation for sodium reacting with water:

sodium + water → sodium hydroxide + **hydrogen**

2Na + **2**H_2O → **2**NaOH + H_2

d

List 3 halogens

chlorine, **fluorine**, **iodine**, **astatine**

How many electrons do they have in their outer shell?

7 electrons

Describe how the reactivity changes as you go down the group.

They become less reactive, the atom becomes larger because there are more electron shells, further from the nucleus so the pull of the nucleus is less. So the electron is less likely to be gained as there is less of a positive pull.

Write balanced symbol equations for the following reactions:

bromine + potassium iodide

Br_2 + 2KI → 2KBr + I_2

chlorine + sodium iodide

Cl_2 + 2NaI → 2NaCl + I_2

fluorine + potassium chloride

F_2 + KCl → 2KF + Cl_2

e

Underline the properties of metals and circle the properties of non-metals:

strong, low density, malleable, dull, good conductors of heat and electricity, high melting and boiling point, brittle, not good conductors of electricity

f

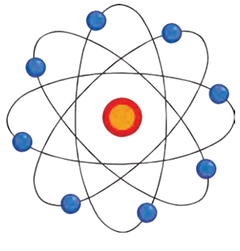
James Chadwick discovered the...

(underline the correct answer)

proton

neutron

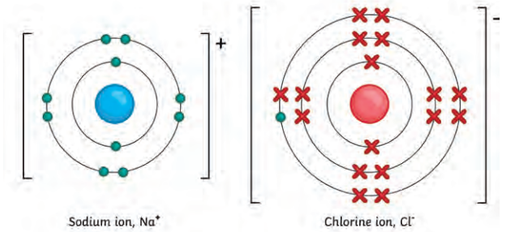
electron



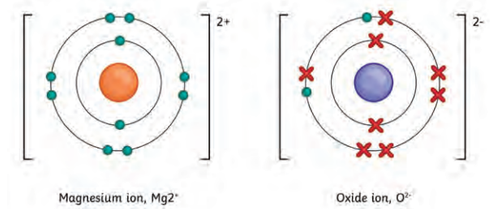
g

Complete the following dot and cross diagrams for:

NaCl



MgO



h

Complete word equations for the following reactions:

sodium + chlorine → **sodium chloride**

lithium + iodine → **lithium iodide**

potassium + bromine → **potassium bromide**

i

How are the groups arranged in the periodic table?

According to their properties.

How can you tell that the alkali metals are very reactive?

They only have 1 electron in their outer shell.

How can you tell the noble gases are unreactive?

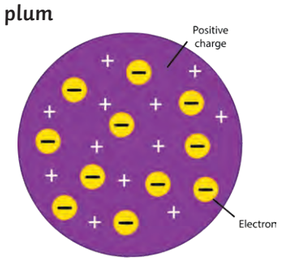
Full shell of outer electrons.

j

Describe the plum pudding model of the atom.

Draw a diagram.

A sphere of positive charge with electrons dotted about; looking like a plum pudding.



Plum pudding model

Why did scientists believe this model?

Lack of experimental evidence.

k

Describe what the alpha scattering experiment showed scientists.

Most alpha particles go straight through, some are scattered, some rebound off the gold foil.
This shows that the nucleus of an atom has a very small radius. Most of the mass is concentrated in the nucleus.

l

Niels Bohr discovered that

electrons orbit the nucleus in shells.

Why did Mendeleev leave gaps in the periodic table?

He knew that the elements existed but they hadn't been found, based on their mass.

What happened to some of the gaps he left?

They have been filled. Scientists have found some of the elements.

a

The three types of chemical bonding are...

1. I_____
2. C_____
3. M_____

Describe the movement and arrangement of subatomic particles in each of the above.

1. _____
2. _____
3. _____

b

Draw a dot and cross diagram for the following ionic bonding:
sodium chloride

Which four groups are more likely to make ions? Choose from the groups below:

1, 2, 3, 6, 7, 8, 0

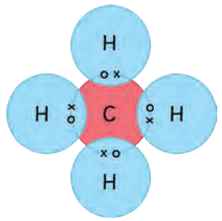
c

Describe the bonding in ionic compounds
Keywords: ions, negative, positive, opposite, attraction.

Why can ionic compounds conduct electricity when in solution?

d

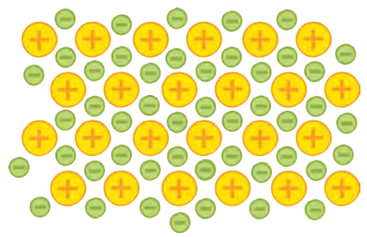
Using this example, draw dot and cross diagrams for H_2O, NH_3 and O_2



1. H_2O
2. NH_3
3. O_2

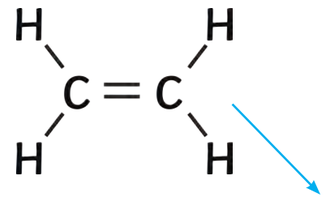
e

Describe how metals conduct heat and electricity. Use the diagram to help explain.



f

Complete the polymer diagram for the following monomer.

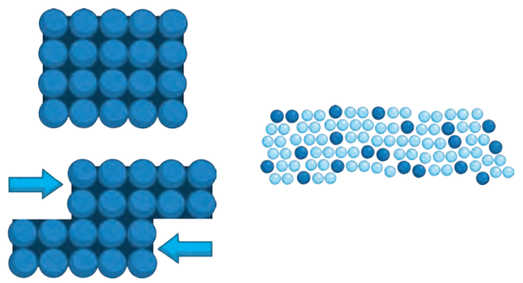


What is a monomer?

What is a polymer?

g

Properties of metals and alloys.



Describe how the 2 pictures are different to each other.

Why are some alloys harder than pure metals?

h

Match up the following with the state symbol.

solid	(g)
liquid	(l)
gas	(s)
solution	(aq)

What happens to the intermolecular forces when a liquid turns into a gas? (Delete the incorrect answers)

Increase

Decrease

Stay the same

i

Describe the changes of state during:

evaporation:

condensation:

melting:

j

Small molecules form substances with **high/low** boiling points because they have **strong/weak** intermolecular forces.

They **do/do not** conduct electricity because they do not have any free electrons.

k

My main areas for improvement are:

a

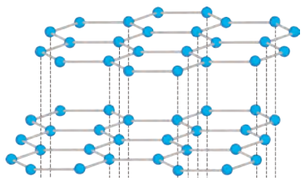
Draw a diagram of the structure of diamond.

Why is this structure so strong? Choose the correct answer.

1. Many strong ionic bonds.
2. Many strong covalent bonds.
3. Many strong metallic bonds.

b

What is this a diagram of?



Explain why it can conduct electricity and heat.

_____

c

The topic I understand the most in this unit is

_____

_____

_____

_____

The topic I need to work on is

_____

_____

_____

_____

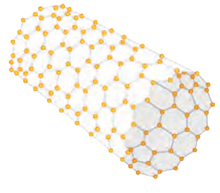
d

This is a carbon n_____.

