GCSE SCIENCE
HOMEWORK BOOKLET
Autumn 2

Name:	

How to use this booklet

Each week this booklet gives you a set of GCSE keywords and definitions, written to match the AQA specification. For each topic:

- Learn the keywords – make flashcards and use them.
- Test yourself actively in the 'Which Keyword?' section – read each scenario and use the word bank to pick out the correct keyword.
- Complete the AQA-style exam questions in full, using the correct scientific vocabulary, to the best of your ability.

Bring your completed booklet to school every week, on the date shown at the top of that week's page. This homework is completed by hand, not online – it supports your learning and helps you practise answering questions in the way GCSE examiners expect, and we will use it in lessons. Please see your class teacher before the deadline if you have any problems completing it. It is important that it is handed in on time, every week.

Autumn 2 overview

Week	Topic	Week set
Week 1	P1 – Energy Calculations	2 November 2026
Week 2	B3 – Organisation and the Digestive System	9 November 2026
Week 3	C3 – Structure and Bonding	16 November 2026
Week 4	P4 – Electric Circuits	23 November 2026
Week 5	B4 – Organising Animals and Plants	30 November 2026
Week 6	C4 – Chemical Calculations	7 December 2026
Week 7	P5 – Mains Electricity (due after christmas)	14 December 2026

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Energy store	Energy can be stored in kinetic, gravitational potential, elastic potential, thermal, chemical, magnetic, electrostatic and nuclear stores. Energy is measured in joules (J).
System	An object or a group of objects. When a system changes, energy is transferred between its stores or between the system and its surroundings.
Closed system	A system in which neither matter nor energy can enter or leave. There is no net change in the total energy of a closed system.
Conservation of energy	Energy can be transferred usefully, stored or dissipated, but it cannot be created or destroyed.
Dissipated	Energy that is transferred to the surroundings in ways that are not useful (usually as thermal energy). Dissipated energy is wasted – it spreads out and becomes less useful.
Work done	The energy transferred when a force moves an object through a distance. One joule of work is done when a force of one newton moves an object one metre in the direction of the force.
Kinetic energy	The energy stored in the kinetic store of a moving object. It depends on the object's mass and the square of its speed.
Gravitational potential energy	The energy stored in the gravitational potential store of an object raised above the ground. It depends on mass, gravitational field strength and height.
Elastic potential energy	The energy stored in the elastic potential store of a stretched (or compressed) spring or other elastic object, provided it has not been stretched past its limit of proportionality.
Spring constant	A measure of the stiffness of a spring: the force needed to produce one metre of extension (N/m). The larger the value, the stiffer the spring.
Specific heat capacity	The amount of energy required to raise the temperature of one kilogram of a substance by one degree Celsius (J/kg °C).
Power	The rate at which energy is transferred, or the rate at which work is done.
Watt	The unit of power. One watt is a rate of energy transfer of one joule per second.
Efficiency	The proportion of the total input energy that is transferred usefully. It can be given as a decimal or (× 100) as a percentage.

Key Equations

Learn these equations and use them in the exam questions. Remember to include units in your answers.

Quantity	Equation	Units
Kinetic energy	$E_k = ½ \times m \times v^2$	J, kg, m/s
Gravitational potential energy	$E_p = m \times g \times h$	J, kg, N/kg, m (g = 9.8 N/kg)
Elastic potential energy	$E_e = ½ \times k \times e^2$	J, N/m, m
Spring force	$F = k \times e$	N, N/m, m
Change in thermal energy	$\Delta E = m \times c \times \Delta\theta$	J, kg, J/kg °C, °C
Work done	$W = F \times s$	J, N, m
Power	$P = E \div t$ (or $P = W \div t$)	W, J, s
Efficiency	efficiency = useful output energy transfer ÷ total input energy transfer	no unit (× 100 for %)

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Energy store · System · Closed system · Conservation of energy · Dissipated · Work done · Kinetic energy · Gravitational potential energy · Elastic potential energy · Spring constant · Specific heat capacity · Power · Watt · Efficiency

1. Harry compares how quickly two motors transfer energy.
Keyword: _____

2. Emily notices that friction heats up a bicycle brake disc, spreading energy to the surroundings in a way that is not useful.
Keyword: _____

3. Bessie stretches a spring and calculates the energy stored in it using its extension.
Keyword: _____

4. Finley measures the energy needed to heat 1 kg of water by 1 °C.
Keyword: _____

5. Leo's lamp is labelled with a unit equal to one joule per second.
Keyword: _____

6. William finds that a spring needs 40 N of force for every metre it is stretched.
Keyword: _____

7. Arthur lists the chemical, thermal and kinetic stores as examples of these.
Keyword: _____

8. Muhammed finds that only 30 J of every 100 J supplied to a motor is transferred usefully.
Keyword: _____

9. Verity's sealed, perfectly insulated flask has no energy entering or leaving, so its total energy stays the same.
Keyword: _____

10. Ania calculates the energy of a cyclist moving at 8 m/s using her mass and speed.
Keyword: _____

11. Joel explains that in a collision energy is never created or destroyed, it is only transferred between stores.
Keyword: _____

12. Isla draws a boundary around a battery, a bulb and some wires so she can describe the energy changes inside it.
Keyword: _____

13. Freddie pushes a trolley 5 m with a force of 20 N and calculates the energy transferred.
Keyword: _____

14. Jake lifts a box onto a high shelf and calculates the energy now stored because of its height.
Keyword: _____

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Verity throws a ball of mass 0.50 kg straight up into the air. It leaves her hand at a speed of 12 m/s. Gravitational field strength = 9.8 N/kg.

