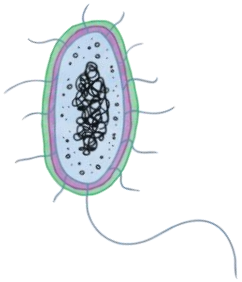
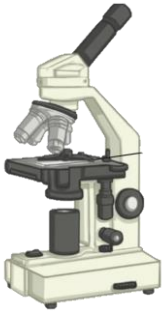
INTERVENTION BOOKLET

PAPER 1

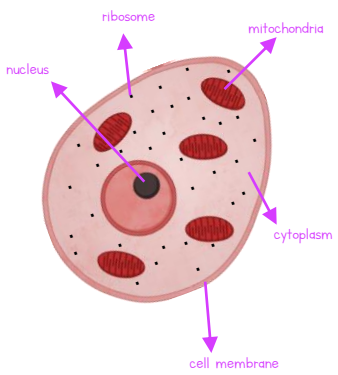
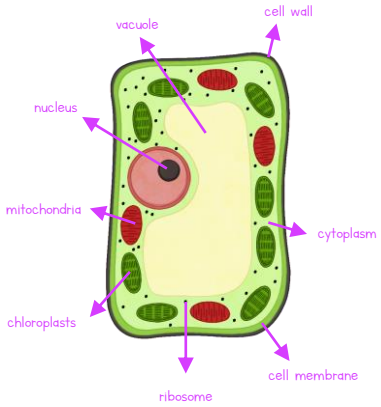
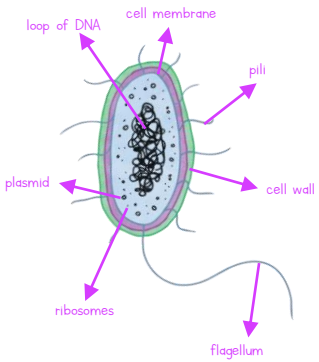
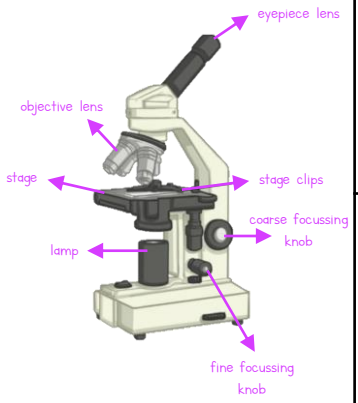
Name: _____

Form Group: _____

CELL BIOLOGY

Label the animal cell 	Label the plant cell 	Label the bacterial cell 	Label the parts of the microscope 	What are the two types of microscope? Write down the formula used to calculate the magnification of an object
Name the part of the cell where protein synthesis occurs	Name the part of the cell where DNA is found	Name the part of the cell where aerobic respiration takes place	Name the part of the cell which absorbs light energy for photosynthesis	Why can ribosomes not be seen under the microscope?
What term is used to describe the movement of particles from a high concentration to a low concentration?	What term is used to describe the movement of water from a high concentration to a low concentration through a semi-permeable membrane?	What term is used to describe the movement of particles from a low concentration to a high concentration using energy?	What will happen to the mass and length of a piece of potato when it is placed into a highly concentrated sugar solution?	What will happen to the mass and length of a piece of potato when it is placed into a highly diluted sugar solution?
Why do root hair cells no contain any chloroplasts?	Explain how a sperm cell is adapted to its function	What are stem cells?	Name two places where human stem cells are found	Name the place where plant stem cells are found