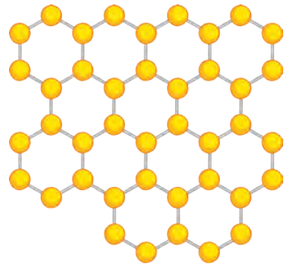
It has high t_____

strength, high h_____

and e_____ conductivity.



e



_____ is a single layer of graphite.

Why is this material so strong?

_____

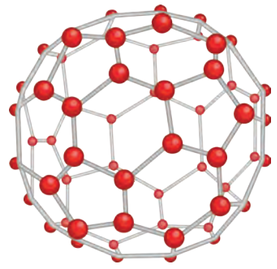
_____

Where is this product used?

_____

_____

f



What is this structure?

_____

How many carbon atoms are there?

a) 20 b) 30 c) 40 d) 50 e) 60

g

Explain the differences and similarities between silicon dioxide and diamond.

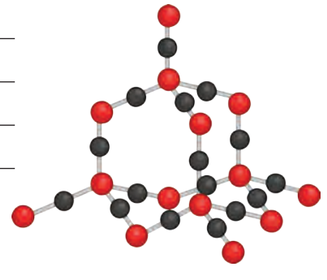
_____

_____

_____

_____

_____



h

What are the formulas for the following?
Match up the answers.

Iron (II) oxide	$Fe(OH)_2$
Iron (II) hydroxide	FeO
Iron (lll) oxide	Fe_2O_3

i

How many:

mm in 1m? _____

m in 1mm? _____

What are the abbreviated units for the following:

metre; _____

centimetre; _____

millimetre; _____

nanometre; _____

micrometre. _____

j

Compare diamond and graphite.
Describe the structure, hardness and conductivity.
Keywords: covalent, atoms, electricity, electrons, flat

_____

_____

_____

_____

_____

_____

k

My main areas for improvement are:

_____

_____

_____

_____

_____

_____

_____

a

The three types of chemical bonding are...

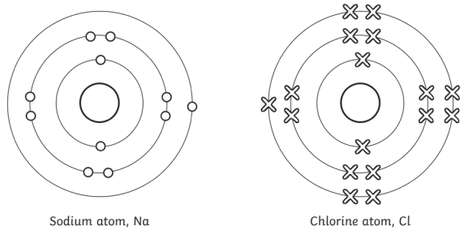
1. **ionic**
2. **covalent**
3. **metallic**

Describe the movement and arrangement of subatomic particles in each of the above.

1. **Electrons are lost and gained to fill the outer shell.**
2. **Electrons are shared to fill the outer shell.**
3. **Positive metal ions are surrounded by free electrons.**

b

Draw a dot and cross diagram for the following ionic bonding:
sodium chloride



Which four groups are more likely to make ions?

1, 2, 6 and 7

c

Describe the bonding in ionic compounds

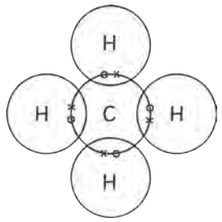
They are held together by the strong ionic forces of oppositely charged ions. Metal ions have a positive charge and non-metals ions have a negative charge so they are attracted. They have very strong bonds.

Why can ionic compounds conduct electricity when in solution?

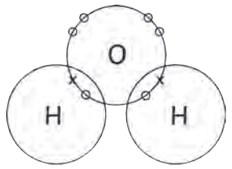
The ions are free to move about and can conduct electricity.

d

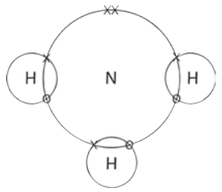
Using this example, draw dot and cross diagrams for H_2O, NH_3 and O_2



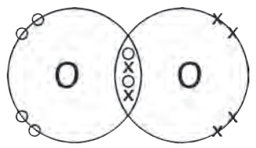
1. H_2O



2. NH_3

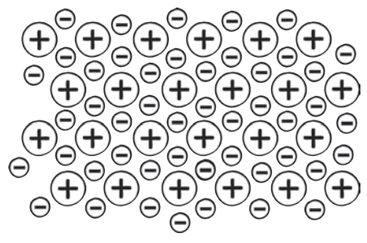


3. O_2



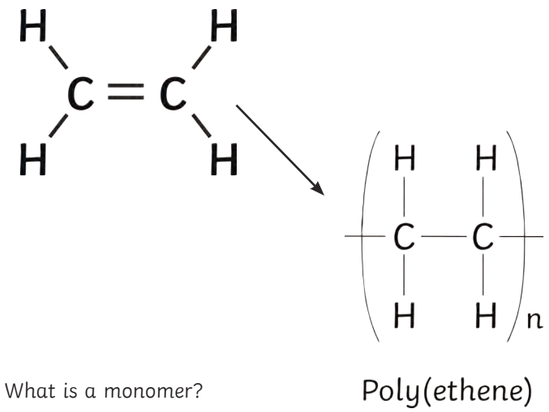
e

Describe how metals conduct heat and electricity. Use the diagram to help explain.
Metals have free Electrons that are able to move around and transfer energy.



f

Complete the polymer diagram for the following monomer.



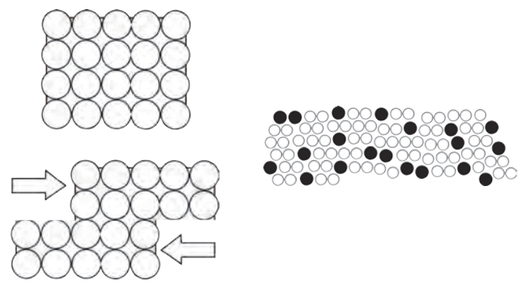
Poly(ethene)

What is a monomer?
One molecule.

What is a polymer?
A long chain of monomers.

g

Properties of metals and alloys.

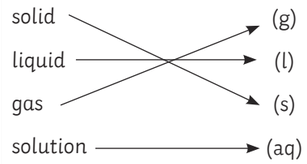


Describe how the 2 pictures are different to each other.
Alloys have different sized particles. In pure metals, all the atoms are the same.

Why are some alloys harder than pure metals?
They have different sized particles so the layers can not slide across each other as easily.

h

Match up the following with the state symbol.



What happens to the intermolecular forces when a liquid turns into a gas?
Decrease

i

Describe the changes of state during:

evaporation:
liquid changes to a gas.

condensation:
gas changes to a liquid.

melting:
solid changes to a liquid.

j

Small molecules form substances with **low** boiling points because they have **weak** intermolecular forces.

They **do not** conduct electricity because they do not have any free electrons.

k

My main areas for improvement are:

_____

_____

_____

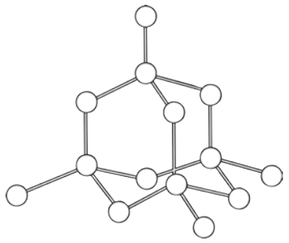
_____

_____

_____

a

Draw a diagram of the structure of diamond.



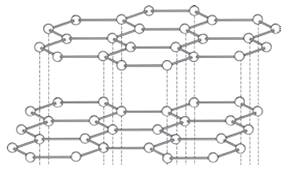
Why is this structure so strong? Choose the correct answer.

2. Many strong covalent bonds.

b

What is this a diagram of?

Graphite



Explain why it can conduct electricity and heat.

Graphite has free delocalised electrons that can pass between layers; the electrons can carry the charge.