(a) Calculate the kinetic energy of the ball as it leaves her hand. *[2 marks]*

Answer: _____ J

(b) Assume all of this kinetic energy is transferred to the gravitational potential energy store at the ball's highest point. Calculate the maximum height the ball reaches. *[3 marks]*

Answer: _____ m

(c) In reality, the ball does not quite reach this height. Explain why. *[2 marks]*

Question 2

Isla heats 2.0 kg of water from 20 °C to 60 °C in an electric kettle. The specific heat capacity of water is 4200 J/kg °C.

(a) Calculate the change in temperature of the water. *[1 mark]*

Answer: _____ °C

(b) Calculate the energy transferred to the water. *[3 marks]*

Answer: _____ J

(c) The kettle has a power of 2000 W. Calculate the minimum time it takes to heat the water. *[3 marks]*

Answer: _____ s

(d) The kettle actually takes longer than this. Suggest one reason why. *[1 mark]*

Question 3

Joel hangs masses from a spring. The spring has a spring constant of 40 N/m and stretches by 0.15 m.

(a) Calculate the force that stretches the spring. *[2 marks]*

Answer: _____ N

(b) Calculate the energy stored in the elastic potential energy store of the spring. *[3 marks]*

Answer: _____ J

(c) The equation for elastic potential energy only applies if the spring has not been stretched past its limit of proportionality. State what happens to a spring that is stretched past this limit. *[1 mark]*

Question 4

Freddie pushes a box 4.0 m across the floor with a constant horizontal force of 50 N. It takes him 8.0 s.

(a) Calculate the work done by Freddie. *[2 marks]*

Answer: _____ J

(b) Calculate Freddie's power. *[2 marks]*

Answer: _____ W

(c) The box slows to a stop after Freddie lets go. Describe the energy transfers that take place as it slows down. *[2 marks]*

Question 5

A motor lifts a load. For every 250 J of electrical energy supplied to the motor, 180 J is transferred usefully to the gravitational potential energy store of the load.

(a) Calculate the efficiency of the motor as a decimal. *[2 marks]*

(b) State what happens to the remaining 70 J of energy. *[1 mark]*

(c) Suggest one way to reduce the amount of wasted energy in the motor. *[1 mark]*

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Tissue	A group of cells with a similar structure and function, e.g. muscular tissue, glandular tissue or epithelial tissue.
Organ	A group of different tissues that work together to perform a certain function, e.g. the stomach.
Organ system	A group of organs that work together to perform a certain function, e.g. the digestive system.
Digestive system	An organ system in which several organs work together to digest and absorb food. It includes the glands (salivary glands and pancreas), stomach, liver, gall bladder, small intestine and large intestine.
Catalyst	A substance which increases the speed of a reaction, without being changed or used up in the reaction.
Enzyme	A biological catalyst. Enzymes are large protein molecules that speed up reactions in living organisms, e.g. digestion.
Active site	The part of an enzyme that has a unique shape and into which its substrate fits (the 'lock and key' model). The substrate is the molecule the enzyme acts on.
Denatured	When the shape of an enzyme's active site has been changed (e.g. by high temperature or extremes of pH), so the substrate no longer fits and the enzyme can no longer catalyse the reaction.
Amylase	A carbohydrase enzyme that breaks down starch into sugars. It is made in the salivary glands, the pancreas and the small intestine.
Protease	An enzyme that breaks down proteins into amino acids. It is made in the stomach, the pancreas and the small intestine.
Lipase	An enzyme that breaks down lipids (fats and oils) into fatty acids and glycerol. It is made in the pancreas and the small intestine.
Bile	An alkaline liquid made in the liver and stored in the gall bladder. It neutralises acid from the stomach and emulsifies fat, giving a larger surface area for lipase to work on.
Optimum	The temperature or pH at which an enzyme works fastest.
Benedict's test	A food test for reducing sugars. Benedict's solution is added to the sample, which is heated in a water bath: the colour changes from blue to green, yellow, orange or brick-red depending on the amount of sugar.

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Tissue · Organ · Organ system · Digestive system · Catalyst · Enzyme · Active site · Denatured · Amylase · Protease · Lipase · Bile · Optimum · Benedict's test

1. Harry explains that this alkaline liquid from the liver neutralises stomach acid and emulsifies fat.
   Keyword: _____

2. William explains that this enzyme breaks down proteins into amino acids in the stomach.
   Keyword: _____

3. Isla explains that the stomach is made of several different tissues that work together to digest food.
   Keyword: _____

4. Jake boils an enzyme solution: the shape of the active site changes and the substrate no longer fits.
   Keyword: _____

5. Arthur is studying muscular tissue: a group of similar cells that all have the same structure and function.
   Keyword: _____

6. Leo finds that an enzyme works fastest at 37 °C.
Keyword:

7. Finley finds that this enzyme breaks down fats into fatty acids and glycerol.
Keyword:

8. Joel names the salivary glands, stomach, liver, pancreas and small intestine as the organs that work together to digest and absorb food.
Keyword:

9. Ania points to the part of the enzyme with a unique shape where the substrate fits.
Keyword:

10. Verity describes a group of organs that work together to perform one function.
Keyword:

11. Freddie describes a protein molecule that acts as a biological catalyst.
Keyword:

12. Muhammed heats a food sample with blue solution and it turns brick-red.
Keyword:

13. Bessie learns that this enzyme in the mouth breaks down starch into sugars.
Keyword:

14. Emily adds a substance that speeds up a reaction without being used up.
Keyword:

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is studying the structure of the stomach, which contains muscular tissue, glandular tissue and epithelial tissue.