CELL BIOLOGY

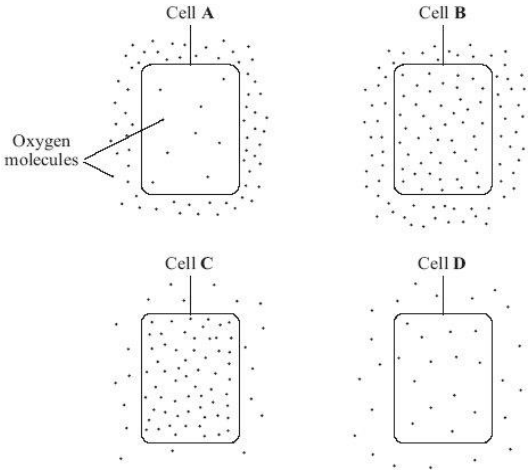
Label the animal cell  	Label the plant cell  	Label the bacterial cell  	Label the parts of the microscope  	What are the two types of microscope? Light microscopes and electron microscopes Write down the formula used to calculate the magnification of an object Magnification = image size ÷ actual size
Name the part of the cell where protein synthesis occurs Ribosomes	Name the part of the cell where DNA is found Nucleus	Name the part of the cell where aerobic respiration takes place Mitochondria	Name the part of the cell which absorbs light energy for photosynthesis Chloroplasts	Why can ribosomes not be seen under the microscope? They are too small
What term is used to describe the movement of particles from a high concentration to a low concentration? Diffusion	What term is used to describe the movement of water from a high concentration to a low concentration through a semi-permeable membrane? Osmosis	What term is used to describe the movement of particles from a low concentration to a high concentration using energy? Active transport	What will happen to the mass and length of a piece of potato when it is placed into a highly concentrated sugar solution? The mass and length will decrease	What will happen to the mass and length of a piece of potato when it is placed into a highly diluted sugar solution? The mass and length will increase
Why do root hair cells no contain any chloroplasts? There is no light for them to photosynthesise under the soil	Explain how a sperm cell is adapted to its function Has flagella – to swim Many mitochondria – energy for movement Enzymes in head – break down egg cells jelly coating	What are stem cells? Cells that have not become specialised yet	Name two places where human stem cells are found Embryonic fluid and bone marrow	Name the place where plant stem cells are found Meristem

EXAM EXPOSURE

1

The diagrams show cells containing and surrounded by oxygen molecules.

Oxygen can move into cells or out of cells.



Into which cell, A, B, C or D, will oxygen move the fastest?

_____

1

Why might stem cells from human embryos be more useful than stem cells from adults?

_____

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_____

6

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

_____

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EXAM EXPOSURE

1

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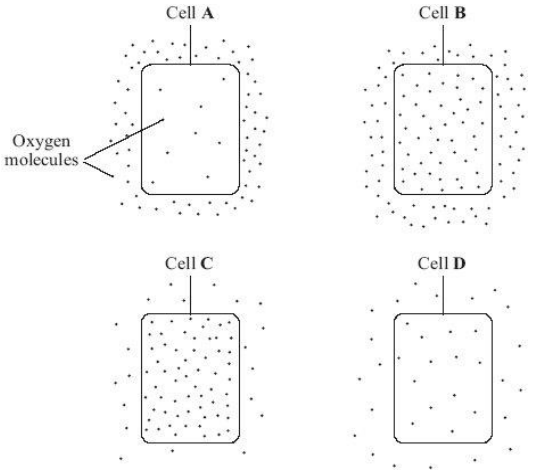


Into which cell, A, B, C or D, will oxygen move the fastest?

A

1

Why might stem cells from human embryos be more useful than stem cells from adults?

Embryonic stem cells can turn into many types of cell, but adult bone marrow stem cells can only differentiate into limited types of cell.

6

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

An example is given of a named substance **or** a process **or** there is an idea of why diffusion is important eg definition.

Level 2 (3 – 4 marks)

At least one example of a substance is given **and** correctly linked to a process in either animals or plants.

Level 3 (5 – 6 marks)

There is a description of a process occurring in either animals or plants that is correctly linked to a substance **and** a process occurring in the other type of organism that is correctly linked to a substance.

examples of points made in the response

Importance of diffusion:

- to take in substances for use in cell processes
- products from cell processes removed

Examples of processes and substances:

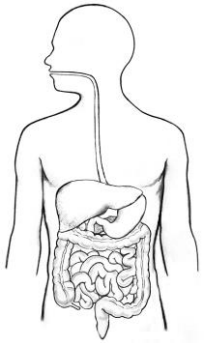
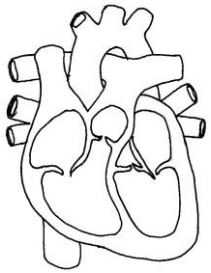
- for gas exchange / respiration: O_2 in / CO_2 out
- for gas exchange / photosynthesis: CO_2 in / O_2 out
- food molecules absorbed: glucose, amino acids, etc
- water absorption in the large intestine
- water lost from leaves / transpiration
- water absorption by roots
- mineral ions absorbed by roots