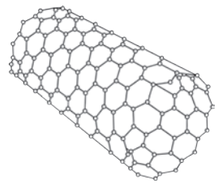
c

The topic I understand the most in this unit is

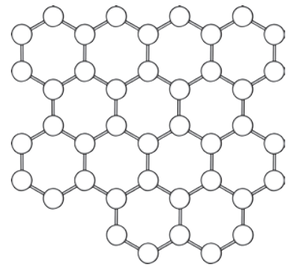
The topic I need to work on is

d

This is a carbon **nanotube**.
It has high **tensile** strength, high **heat** and **electrical** conductivity.



e



Graphene is a single layer of graphite.

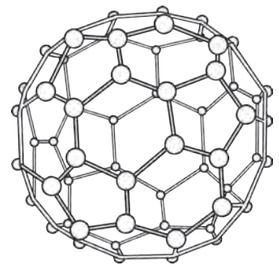
Why is this material so strong?

It has strong covalent bonds.

Where is this product used?

In electronics and composites.

f



What is this structure?

Buckminsterfullerene

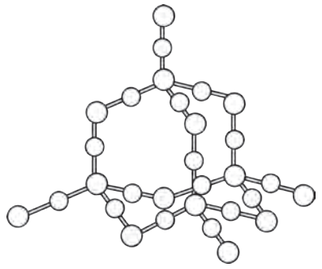
How many carbon atoms are there?

e) 60

g

Explain the differences and similarities between silicon dioxide and diamond.

Silicon dioxide contains silicon and oxygen atoms instead of carbon but has a similar structure to diamond.



h

What are the formulas for the following?
Match up the answers.

Iron (II) oxide → FeO

Iron (II) hydroxide → $Fe(OH)_2$

Iron (lll) oxide → Fe_2O_3

i

How many:

mm in 1m? **1000mm**

m in 1mm? **0.001m**

What are the abbreviated units for the following:

metre; **m**

centimetre; c**m**

millimetre; **mm**

nanometre; **nm**

micrometre. **µm**

j

Compare diamond and graphite.
Describe the structure, hardness and conductivity.

Both – forms of carbon.

Single covalent bonds

Have many atoms.

Graphite – flat sheets, conducts electricity, each carbon atom forms 3 covalent bonds.

Diamond – tetrahedral structure, each carbon atom forms 4 covalent bonds, does not conduct electricity.

k

My main areas for improvement are:

a

Mass of the p_____ must always equal the mass of the r_____.

Balance the following:

$H_2 + O_2 \longrightarrow H_2O$

$Na + Cl_2 \longrightarrow NaCl$

$Br_2 + KI \longrightarrow I_2 + KBr$

$N_2 + H_2 \longrightarrow NH_3$

b

Complete the following sentences

The relative formula mass is the (_____) of a compound.

It is the sum of the r_____ atomic masses (A_r) of the atoms.

Calculate the relative formula mass for the following. Show your working out.

A_r of C = 12
A_r of H = 1
A_r of O = 16
A_r of N = 14

Example:
CO_2
12 + (16 × 2)
12 + 32
= 44

H_2O

CH_4

NH_4NO_3

c

When a gas is produced during a reaction, why might the mass go down?
(Hint: think about where the gas may go)

_____

_____

_____

Write the equation for when magnesium reacts with oxygen.

_____

What happens to the mass of the product from the question above?

_____

_____

_____

d

$$\% \text{ mass} = \frac{A_r \times \text{number of atoms} \times 100}{M_r \text{ of the compound}}$$

Using the equation above, calculate the % mass of sodium (Na) in NaCl.

A_r of Na = 23

A_r of Cl = 35.5

e

If 9g of magnesium reacts completely with 6g of oxygen what is the mass of magnesium oxide produced?

1. 5g
2. 10g
3. 15g
4. 20g
5. 25g

f

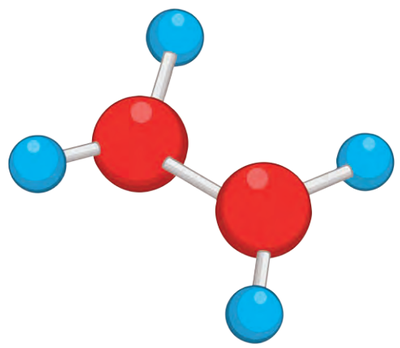
Show that mass is conserved in the following equation.

Use the A_r values to calculate the M_r of both sides of the equation.

A_r of H = 1

A_r of O = 16

$2H_2 + O_2 \longrightarrow 2H_2O$

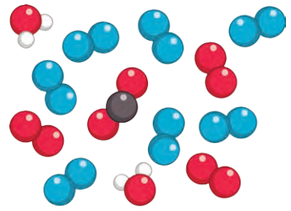


g

Complete the concentration equation.

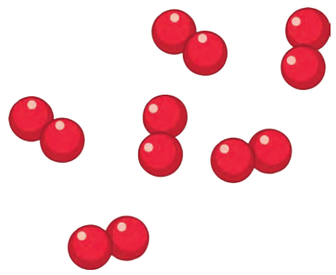
concentration = _____

What is the concentration of a solution if there is 40g of dissolved substance and 0.5dm³ of solvent?



h

Rearrange the equation to calculate the mass of the dissolved substance when the concentration is 15g/dm³ and the volume is 0.8dm³.



a

Mass of the **product** must always equal the mass of the **reactants**.

Balance the following:

$2H_2 + O_2 \longrightarrow 2H_2O$
$2Na + Cl^2 \longrightarrow 2NaCl$
$Br_2 + 2KI \longrightarrow I_2 + 2KBr$
$N_2 + 3H_2 \longrightarrow 2NH_3$

b

Complete the following sentences

The relative formula mass is the (M_r) of a compound.

It is the sum of the **relative** atomic masses (A_r) of the atoms.

Calculate the relative formula mass for the following. Show your working out.

A_r of C = 12
A_r of H = 1
A_r of O = 16
A_r of N = 14

Example:
CO_2
12 + (16 × 2)
12 + 32
= 44

H_2O
(1 × 2) + 16
2 + 16
= 18

CH_4
12 + (1 × 4)
12 + 4
= 16

NH_4NO_3
14 + (1 × 4) + 14 + (16 × 3)
14 + 4 + 14 + 48
= 80

c

When a gas is produced during a reaction, why might the mass go down?
(Hint: think about where the gas may go)

The gas may be released into the environment.

Write the equation for when magnesium reacts with oxygen.

$2Mg + O_2 \longrightarrow 2MgO$

What happens to the mass of the product from the question above?

The mass increases because oxygen is added from the environment.

d

$$\% \text{ mass} = \frac{A_r \times \text{number of atoms} \times 100}{M_r \text{ of the compound}}$$

Using the equation above, calculate the % mass of sodium (Na) in NaCl.

A_r of Na = 23

A_r of Cl = 35.5

$$\textbf{\% mass} = \frac{\textbf{23} \times \textbf{1} \times \textbf{100}}{\textbf{23 + 35.5}}$$

$$= \frac{\textbf{2300}}{\textbf{58.5}}$$

= 39.3% (to 1d.p.)

e

If 9g of magnesium reacts completely with 6g of oxygen what is the mass of magnesium oxide produced?