(a) State what is meant by the term 'tissue'. *[1 mark]*

(b) Explain why the stomach is described as an organ. *[2 marks]*

(c) Name the organ system that the stomach belongs to. *[1 mark]*

(d) Describe the function of the glandular tissue in the stomach. *[2 marks]*

Question 2

Isla investigates the enzyme amylase, which is found in saliva.

(a) Name the substrate of amylase and the product it produces. *[2 marks]*

(b) Describe the 'lock and key' model of enzyme action. *[3 marks]*

(c) Isla heats amylase to 80 °C. Explain why it can no longer break down starch. *[3 marks]*

Question 3

Verity tests food samples to find out which nutrients they contain.

(a) Name the reagent used to test for starch and state the positive result. *[2 marks]*

(b) Describe how Verity should test a food sample for reducing sugars. *[3 marks]*

(c) A food sample turns purple when Biuret reagent is added. Name the nutrient present. *[1 mark]*

Question 4

Joel is learning about bile.

(a) State where bile is (i) made and (ii) stored. *[2 marks]*

(b) Explain two ways in which bile helps digestion in the small intestine. *[4 marks]*

Question 5

Emily investigates how pH affects the rate at which an enzyme from the stomach breaks down protein. Her results are shown below.

pH	1	2	3	4	6	8
Rate of reaction (arbitrary units)	8	10	6	2	0	0

(a) State the optimum pH for this enzyme. *[1 mark]*

(b) Name the type of enzyme Emily is investigating and the product it makes. *[2 marks]*

(c) Explain why the rate of reaction is zero at pH 8. *[2 marks]*

(d) Food leaving the stomach is acidic, but enzymes in the small intestine work best in alkaline conditions. Explain how the small intestine is made alkaline. *[2 marks]*

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Ionic bonding	The strong electrostatic force of attraction between oppositely charged ions. Ions are formed when a metal atom transfers electrons to a non-metal atom.
Giant ionic lattice	A regular arrangement of oppositely charged ions held together by strong electrostatic forces in all directions. It has a high melting point and conducts electricity when molten or dissolved, because the ions are free to move.
Covalent bond	A shared pair of electrons between two non-metal atoms. Covalent bonds are strong.
Simple molecule	A small molecule (e.g. H_2O, CH_4, CO_2) with strong covalent bonds between its atoms but only weak forces between molecules. It has a low melting and boiling point and does not conduct electricity.
Intermolecular forces	The weak forces between molecules. They increase with the size of the molecules, so larger molecules have higher melting and boiling points. Only these forces are overcome when a simple molecular substance melts or boils.
Giant covalent structure	A very large structure in which all the atoms are joined by strong covalent bonds. It has a very high melting point, e.g. diamond, graphite and silicon dioxide.
Polymer	A very large molecule made of long chains of atoms joined by strong covalent bonds. The intermolecular forces between chains are relatively strong, so polymers are solid at room temperature.
Metallic bonding	The strong electrostatic attraction between positive metal ions and the shared delocalised electrons in a regular arrangement of layers.
Delocalised electrons	Electrons that are not attached to one atom and are free to move through a structure, e.g. in metals and graphite. They carry electrical charge and thermal energy.
Alloy	A mixture of two or more elements, at least one of which is a metal. Alloys are harder than pure metals because the different-sized atoms distort the layers, so they cannot slide over each other easily.
Allotrope	One of the different structural forms of the same element in the same physical state, e.g. diamond and graphite are allotropes of carbon.
Graphene	A single layer of graphite, one atom thick. It is very strong and, because of its delocalised electrons, conducts electricity.
Fullerene	A molecule of carbon shaped like a hollow ball or tube, based on rings of carbon atoms, e.g. Buckminsterfullerene (C_{60}) and carbon nanotubes.
Nanoparticles	Particles between 1 and 100 nm across. They have a very high surface area to volume ratio, which gives them different properties from the same material in bulk.