extra information

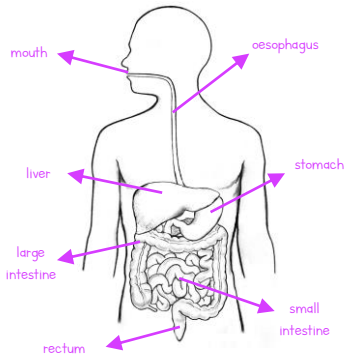
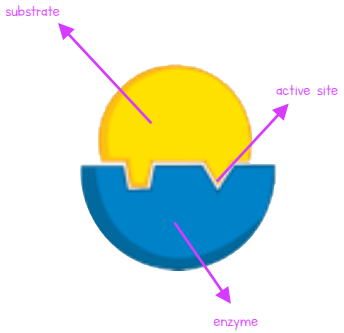
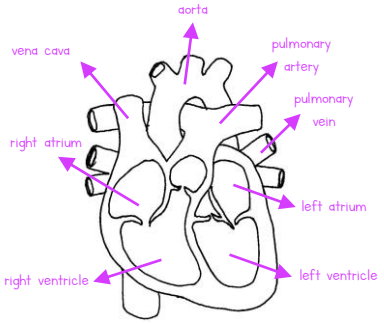
Description of processes might include:

- *movement of particles / molecules / ions*
- *through a partially permeable membrane*
- *(movement of substance) down a concentration gradient*
- *osmosis: turgor / support / stomatal movements*

ORGANISATION

Label the digestive system 	Label the parts of the enzyme substrate complex 	Label the the parts of the heart 	Name the five levels of organisation in living organisms	What is described as a group of cells with similar structure and function?
			What is described as a group of tissues working together to perform a specific function?	What is described as a group of organs working together to perform a specific function?
Name three enzymes that are produced in the pancreas	What substance neutralises stomach acid and emulsifies fat during digestion?	What enzyme is released with the saliva to break down carbohydrates?	Where are nutrients absorbed into the bloodstream?	How are alveoli adapted for gas exchange?
State the four components of blood	What feature do veins have to stop the backflow of blood?	Which blood vessel carries blood into the heart from the body?	Which blood vessel takes blood from the heart to the lungs?	Where are pacemaker cells found?
What are the two types of tumour?	Give two risk factors of CHD	What is the process by which plants release water out of their stomata?	State two ways leaves are adapted for gas exchange	What is the name of the cells that surround the stomata?

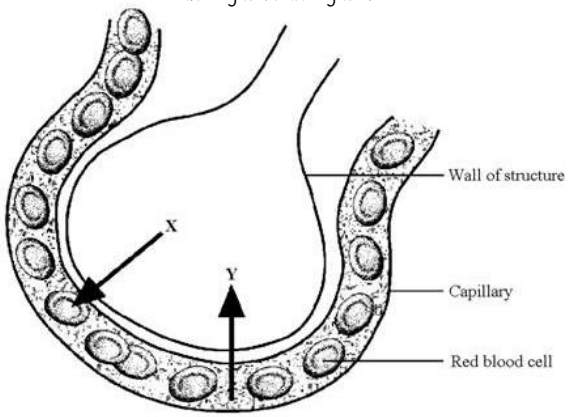
ORGANISATION

Label the digestive system  	Label the parts of the enzyme substrate complex  	Label the the parts of the heart  	Name the five levels of organisation in living organisms Cell, tissue, organ, organ system, organism	What is described as a group of cells with similar structure and function? Tissue
			What is described as a group of tissues working together to perform a specific function? Organ	What is described as a group of organs working together to perform a specific function? Organ system
Name three enzymes that are produced in the pancreas Protease, lipase, amylase	What substance neutralises stomach acid and emulsifies fat during digestion? Bile	What enzyme is released with the saliva to break down carbohydrates? Amylase	Where are nutrients absorbed into the bloodstream? Small intestine	How are alveoli adapted for gas exchange? Large surface area, good blood supply, thin moist walls and large diffusion gradient
State the four components of blood Red blood cells, white blood cells, platelets and plasma	What feature do veins have to stop the backflow of blood? Valves	Which blood vessel carries blood into the heart from the body? Vena cava	Which blood vessel takes blood from the heart to the lungs? Pulmonary veins	Where are pacemaker cells found? Right atrium
What are the two types of tumour? Benign and malignant	Give two risk factors of CHD Smoking, poor diet and stress	What is the process by which plants release water out of their stomata? Transpiration	State two ways leaves are adapted for gas exchange Large surface area, thin, large networks of veins and stomata	What is the name of the cells that surround the stomata? Guard cells

EXAM EXPOSURE

2

The diagram shows an alveolus.
The arrows show the direction of the gases exchanged.
Name gas **X** and gas **Y**.