1. 5g
2. 10g
3. **15g**
4. 20g
5. 25g

f

Show that mass is conserved in the following equation.

Use the A_r values to calculate the M_r of both sides of the equation.

A_r of H = 1

A_r of O = 16

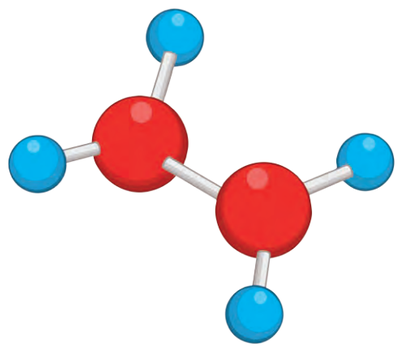
$2H_2 + O_2 \longrightarrow 2H_2O$

$2 \times (1 \times 2) + (16 \times 2) \longrightarrow 2((1 \times 2) + 16)$

$4 + 32 \longrightarrow 2 \times 18$

$36 \longrightarrow 36$

left-hand side = right-hand side



g

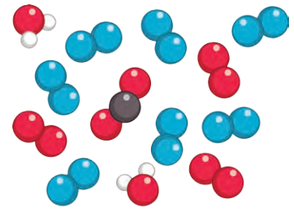
Complete the concentration equation.

$$\text{concentration} = \frac{\textbf{mass of dissolved substance}}{\textbf{volume of solvent}}$$

What is the concentration of a solution if there is 40g of dissolved substance and 0.5dm^3 of solvent?

$$\textbf{concentration} = \frac{\textbf{40}}{\textbf{0.5}}$$

concentration = 80g/dm^3



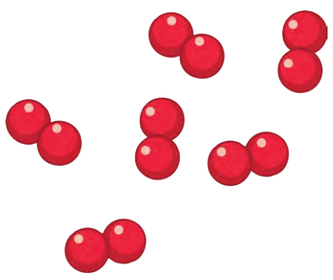
h

Rearrange the equation to calculate the mass of the dissolved substance when the concentration is 15g/dm^3 and the volume is 0.8dm^3.

mass = concentration × volume

mass = 15 × 0.8

mass = 12g



a

Describe what a system is.

_____

b

Describe energy store changes for the following objects:

A football that has been kicked upwards.

As the ball moves upwards, the kinetic energy store of the ball _____ and the _____ store of the ball increases.

A squash ball hitting a wall.

When the ball hits the wall, the kinetic energy store of the ball _____ and the _____ store increases. Some of the energy is also transferred to the surroundings. The thermal energy store of the _____ increases and some of the energy is carried by sound waves.

A car accelerating.

As the car moves, the chemical energy store of the petrol _____and the _____ of the car increases. Some of the energy is also transferred by _____ waves to the surroundings and the energy store of the surroundings also increases.

A car decelerating.

As the car slows down, the _____ energy store decreases and the _____ energy store of the surroundings and brakes _____. Some of the energy is also transferred by _____ waves to the surroundings.

Bringing water to the boil.

The electric current transfers some of the _____ and the _____ energy store of the water increases, which increases the _____ energy stores of the particles that make up the water.

c

What is the equation linking kinetic energy, mass and speed?

_____

Write the units for the following:

kinetic energy: _____

mass: _____

speed: _____

A toy car moving down a ramp has a kinetic energy store. Give two more examples of objects with kinetic energy stores.

_____

_____

d

What is the equation linking elastic potential energy, spring constant and extension?

_____

Write the units for the following:

elastic potential energy: _____

spring constant: _____

extension: _____

A tennis ball that has been squashed has an elastic potential energy store. Give two more examples of objects with elastic potential energy stores.

_____

_____

e

What is the equation linking gravitational potential energy, mass, gravitational field strength and height?

_____

Write the units for the following:

gravitational potential energy: _____

mass: _____

gravitational field strength: _____

height: _____

An apple on a tree is an example of an object that has a gravitational potential energy store. Give two more examples.

_____

_____

_____

f

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

_____

_____

Write the units for the following:

change in thermal energy: _____

specific heat capacity: _____

Write a definition for specific heat capacity.

_____

_____

_____

g

Power is:

the rate at which _____

and the rate at which _____

What is the equation linking power, energy transferred and time?

_____

What is the equation linking power, work done and time?

_____

Write the units for the following:

power: _____

energy transferred: _____

time: _____

work done: _____

The power output of a hairdryer is 2000W. How much energy is transferred per second?

_____

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

_____

_____

a

What is the law of conservation of energy?

Energy cannot be _____ or destroyed. It can be _____,

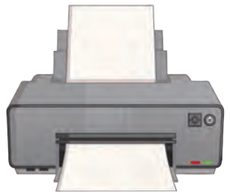
_____ or dissipated.

Define dissipation.

_____

b

The following questions are about energy stores and transfers in a printer. Choose the answers from the box.



by heating	electrically	internal (thermal)	kinetic

The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? _____

What is the final energy store? _____

Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? _____

What is the final energy store? _____

c

For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.
Hot water stored in a tank.

_____

_____

Moving parts in a car.

_____

_____

d

Describe how thermal conductivity of a material affects how it transfers energy by conduction.

_____

_____

e

How is energy lost from a building? What factors affect this?

_____

_____

_____

f

What is the equation linking efficiency, useful output energy transfer and total input energy transfer?

_____

What is the equation linking efficiency, useful power output and total power input?

_____

When energy is transferred in a closed system, what happens to the total amount of energy?

_____

How can the efficiency of an energy transfer be increased?

_____

g

Which lorry is more energy efficient and why?

_____

_____

_____

h

List the main energy resources.

_____

_____

_____

_____

_____

i

Define renewable and non-renewable energy resources.

_____

_____

j

For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.

Except for oil, all energy resources are used for electricity generation. Which are used for heating?

_____

k

My main areas for improvement are:

_____

_____

_____

l

Energy Resource	Environmental Impact – what does it produce that is harmful/can it affect wildlife/is a lot of land needed/does it have any environmental impact?	Reliable/Unreliable – do you always get the same amount of energy?
Coal	Produces carbon dioxide, a greenhouse gas, and sulfur dioxide which contributes to acid rain.	Reliable.
Oil		
Gas		
Nuclear		
Biofuel		
Wind		
Hydroelectricity		
Geothermal		
Tidal		Not always reliable due to changing tides.
Waves		
Solar	None.	

a

Describe what a system is.

It is an object or group of objects.

b

Describe energy store changes for the following objects:

A football that has been kicked upwards.

As the ball moves upwards, the kinetic energy store of the ball **decreases** and the **gravitational potential energy** store of the ball increases.

A squash ball hitting a wall.

When the ball hits the wall, the kinetic energy store of the ball **decreases** and the **elastic potential energy** store increases. Some of the energy is also transferred to the surroundings. The thermal energy store of the **surroundings** increases and some of the energy is carried by sound waves.

A car accelerating.

As the car moves, the chemical energy store of the petrol **decreases** and the **kinetic energy store** of the car increases. Some of the energy is also transferred by **sound** waves to the surroundings and the **thermal** energy store of the surroundings also increases.