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Ionic bonding · Giant ionic lattice · Covalent bond · Simple molecule · Intermolecular forces · Giant covalent structure · Polymer · Metallic bonding · Delocalised electrons · Alloy · Allotrope · Graphene · Fullerene · Nanoparticles

1. Finley notes that diamond and graphite are different structural forms of carbon.
   Keyword: _____

2. Leo describes a hollow ball made of 60 carbon atoms.
   Keyword: _____

3. William's bronze, made from copper and tin, is much harder than pure copper.
   Keyword: _____

4. Ania describes poly(ethene) as a very long chain molecule which is solid at room temperature.
Keyword:

5. Arthur explains that the strong attraction between Na^+ and Cl^- ions holds table salt together.
Keyword:

6. Verity draws two chlorine atoms sharing one pair of electrons.
Keyword:

7. Emily explains that methane boils at a low temperature because only the weak forces between its molecules need to be overcome.
Keyword:

8. Muhammed's sunscreen contains particles between 1 and 100 nm across.
Keyword:

9. Freddie explains that silicon dioxide has a very high melting point because of a huge network of atoms joined by strong covalent bonds.
Keyword:

10. Joel notes that water is made of small molecules, has a low boiling point and does not conduct electricity.
Keyword:

11. Harry describes a sheet of carbon atoms that is only one atom thick, very strong and able to conduct electricity.
Keyword:

12. Bessie says that electrons in graphite are free to move through the layers and carry charge.
Keyword:

13. Isla draws a regular three-dimensional arrangement of oppositely charged ions in a salt crystal.
Keyword:

14. Jake explains that copper's positive ions are held together by a 'sea' of shared electrons.
Keyword:

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is studying sodium chloride, NaCl, which has a giant ionic lattice structure.

(a) Describe what happens to the electrons when sodium reacts with chlorine to form sodium chloride. *[2 marks]*

(b) Explain why sodium chloride has a high melting point. *[3 marks]*

(c) Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does. *[2 marks]*

Question 2

Isla is comparing methane, CH_4, with sodium chloride.

(a) Describe what is meant by a covalent bond. *[1 mark]*

(b) Explain why methane has a low boiling point. *[2 marks]*

(c) Explain why methane does not conduct electricity. *[1 mark]*

(d) Hexane has larger molecules than methane. Predict whether it has a higher or lower boiling point than methane and explain your answer. *[2 marks]*

Question 3

Verity is learning about metals and alloys.

(a) Explain why metals are good conductors of electricity. *[2 marks]*

(b) Explain why pure metals can be bent and shaped. *[2 marks]*

(c) Explain why steel, an alloy of iron, is harder than pure iron. *[3 marks]*

Question 4

Joel is comparing diamond and graphite, which are both made of carbon.

(a) State the name given to different forms of the same element. *[1 mark]*

(b) Explain why diamond is very hard. *[2 marks]*

(c) Explain why graphite conducts electricity. *[2 marks]*

(d) Explain why graphite is soft and slippery and is used as a lubricant. *[2 marks]*

Question 5

Emily is researching nanoparticles. A sample of titanium dioxide particles has a diameter of 50 nm.

(a) State whether these particles are nanoparticles. Give a reason for your answer. *[1 mark]*

(b) Nanoparticles are used as catalysts. Explain why nanoparticles make better catalysts than the same mass of larger particles. *[2 marks]*

(c) Suggest one possible risk of using nanoparticles in sunscreen. *[1 mark]*

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Electric current	The rate of flow of electrical charge around a closed circuit. It is measured in amperes (A) and is the same at all points in a series circuit.
Charge	A quantity of electricity measured in coulombs (C). In a metal wire, charge is carried by electrons.
Potential difference	The energy transferred per unit charge between two points in a circuit. It is measured in volts (V) and is sometimes called voltage.
Resistance	The opposition to the flow of current in a component. It is measured in ohms (Ω). The greater the resistance, the smaller the current for a given potential difference.
Ohmic conductor	A conductor for which the current is directly proportional to the potential difference, at constant temperature. Its resistance stays constant, e.g. a fixed resistor.
Series circuit	A circuit with components connected one after another in a single loop. The current is the same through every component, the potential difference is shared, and the total resistance is the sum of the resistances.
Parallel circuit	A circuit with components connected on separate branches. The potential difference across each branch is the same as the supply, the current is shared between branches, and adding more branches reduces the total resistance.
Ammeter	A meter that measures current in amperes. It is connected in series with the component.
Voltmeter	A meter that measures potential difference in volts. It is connected in parallel across the component.
Variable resistor	A component whose resistance can be changed by hand, used to control the current in a circuit, e.g. in a dimmer switch.
Thermistor	A resistor whose resistance decreases as its temperature increases. It is used in thermostats and temperature sensors.
LDR (light-dependent resistor)	A resistor whose resistance decreases as light intensity increases. It is used in automatic lighting and light sensors.
Diode	A component that allows current to flow in one direction only. Its resistance is very high in the reverse direction.
Electrical power	The rate at which energy is transferred by an electrical device. It is measured in watts (W).

Key Equations

Learn these equations and use them in the exam questions. Remember to include units in your answers.