A car decelerating.

As the car slows down, the **kinetic** energy store decreases and the **thermal** energy store of the surroundings and brakes **increases**. Some of the energy is also transferred by **sound** waves to the surroundings.

Bringing water to the boil.

The electric current transfers some of the **energy** and the **thermal** energy store of the water increases, which increases the **kinetic** energy stores of the particles that make up the water.

c

What is the equation linking kinetic energy, mass and speed?

kinetic energy = $\frac{1}{2}$ × mass × (speed)^2

Write the units for the following:

kinetic energy: **(E_k), joules, J**

mass: **(m), kilograms, kg, grams, g**

speed: **(v), metres per second, m/s**

A toy car moving down a ramp has a kinetic energy store. Give two more examples of objects with kinetic energy stores.

(These are just a few examples. There will be many more.)

Parachute falling through the air.

Gas particles moving in the air.

d

What is the equation linking elastic potential energy, spring constant and extension?

elastic potential energy = $\frac{1}{2}$ x spring constant x (extension)^2

Write the units for the following:

elastic potential energy: **(E_e), joules, J**

spring constant: **(k), newtons per metre, N/m**

extension: **(e), metres, m**

A tennis ball that has been squashed has an elastic potential energy store. Give two more examples of objects with elastic potential energy stores.

(These are just a few examples. There will be many more.)

Stretched elastic band.

Extended spring.

e

What is the equation linking gravitational potential energy, mass, gravitational field strength and height?

gravitational potential energy = mass x gravitational field strength x height

Write the units for the following:

gravitational potential energy: **(E_p), joules, J**

mass: **(m), kilograms, kg**

gravitational field strength: **(g), newtons per kilogram, N/kg**

height: **(h), metres, m**

An apple on a tree is an example of an object that has a gravitational potential energy store. Give two more examples.

(These are just a few examples. There will be many more.)

Plant pot on a windowsill.

Aeroplane in the sky.

f

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

change in thermal energy

= mass x specific heat capacity x temperature change

Write the units for the following:

change in thermal energy: **(ΔE), joules, J**

specific heat capacity: **(c), joules per kilogram per degree Celsius, J/kg °C**

Write a definition for specific heat capacity.

The amount of energy needed to increase the temperature of a 1kg material by 1°C.

g

Power is:

the rate at which energy is transferred;

and the rate at which work is done.

What is the equation linking power, energy transferred and time?

power = energy transferred ÷ time

What is the equation linking power, work done and time?

power = work done ÷ time

Write the units for the following:

power: **(P), watts, W**

energy transferred: **(E), joules, J**

time: **(t), seconds, s**

work done: **(E), joules, J**

The power output of a hairdryer is 2000W. How much energy is transferred per second?

2000 joules per second.

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

The LED bulb transfers less energy per second than the halogen bulb.

a

What is the law of conservation of energy?

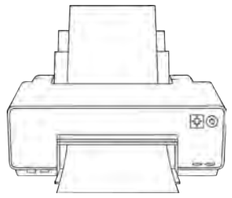
Energy cannot be created or destroyed. It can be transferred, stored or dissipated.

Define dissipation.

Energy being transferred to the surroundings.

b

The following questions are about energy stores and transfers in a printer. Choose the answers from the box.



by heating	electrically	internal (thermal)	kinetic

The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? **electrically**

What is the final energy store? **kinetic**

Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? **by heating**

What is the final energy store? **internal (thermal)**

c

For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.
Hot water stored in a tank.

Insulation around the water tank. Reduces dissipation of energy to the surroundings into thermal energy stores.

Moving parts in a car.

Lubricating the moving parts. Reduces dissipation of energy to the surroundings into thermal energy stores.

d

Describe how thermal conductivity of a material affects how it transfers energy by conduction.

If a material has a high thermal conductivity, it will transfer heat via conduction at a much quicker rate.

e

How is energy lost from a building? What factors affect this?

Energy is transferred to thermal energy stores of the surroundings. The factors that affect this are the thermal conductivity of the walls and the thickness of them.

f

What is the equation linking efficiency, useful output energy transfer and total input energy transfer?

efficiency = useful output energy ÷ total imput energy transfer

What is the equation linking efficiency, useful power output and total power input?
efficiency = useful power output ÷ total power output

When energy is transferred in a closed system, what happens to the total amount of energy?
Total energy does not change.

How can the efficiency of an energy transfer be increased?

By increasing the useful output by reducing the wasted energy.

g

Which lorry is more energy efficient and why?

The red lorry is streamlined and so is more energy efficient . It wastes less energy due to air resistance and so has a higher useful output energy.

h

List the main energy resources.

Fossil fuels (coal, oil and gas) N **Nuclear fuel N** **Biofuel R**

Wind R **Hydroelectricity R** **Geothermal R**

Tidal R **Waves R** **Sun R**

i

Define renewable and non-renewable energy resources.

A renewable energy resource can be replenished.

A non-renewable energy resource will eventually run out.

j

For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.

Except for oil, all energy resources are used for electricity generation. Which are used for heating?

geothermal, solar, fossil fuels (coal, oil and gas)

k

My main areas for improvement are:

_____

_____

_____

l

Energy Resource	Environmental Impact – what does it produce that is harmful/can it affect wildlife/is a lot of land needed/does it have any environmental impact?	Reliable/Unreliable – do you always get the same amount of energy?
Coal	Produces carbon dioxide, a greenhouse gas, and sulfur dioxide which contributes to acid rain.	Reliable.
Oil	Produces carbon dioxide, nitrogen dioxide and sulfur dioxide. If it is spilt there can be disastrous environmental consequences.	Reliable.
Gas	Produces carbon dioxide.	Reliable.
Nuclear	Produces radioactive waste.	Reliable.
Biofuel	A lot of land is needed for growing the fuel.	Reliable.
Wind	Can be noisy and the turbines are dangerous for birds.	Unreliable.
Hydroelectricity	Large areas of land are needed and can cause disruption to ecosystems.	Reliable.
Geothermal	small amounts of greenhouse gases solar - uses up land, a lot of energy is needed to make the solar panels.	Reliable.
Tidal	Can affect habitats.	Not always reliable due to changing tides.
Waves	Can affect habitats.	Unreliable.
Solar	None.	Unreliable.

a

Draw the symbol diagrams for:

cell

resistor

battery

variable resistor

lamp (bulb)

ammeter

fuse

voltmeter

LED

diode

LDR

thermistor

b

What is electric current?

_____

State the equation that links charge, current and time.

_____

Write the symbols and units for the following:

charge: _____

current: _____

time: _____

c

A charge of 12A flows through an electric cooker for 1 hour. How much charge has been used?

_____

_____

State the equation that links current, potential difference and resistance. Remember to include units.

_____

_____

A voltmeter reading is 3V and the resistance is 2Ω. What is the current?