Quantity	Equation	Units
Charge flow	$Q = I \times t$	C, A, s
Potential difference	$V = I \times R$	V, A, Ω
Electrical power	$P = V \times I$ and $P = I^2 \times R$	W, V, A, Ω
Energy transferred	$E = P \times t$ and $E = Q \times V$	J, W, s, C, V
Series resistors	$R_{total} = R_1 + R_2$	Ω

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Electric current · Charge · Potential difference · Resistance · Ohmic conductor · Series circuit · Parallel circuit · Ammeter · Voltmeter · Variable resistor · Thermistor · LDR (light-dependent resistor) · Diode · Electrical power

1. William slides a contact along a coil of wire to dim a lamp by changing the resistance.
Keyword: _____

2. Jake connects a meter in series with a lamp to measure the current.
Keyword: _____

3. Emily finds that the current through a resistor doubles when the potential difference doubles, at constant temperature.
Keyword: _____

4. Isla finds the quantity of electricity, in coulombs, that flows through a wire in 20 seconds.
Keyword: _____

5. Joel finds that a long thin wire opposes the flow of current more than a short thick one.
Keyword: _____

6. Muhammed calculates the rate at which a lamp transfers energy using potential difference × current.
Keyword: _____

7. Verity measures the energy transferred per coulomb between two points in a circuit.
Keyword: _____

8. Harry's street lamp switches on in the dark because the resistance of this component rises as the light level falls.
Keyword: _____

9. Freddie connects three bulbs one after another in a single loop. The same current flows through each.
Keyword: _____

10. Bessie connects a meter in parallel across a lamp to measure the potential difference.
Keyword: _____

11. Arthur measures the rate of flow of charge around a circuit.
Keyword: _____

12. Leo uses a component that only lets current flow in one direction.
Keyword: _____

13. Ania connects three lamps on separate branches, each with the same potential difference as the cell.
Keyword: _____

14. Finley uses a component in a thermostat whose resistance drops as the temperature rises.
Keyword: _____

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is investigating a simple circuit containing a cell, a lamp, an ammeter and a voltmeter.

(a) State which meter is connected in series with the lamp. *[1 mark]*

(b) A current of 3.0 A flows for 20 s. Calculate the charge that flows. *[2 marks]*

Answer: _____ C

(c) The potential difference across the lamp is 12 V and the current through it is 0.50 A. Calculate the resistance of the lamp. *[2 marks]*

Answer: _____ Ω

Question 2

Isla connects two 6.0 Ω resistors in series with a 12 V cell.

(a) Calculate the total resistance of the circuit. *[1 mark]*

Answer: _____ Ω

(b) Calculate the current in the circuit. *[2 marks]*

Answer: _____ A

(c) Calculate the potential difference across one of the resistors. *[2 marks]*

Answer: _____ V

(d) Isla now connects the two resistors in parallel across the same 12 V cell. State the potential difference across each resistor and calculate the total current from the cell. *[3 marks]*

Question 3

Verity investigates how the current through different components changes with potential difference.

(a) Describe the shape of the current–potential difference graph for an ohmic conductor. *[2 marks]*

(b) Explain why the resistance of a filament lamp increases as the current through it increases. *[3 marks]*

(c) Describe how the current through a diode changes when the potential difference is reversed. *[1 mark]*

Question 4

Joel is designing two circuits: a fire alarm that responds to heat and a night light that turns on in the dark.

(a) State what happens to the resistance of a thermistor as its temperature increases. *[1 mark]*

(b) State what happens to the resistance of an LDR as the light intensity increases. *[1 mark]*

(c) Choose the component Joel should use in his night light. Explain your choice. *[3 marks]*

Question 5

Emily's kettle is connected to the 230 V mains supply and draws a current of 10 A.

(a) Calculate the power of the kettle. *[2 marks]*

Answer: _____ W

(b) Calculate the energy transferred by the kettle in 3.0 minutes. *[3 marks]*

Answer: _____ J

(c) The heating element gets hot when a current flows through it. Explain why. *[2 marks]*

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Double circulatory system	A circulatory system in which blood passes through the heart twice on each circuit of the body. The right side pumps deoxygenated blood to the lungs; the left side pumps oxygenated blood around the body.
Atrium	An upper chamber of the heart. It receives blood returning to the heart from the veins and passes it into the ventricle below.
Ventricle	A lower chamber of the heart with a muscular wall. It pumps blood out of the heart into the arteries. The left ventricle has a thicker wall because it pumps blood around the whole body.
Valve	A flap of tissue in the heart and in veins that prevents the backflow of blood, so blood only flows in one direction.
Artery	A blood vessel that carries blood away from the heart at high pressure. It has thick, muscular and elastic walls and a narrow lumen.
Vein	A blood vessel that carries blood to the heart at low pressure. It has thinner walls, a wide lumen and valves.
Capillary	A tiny blood vessel with a wall only one cell thick. Substances such as oxygen and glucose diffuse between the blood and the body cells through it.
Coronary heart disease	A non-communicable disease in which layers of fatty material build up inside the coronary arteries, narrowing them and reducing the blood flow to the heart muscle. It can be treated with stents or statins.
Stomata	Tiny pores, mostly on the underside of a leaf, which allow gases to enter and leave. Their size is controlled by guard cells.
Transpiration	The loss of water vapour from the leaves, by evaporation and diffusion through the stomata. It creates a stream of water through the xylem from the roots.
Xylem	The plant tissue that transports water and mineral ions from the roots to the shoots. It is made of dead cells forming hollow tubes strengthened by lignin.
Phloem	The plant tissue that transports dissolved sugars (sucrose) around the plant in both directions. It is made of living cells.
Translocation	The movement of dissolved sugars from the leaves to the rest of the plant, for immediate use or for storage.
Meristem	Plant tissue found at the growing tips of shoots and roots. It contains stem cells that can differentiate into many types of plant cell.

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Double circulatory system · Atrium · Ventricle · Valve · Artery · Vein · Capillary · Coronary heart disease · Stomata · Transpiration · Xylem · Phloem · Translocation · Meristem

1. Bessie looks at tiny pores on the underside of a leaf that let carbon dioxide in and water vapour out.
   Keyword: _____
2. Muhammed finds stem cells at the tip of a root that can become many different types of cell.
   Keyword: _____
3. Joel explains that these flaps stop blood flowing backwards in the heart and in veins.
   Keyword: _____
4. Isla points to the upper chamber of the heart which receives blood from the veins.
   Keyword: _____
5. William explains that evaporation of water from leaves pulls water up through the plant.
   Keyword: _____

6. Leo explains how sugars made in the leaves reach the roots and growing tips for storage and use.
Keyword:

7. Jake's grandad has fatty material building up in the arteries that supply his heart muscle.
Keyword:

8. Emily describes a vessel that carries blood away from the heart at high pressure and has thick elastic walls.
Keyword:

9. Harry describes living cells that carry dissolved sugars up and down the plant.
Keyword:

10. Verity points to the thick, muscular lower chamber that pumps blood out into the arteries.
Keyword:

11. Ania explains that oxygen can diffuse quickly into cells because the vessel wall is only one cell thick.
Keyword:

12. Arthur explains that blood passes through the heart twice on each complete circuit of the body.
Keyword:

13. Freddie describes a vessel with a wide lumen and valves that carries blood back to the heart at low pressure.
Keyword:

14. Finley describes dead, hollow cells strengthened with lignin that carry water and minerals up the stem.
Keyword:

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is studying the structure of the human heart, which is part of a double circulatory system.

(a) Name the chamber of the heart that pumps blood to the lungs. *[1 mark]*

(b) Explain why the wall of the left ventricle is thicker than the wall of the right ventricle. *[2 marks]*

(c) State the function of the valves in the heart. *[1 mark]*

(d) Describe the path taken by blood from the vena cava to the lungs. *[3 marks]*

Question 2

Isla is comparing the three types of blood vessel.

(a) Name the type of blood vessel that has thick elastic walls and carries blood at high pressure. *[1 mark]*

(b) Explain how a capillary is adapted for exchanging substances with body cells. *[2 marks]*

(c) Explain why veins have valves but arteries do not. *[2 marks]*

Question 3

Verity is learning about coronary heart disease.

(a) Describe how coronary heart disease affects the heart. *[2 marks]*

(b) Describe how a stent helps to treat coronary heart disease. *[2 marks]*

(c) Give one lifestyle factor that increases the risk of coronary heart disease. *[1 mark]*

Question 4

Joel is investigating transpiration in a leafy shoot.

(a) Describe what is meant by transpiration. *[2 marks]*

(b) Explain why the rate of transpiration is higher on a hot, windy day than on a cool, still day. *[3 marks]*

(c) Explain how guard cells control the loss of water from a leaf. *[2 marks]*

Question 5

Emily is comparing the tissues that transport substances in plants.

(a) Name the tissue that transports water from the roots to the leaves. *[1 mark]*

(b) Describe two differences between xylem and phloem. *[2 marks]*

(c) State the name of the substance transported in phloem and describe the process by which it moves. *[2 marks]*

(d) Explain why meristem tissue is important for the growth of a plant. *[2 marks]*

Key Word Flashcards

Keywords marked (HT) are for Higher Tier students only.

Keyword	Definition (AQA specification wording)
Relative atomic mass (A_r)	An average value for the mass of the atoms of an element, which takes into account the abundance of its isotopes. It is shown on the periodic table.
Relative formula mass (M_r)	The sum of the relative atomic masses (A_r) of all the atoms shown in the formula, e.g. M_r of CO_2 = 12 + (2 × 16) = 44.
Conservation of mass	No atoms are lost or made during a chemical reaction, so the mass of the products equals the mass of the reactants.
Balanced symbol equation	An equation with the same number of atoms of each element on both sides, showing the quantities of reactants and products.
Mole (HT)	The unit for amount of substance. One mole of a substance has a mass in grams equal to its relative formula mass (M_r).
Avogadro constant (HT)	6.02×10^{23} per mole: the number of atoms, molecules or ions in one mole of a substance.
Limiting reactant (HT)	The reactant that is completely used up first in a reaction, so it limits the amount of product that can be made.
Reactant in excess (HT)	A reactant that is not completely used up in a reaction, so some is left over at the end.
Yield	The mass of product actually obtained from a reaction.
Theoretical yield	The maximum mass of product that could be made, calculated from the balanced equation, if all of the reactants were converted into product.
Percentage yield	How much product is actually obtained compared with the maximum theoretical amount: actual yield ÷ theoretical yield × 100.
Atom economy	A measure of the amount of starting materials that end up as useful products: M_r of desired product ÷ sum of M_r of all reactants × 100. A high atom economy means less waste.
Concentration	The amount of solute dissolved in a given volume of solution, measured in g/dm^3 (or mol/dm^3).
Titration (HT calculations)	A technique for finding the volume of one solution that exactly reacts with a known volume of another, using an indicator to show the end-point. The results can be used to calculate an unknown concentration.

Key Equations

Learn these equations and use them in the exam questions. Remember to include units in your answers.