_____

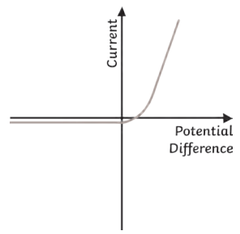
_____

d

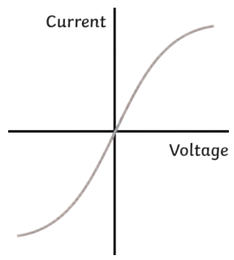
Use the components stated below to identify the potential difference/current graphs:

filament lamp, diode, ohmic conductor

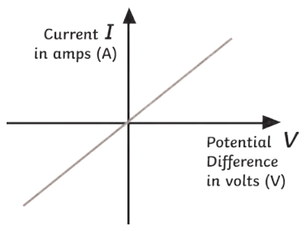
_____



_____



_____



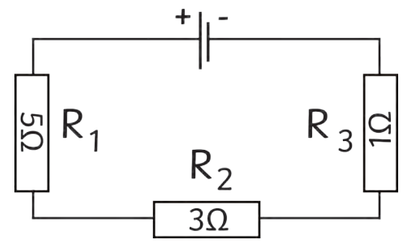
e

Complete the table.

Type of Circuit	Potential Difference Shared or the Same?	Current Same or Split?
Series		
Parallel		

For the circuit below, calculate the total resistance.

_____



On the diagram, draw where a voltmeter could be positioned to measure the voltage through one of the components.

f

Complete the following sentences.

For a thermistor: as the temperature increases, the resistance _____

Used in: _____

For an LDR: as the light intensity increases, the resistance _____

Used in: _____

g

State the 2 different types of electricity supply.

1. _____

2. _____

The UK mains supply has an AC supply of _____V

and a frequency of _____Hz.

h

Label the diagram of the 3 pin plug.

What is the purpose of:

the neutral wire?

_____

_____

the live wire?

_____

_____

the earth wire?

_____

_____

a

Describe how each of the appliances below transfers energy.

Kettle

Energy is transferred electrically from chemical energy store in the power station to the _____ energy store of the heating element of the kettle.

Hairdryer

Energy is transferred electrically from chemical energy stores in the power station to the _____ energy store of the motor and the _____ energy store of the heating element of the hairdryer.

b

What is the equation linking energy transferred, power and time?

_____

what are the units for:

energy? _____

power? _____

time? _____

c

Most devices have a power rating. Describe the relationship between the power rating and the changes in stored energy when a device is used.

_____

_____

_____

_____

d

State the equation that links power, current and potential difference.

_____

A 2.4kW kettle is connected to the mains power supply (230V). Calculate the current through the kettle.

Remember 1000W = 1kW

You will need to rearrange your equation above.

_____

_____

_____

_____

_____

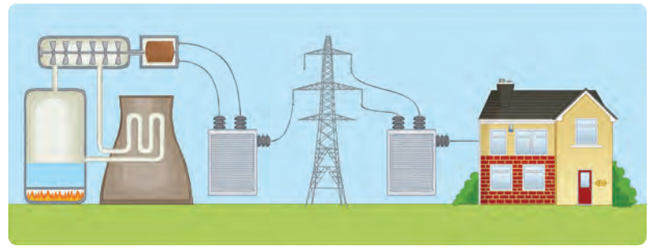
e

True or false:

- The current in a circuit can be altered by a variable resistor. _____
- A voltmeter is connected in parallel with a component. _____
- An ammeter is connected in parallel with a component. _____

f

Label the National Grid diagram.



Give two examples of when the demand for electricity is likely to be high.

1. _____
2. _____

g

Why is energy transferred at such high voltage in cables?

_____

_____

_____

_____

_____

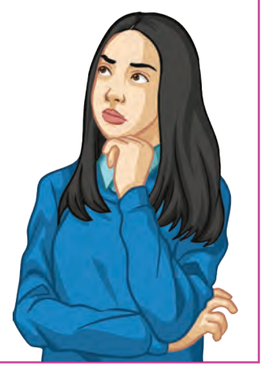
Describe how the following work:

step-up transformer.

_____

step-down transformer.

_____



h

Describe an experiment to show how the length of a wire affects its resistance.
Equipment: metre ruler, ammeter, voltmeter, cell, switch.

Hint: it may help to draw a diagram of how to set up the apparatus.

_____

_____

_____

_____

_____

_____

_____

_____

a

Draw the symbol diagrams for:

cell

resistor

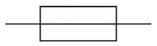
battery

variable resistor

lamp (bulb)

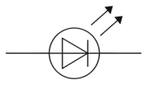
ammeter

fuse



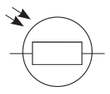
voltmeter

LED

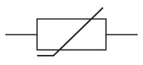


diode

LDR



thermistor



b

What is electric current?
The flow of electrical charge.

State the equation that links charge, current and time.
charge = current × time

Write the symbols and units for the following:

charge: **(Q) coulombs, C**

current: **(I) amperes, A**

time: **(t) seconds, s**

c

A charge of 12A flows through an electric cooker for 1 hour. How much charge has been used?
Convert hours to seconds: 60 mins = 3600 secs
12 × 3600 = 43200 C

State the equation that links current, potential difference and resistance. Remember to include units.
potential difference (V) = current (A) × resistance (Ω)

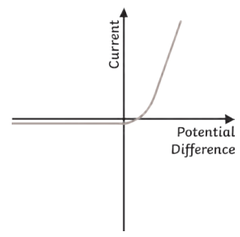
A voltmeter reading is 3V and the resistance is 2Ω. What is the current?
current = potential difference ÷ resistance
3 ÷ 2 = 1.5A

d

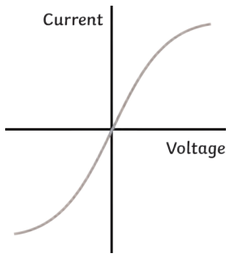
Use the components stated below to identify the potential difference/current graphs:

filament lamp, diode, ohmic conductor

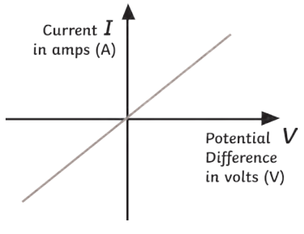
diode



filament lamp



ohmic conductor

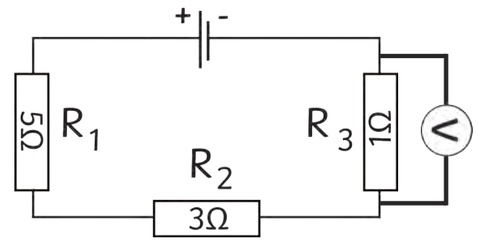


e

Complete the table.

Type of Circuit	Potential Difference Shared or the Same?	Current Same or Split?
Series	**shared**	**same**
Parallel	**same**	**split between branches**

For the circuit below, calculate the total resistance.
9Ω



On the diagram, draw where a voltmeter could be positioned to measure the voltage through one of the components. The voltmeter should be drawing using a V within a circle as the correct symbol and can be drawn across any of the components within the circuit.

f

Complete the following sentences.

For a thermistor: as the temperature increases, the resistance **decreases**

Used in: **thermostats**

For an LDR: as the light intensity increases, the resistance **decreases**

Used in: **street lights**

g

State the 2 different types of electricity supply.