Quantity	Equation	Units
Moles (HT)	number of moles = mass (g) ÷ M_r	mol, g
Number of particles (HT)	particles = moles × 6.02×10^{23}	–
Percentage yield	% yield = actual yield ÷ theoretical yield × 100	%
Atom economy	atom economy = M_r of desired product ÷ sum of M_r of all reactants × 100	%
Concentration	concentration (g/dm^3) = mass of solute (g) ÷ volume (dm^3)	g/dm^3, g, dm^3

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Relative atomic mass (A_r) · Relative formula mass (M_r) · Conservation of mass · Balanced symbol equation · Mole (HT) · Avogadro constant (HT) · Limiting reactant (HT) · Reactant in excess (HT) · Yield · Theoretical yield · Percentage yield · Atom economy · Concentration · Titration (HT calculations)

1. Ania's reaction stops when all the magnesium is used up, even though acid is still left.
Keyword:

2. Verity notices that the mass of a sealed flask is the same before and after a reaction.
Keyword:

3. Bessie weighs 7.2 g of product at the end of her experiment.
Keyword:

4. Finley divides the mass of product she made by the maximum possible mass and multiplies by 100.
Keyword:

5. Isla finds the average mass of chlorine atoms, taking into account how much of each isotope is present.
Keyword:

6. Joel changes the large numbers in front of the formulae until there are the same atoms on both sides.
Keyword:

7. Muhammed adds alkali from a burette until the indicator changes colour.
Keyword:

8. Arthur adds together the relative atomic masses of every atom in CO_2 to get 44.
Keyword:

9. Harry's process makes lots of waste products, so only a small fraction of the reactant mass ends up as the product he wants.
Keyword:

10. Freddie states there are 6.02×10^{23} atoms in 12 g of carbon-12.
Keyword:

11. Leo dissolves 20 g of solute in 1 dm^3 of solution.
Keyword:

12. Emily weighs out 12 g of carbon, which is its relative atomic mass in grams.
Keyword:

13. Jake finds that some acid is left over unreacted at the end of the reaction.
Keyword:

14. William calculates that 10 g is the most product that could possibly be made.
Keyword:

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is calculating relative formula masses. Relative atomic masses (A_r): H = 1; C = 12; O = 16; Mg = 24; Ca = 40.

(a) Calculate the relative formula mass (M_r) of calcium carbonate, $CaCO_3$. *[2 marks]*

(b) Calculate the relative formula mass (M_r) of magnesium hydroxide, $Mg(OH)_2$. *[2 marks]*

Question 2

Isla heats 5.0 g of magnesium ribbon in an open crucible. The magnesium reacts with oxygen and the mass of the solid increases to 8.3 g.

(a) Explain why the mass of solid increases. *[2 marks]*

(b) Calculate the mass of oxygen that reacted. *[1 mark]*

Answer: _____ g

(c) Verity heats calcium carbonate in an open container and the mass of solid decreases. Explain why this does not break the law of conservation of mass. *[2 marks]*

Question 3

Joel makes calcium oxide by heating calcium carbonate: $CaCO_3 \rightarrow CaO + CO_2$. He expects 12.0 g of calcium oxide but makes only 9.0 g. A_r: C = 12; O = 16; Ca = 40.

(a) Calculate the percentage yield. *[2 marks]*

Answer: _____ %

(b) Give two reasons why the percentage yield of a reaction is less than 100%. *[2 marks]*

(c) Calculate the atom economy for making calcium oxide in this reaction. *[3 marks]*

Answer: _____ %

(d) Suggest why a high atom economy is important for sustainable development. *[1 mark]*

Question 4

Emily makes a salt solution.

(a) Emily dissolves 4.0 g of sodium chloride in water to make 250 cm^3 of solution. Calculate the concentration of the solution in g/dm^3. *[3 marks]*

Answer: _____ g/dm^3

(b) Emily makes a second solution with a concentration of 16 g/dm^3. Calculate the mass of sodium chloride in 500 cm^3 of this solution. *[2 marks]*

Answer: _____ g

Question 5

(Higher Tier) Freddie reacts magnesium with hydrochloric acid: $Mg + 2HCl \rightarrow MgCl_2 + H_2$. A_r: Mg = 24; Cl = 35.5; O = 16; C = 12.

(a) Calculate the number of moles in 44 g of carbon dioxide, CO_2. *[2 marks]*

Answer: _____ mol

(b) Calculate the number of molecules in 0.50 mol of water. *[2 marks]*

(c) Freddie reacts 2.4 g of magnesium with excess hydrochloric acid. Calculate the mass of magnesium chloride, $MgCl_2$, that can be made. *[4 marks]*