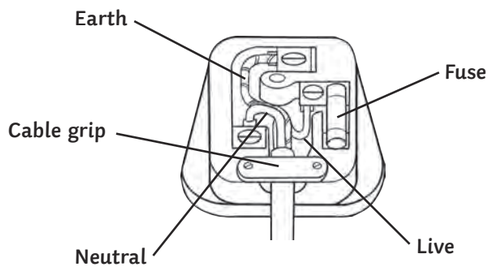
1. **alternating current**

2. **direct current**

The UK mains supply has an AC supply of **230**V and a frequency of **50**Hz.

h

Label the diagram of the 3 pin plug.



What is the purpose of:

the neutral wire?
It completes the circuit and carries away the current.

the live wire?
It provides alternating potential difference.

the earth wire?
It is a safety feature to prevent the application from becoming live.

a

Describe how each of the appliances below transfers energy.

Kettle

Energy is transferred electrically from chemical energy stores in the power station to the **internal (thermal)** energy store of the heating element of the kettle.

Hairdryer

Energy is transferred electrically from chemical energy stores in the power station to the **kinetic** energy store of the motor and the **internal (thermal)** energy store of the heating element of the hairdryer.

b

What is the equation linking energy transferred, power and time?
energy transferred = power × time

what are the units for:

energy? **joules**

power? **watts**

time? **seconds**

c

Most devices have a power rating. Describe the relationship between the power rating and the changes in stored energy when a device is used.
A device with a higher power rating will transfer stored energy to other types of energy at a faster rate.

d

State the equation that links power, current and potential difference.
power (W) = potential difference (V) × current (A)

A 2.4kW kettle is connected to the mains power supply (230V). Calculate the current through the kettle.

Remember 1000W = 1kW

You will need to rearrange your equation above.

2.4 × 1000 = 2400

Current = power ÷ potential difference
= 2400 ÷ 230
= 10.43A

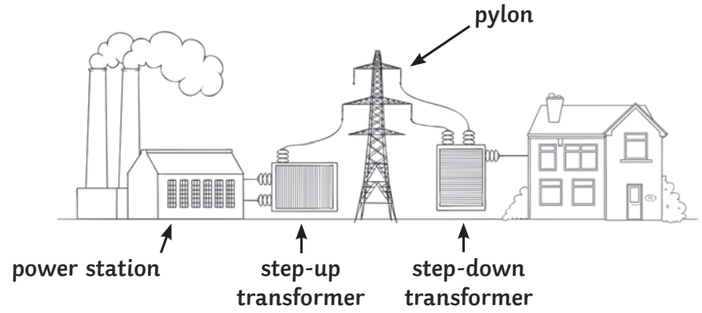
e

True or false:

- The current in a circuit can be altered by a variable resistor. **True**
- A voltmeter is connected in parallel with a component. **True**
- An ammeter is connected in parallel with a component. **False**

f

Label the National Grid diagram.



Give two examples of when the demand for electricity is likely to be high.

1. **At half-time or the end of large sporting events.**
2. **First thing in the morning when people are getting up, or later when arriving home.**

g

Why is energy transferred at such high voltage in cables?
High voltage means that the energy is transferred at low currents. This results in less resistance, therefore less energy is lost as heat, so the transmission is more efficient.

Describe how the following work:

step-up transformer.

Potential difference is increased.

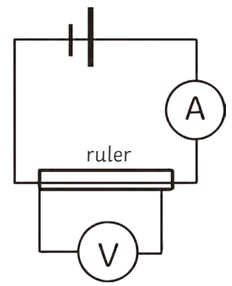
step-down transformer.

Potential difference is decreased.

h

Describe an experiment to show how the length of a wire affects its resistance.
Equipment: metre ruler, ammeter, voltmeter, cell, switch.

Hint: it may help to draw a diagram of how to set up the apparatus.



Set up the apparatus as shown.
Attach the first crocodile clip at 0cm.
Attach the second crocodile clip at 10cm.
Record the potential difference and the current.
Connect the second crocodile clip at different lengths (20cm, 30cm) and repeat the process.
Use the results to calculate resistance at different lengths, using the formula:
resistance = potential difference ÷ current

a

Draw the particle models for solids, liquids and gases.

Complete the table below.

State	Can You Squash it?	Does It Flow?	Shape
Solid			
Liquid			
Gas			

Underline the physical changes and circle the chemical changes from the following:

iron rusting, digesting food, dissolving sugar in water, burning wood, ice melting, breaking a bottle

b

What is the equation linking density, volume and mass?

Write the symbols and units for:

density:

volume:

mass:

c

Describe how you would find out the density of an irregular object and a liquid.

Keywords: balance, Eureka can, measuring cylinder

d

Underline the correct answer:

The internal energy of a system is the total energy that its particles have in its:

kinetic energy stores
potential energy stores
kinetic and potential energy stores

e

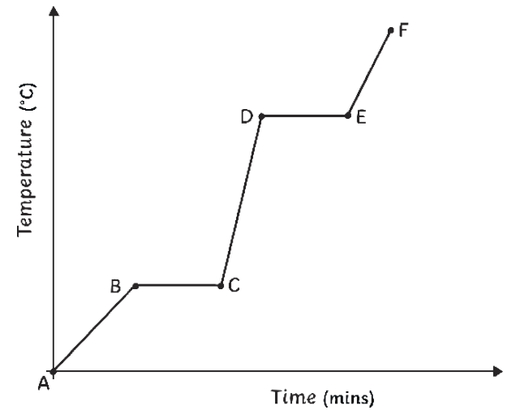
For the heating and cooling curve shown below, what are the terms used to describe the changes of state between:

B → C M

D → E E

E → D C

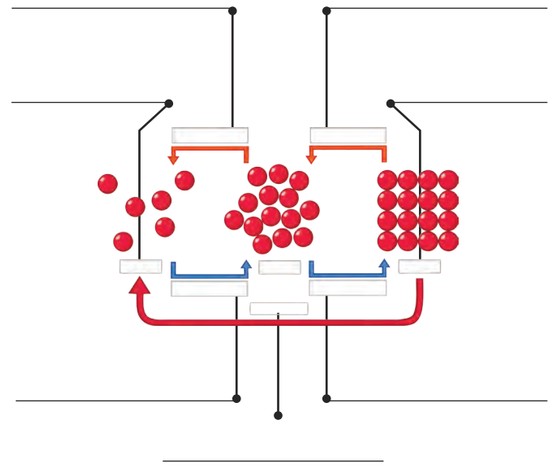
C → B F



In terms of energy, what do the horizontal sections on the graph show?

f

Label the diagram, using the following keywords: melting, freezing, evaporating, condensing, sublimating, liquid, gas, solid



g

Delete the wrong answers.

The specific heat capacity of a substance is the energy required to change the temperature of 500g / 1kg of the substance by 1°C / 10°C.

When a substance changes state – for example, from a solid to a liquid – explain why the mass of the substance remains the same.

a

Specific Heat Capacity

Complete the sentences below about temperature and heat.

Temperature is the measure of how _____ an object is. It is measured in _____.

Heat is the measure of the _____contained in an object. It is measured in _____.

When heat energy is transferred to an object, there is a temperature increase. The temperature rise is dependent on three things:

_____

_____

_____

State the equation that links energy, mass, specific heat capacity and temperature change.

_____

Write the units for

energy: _____

mass: _____

specific heat capacity: _____

b

Calculate the amount of energy transferred to increase the temperature of 24g of lead from 10°C to 30°C.

The specific heat capacity of lead is 128J/kg°C

_____

_____

c

	Force between Particles	Energy Levels
Solid	s _____	l _____
Liquid	w _____	s _____
Gas	almost n _____	l _____

Define the differences in density between solids and liquids.

less, particles, dense, fewer, strong, closely

Solids are very _____ because the particles are so _____ packed together and there are _____ forces of attraction between them.

Liquids are _____ dense than solids because the _____ are further apart and have _____ forces of attraction.

d

Explain, in terms of particles, why gases are easy to compress.

_____

A gas has a mass of 4.4g and a volume of 2.3cm^3. Calculate the density of the gas.

_____

_____

A student heats a sealed cylinder containing a gas. What will happen to the pressure within the cylinder?

_____

_____

_____

_____

_____

e

Explain the term specific latent heat of fusion.

_____

_____

_____

f

What is an internal system?

_____

_____

_____

_____

_____

g

Describe how you would find out the density of a liquid.

_____

_____

_____

_____

_____

a

Draw the particle models for solids, liquids and gases.

Complete the table below.

State	Can You Squash it?	Does It Flow?	Shape
Solid	no	no	fixed
Liquid	no	yes	Takes shape of container from bottom.
Gas	yes	yes	Takes shape of whole container.

Underline the physical changes and circle the chemical changes from the following:

iron rusting, digesting food, dissolving sugar in water, burning wood, ice melting, breaking a bottle

b

What is the equation linking density, volume and mass?

density = mass ÷ volume

Write the symbols and units for:

density: (p) kilograms per metre cubed, kg/m^3

volume: (V) metres cubed, m^3

mass: (m) kilograms, kg

c

Describe how you would find out the density of an irregular object and a liquid.

Keywords: balance, Eureka can, measuring cylinder

Measure the mass of the object.

Place a beaker under the spout of a eureka can and fill with water until water comes out of the spout.

Once the water has stopped dripping, remove the beaker and replace it with a measuring cylinder.

Submerge the object in the eureka can and collect the displaced water. The volume of water collected equals the volume of the object.

d

Underline the correct answer:

The internal energy of a system is the total energy that its particles have in its:

kinetic energy stores
potential energy stores
kinetic and potential energy stores

e

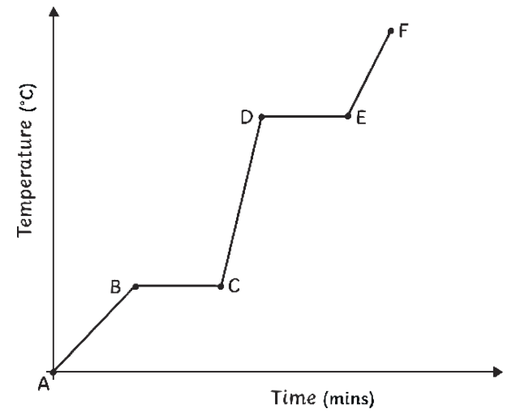
For the heating and cooling curve shown below, what are the terms used to describe the changes of state between:

B → **C M**elting

D → **E E**vaporating

E → **D C**ondensing

C → **B F**reezing

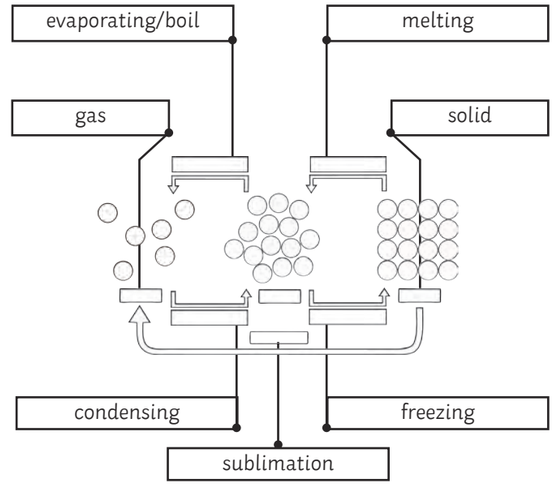


In terms of energy, what do the horizontal sections on the graph show?

Energy is transferred by heating and not used to change temperature.

f

Label the diagram, using the following keywords: melting, freezing, evaporating, condensing, sublimating, liquid, gas, solid



g

Delete the wrong answers.

The specific heat capacity of a substance is the energy required to change the temperature of ~~500g~~ / 1kg of the substance by 1°C / ~~10°C~~.

When a substance changes state – for example, from a solid to a liquid – explain why the mass of the substance remains the same.

The number of particles in the substance remains the same.

a

Specific Heat Capacity

Complete the sentences below about temperature and heat.

Temperature is the measure of how hot **an object is. It is measured in** °C.

Heat is the measure of the thermal energy **contained in an object. It is measured in** joules.

When heat energy is transferred to an object, there is a temperature increase. The temperature rise is dependent on three things:

1. The mass of the object;
2. The substance the object is made from;
3. The amount of energy transferred.

State the equation that links energy, mass, specific heat capacity and temperature change.

energy = mass × specific heat capacity × temperature change

Write the units for

energy: joules

mass: kg

specific heat capacity: J/kg°C

b

Calculate the amount of energy transferred to increase the temperature of 24g of lead from 10°C to 30°C.

The specific heat capacity of lead is 128J/kg°C

0.024 × 128 × 20 = 61.44J

c

	Force between Particles	Energy Levels
Solid	**s**trong	**l**ittle
Liquid	**w**eaker	**s**ome
Gas	**almost** **n**one	**l**ots

Define the differences in density between solids and liquids.

less, particles, dense, fewer, strong, closely

Solids are very dense **because the particles are so** closely **packed together and there are** strong **forces of attraction between them. Liquids are** less **dense than solids because the** particles **are further apart and have** fewer **forces of attraction.**

d

Explain, in terms of particles, why gases are easy to compress.

There are spaces between the particles.

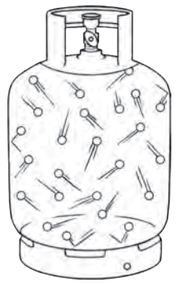
A gas has a mass of 4.4g and a volume of 2.3cm^3. Calculate the density of the gas.

density = mass ÷ volume

= 4.4 ÷ 2.3

1.9g/cm^3

A student heats a sealed cylinder containing a gas. What will happen to the pressure within the cylinder?



If the gas is heated up, the pressure will increase. This is because the particles will move around more quickly and hit the walls of the cylinder harder and more frequently.

e

Explain the term specific latent heat of fusion.

The amount of energy required to change 1kg of a solid into 1kg of liquid without a change in temperature.

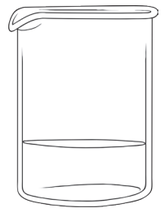
f

What is an internal system?

An internal system is one in which the energy is stored by the particles within it.

g

Describe how you would find out the density of a liquid.



Measure the mass of an empty beaker.

Using a measuring cylinder, measure 100cm^3 of liquid.

Pour the liquid into the beaker and record its mass.

mass of liquid = mass of beaker and liquid - mass of empty beaker

density of liquid = mass of liquid ÷ volume of liquid