Answer: _____ g

Key Word Flashcards

Keyword	Definition (AQA specification wording)
Direct current (d.c.)	An electric current that flows in one direction only. It is supplied by cells and batteries.
Alternating current (a.c.)	An electric current that constantly changes direction. Mains electricity is an a.c. supply.
Frequency	The number of complete cycles (changes of direction) of an alternating current each second. It is measured in hertz (Hz). UK mains has a frequency of 50 Hz.
Mains electricity	The electricity supplied to homes in the UK. It is an a.c. supply with a frequency of 50 Hz and a potential difference of about 230 V.
Live wire	The brown wire in a three-core cable. It carries the alternating potential difference (about 230 V) from the supply and is dangerous even when a switch is off.
Neutral wire	The blue wire in a three-core cable. It completes the circuit and is at, or close to, 0 V.
Earth wire	The green and yellow striped wire in a three-core cable. It is a safety wire that stops the appliance becoming live. It is at 0 V and carries a current only if there is a fault.
Three-core cable	A cable containing the live, neutral and earth wires, each with a coloured plastic insulating layer, inside an outer layer of insulation. It is used to connect most mains appliances.
Fuse	A safety device containing a thin wire that heats up and melts if too much current flows, breaking the circuit. It is fitted in the live wire.
Circuit breaker	A safety switch that automatically opens and breaks the circuit if the current becomes too large. It can be reset, unlike a fuse.
Insulation	A material, such as plastic, that does not conduct electricity. It covers wires and plugs to prevent electric shocks.
Step-up transformer	A transformer that increases the potential difference. Step-up transformers are used at power stations to increase the potential difference before electricity is transmitted.
Step-down transformer	A transformer that decreases the potential difference. Step-down transformers are used near homes to reduce the potential difference to a safe level.
Power rating	The maximum power an appliance is designed to use, in watts (W). It shows the energy transferred each second when the appliance is working normally.

Key Equations

Learn these equations and use them in the exam questions. Remember to include units in your answers.

Quantity	Equation	Units
Charge flow	$Q = I \times t$	C, A, s
Electrical power	$P = V \times I$ and $P = I^2 \times R$	W, V, A, Ω
Energy transferred	$E = P \times t$ and $E = Q \times V$	J, W, s, C, V
Fuse current	current = power ÷ potential difference ($I = P \div V$)	A, W, V

Which Keyword?

Cover the table above. Read each scenario below and use the word bank to write the keyword it describes.

Word bank: Direct current (d.c.) · Alternating current (a.c.) · Frequency · Mains electricity · Live wire · Neutral wire · Earth wire · Three-core cable · Fuse · Circuit breaker · Insulation · Step-up transformer · Step-down transformer · Power rating

1. Verity counts 50 complete cycles of the supply every second.
Keyword:

2. Jake's cable contains three insulated wires, with brown, blue and green and yellow coverings.
Keyword:

3. William resets a switch in the fuse box after it trips due to a large current.
Keyword:

4. Emily knows this brown wire is dangerous because it is at a high potential difference from the ground.
Keyword:

5. Isla's oscilloscope shows a current that repeatedly reverses direction.
Keyword:

6. Finley notes that the plastic around the wires stops people getting an electric shock.
Keyword:

7. Arthur's torch is powered by a cell that makes charge flow in one direction only.
Keyword:

8. Muhammed reads '2000 W' on the label of his kettle.
Keyword:

9. Freddie identifies the blue wire that completes the circuit and is at or near 0 V.
Keyword:

10. Bessie's plug contains a thin wire that melts if too much current flows.
Keyword:

11. Leo explains that this transformer lowers the potential difference to a safe level near homes.
Keyword:

12. Ania explains that the green and yellow wire stops a metal casing becoming live in a fault.
Keyword:

13. Joel's house is supplied with a 230 V a.c. supply at 50 Hz.
Keyword:

14. Harry explains that this transformer raises the potential difference before electricity leaves the power station.
Keyword:

Exam Practice Questions (AQA style)

Answer every question fully, using the keywords above wherever you can. Write in full sentences for 'describe' and 'explain' questions.

Question 1

Arthur is learning about the electricity supply to a house in the UK.

(a) State the potential difference and the frequency of the UK mains supply. *[2 marks]*

(b) Describe the difference between direct current and alternating current. *[2 marks]*

(c) Name one source of d.c. electricity. *[1 mark]*

Question 2

Isla is wiring a three-pin plug for a lamp.

(a) Complete the table to show the colour and function of each wire. *[3 marks]*

Wire	Colour	Function
Live		
Neutral		
Earth		

(b) Explain why the switch for a lamp should be fitted in the live wire and not the neutral wire. *[2 marks]*

(c) Explain why a lamp with a plastic casing does not need an earth wire. *[2 marks]*

Question 3

Verity's hair dryer is rated at 2300 W and is connected to the 230 V mains supply.

(a) Calculate the current in the hair dryer. *[2 marks]*

Answer: _____ A

(b) The plug can be fitted with a 3 A, 5 A or 13 A fuse. Choose the correct fuse and explain your choice. *[2 marks]*

(c) Calculate the energy transferred by the hair dryer in 5 minutes. *[3 marks]*

Answer: _____ J

Question 4

Joel's toaster stops working after a fault makes the live wire touch the metal casing.

(a) Explain how the earth wire and the fuse work together to make the toaster safe. *[3 marks]*

(b) Describe one advantage of using a circuit breaker instead of a fuse. *[1 mark]*

(c) Explain why touching a live wire can cause an electric shock. *[2 marks]*

Question 5

Emily is investigating how electricity is transmitted from power stations to homes.

(a) Name the type of transformer used at the power station. *[1 mark]*

(b) Explain why electricity is transmitted at a very high potential difference. *[3 marks]*

(c) Explain why a step-down transformer is used near homes. *[2 marks]*