Gas X: _____

Gas Y: _____

3

Different organs in the digestive system have different functions.
Draw **one line** from each function to the organ with that function.

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

4

Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.
Describe how.
To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

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EXAM EXPOSURE

2

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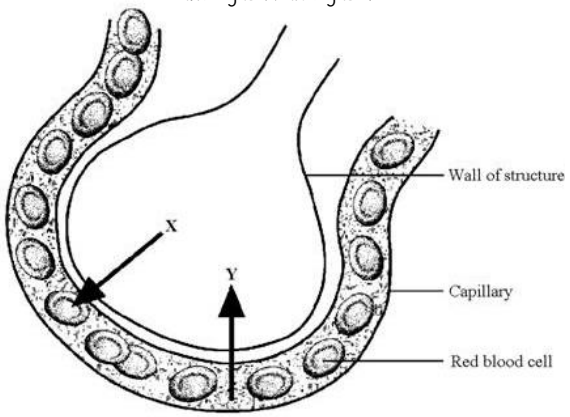
Name gas **X** and gas **Y**.



Gas X: oxygen

Gas Y: carbon dioxide

3

Different organs in the digestive system have different functions.
Draw **one line** from each function to the organ with that function.

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

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Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.
Describe how.
To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance.

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a simple description of part of a process or a reference to at least one of: mechanical digestion, lipase, product of enzyme action, bile, site of production or site of digestion

Level 2 (3-4 marks)

There is a description of at least one process linking ideas

Level 3 (5-6 marks)

There is a clear description of the process including reference to the majority of: mechanical digestion, lipase, bile, where they are produced, products, function of bile and site of digestion / absorption

Examples of biological points made in the response:

- mechanical breakdown in mouth / stomach
- fats → fatty acids and / or glycerol
- by lipase
- (produced by) pancreas
- and small intestine
- fat digestion occurs in small intestine
- bile
- produced by liver
- neutralises acid from stomach
- produces alkaline conditions in intestine
- refs. to increased surface area related to emulsification or chewing
- products are small molecules / water-soluble
- products absorbed by small intestine

INFECTION AND RESPONSE

What is a communicable disease?	What is a non-communicable disease?	What is a pathogen?	State the four types of pathogen	How can pathogens spread?
Name a viral disease	Name a bacterial disease	Name a fungal disease	Name a protist disease	How do bacteria make you ill?
How do viruses make you ill?	What is the term for an organism that spread disease by carrying pathogens between people?	State the physical barrier to infection in your body	State the part of the body containing strong acid to kill pathogens	State the part of the body that secretes mucus to trap pathogens stopping them from entering the lungs
What three things can white blood cells do to kill pathogens?	What type of drug is used to treat bacterial disease?	What disease is where layers of fatty material build up in the arteries, narrowing them and reducing oxygen flow?	Which treatment consists of a device inserted into a blocked artery to keep it open and allow blood and oxygen to the heart?	Which treatment consists of drugs that reduce blood cholesterol levels, slowing the rate of fatty material build up in arteries?
How can faulty heart valves be treated?	Give two risk factors that can affect health	What is cancer?	What are the two types of tumour?	What is the name for a substance that can cause cancers to develop?

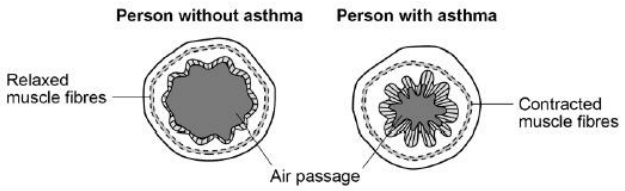
INFECTION AND RESPONSE

What is a communicable disease? A diseases that can be passed from person to person	What is a non-communicable disease? A diseases that cannot be passed from person to person	What is a pathogen? A disease causing organism	State the four types of pathogen Bacteria, virus, fungus and protists	How can pathogens spread? Direct contact, water, air, unhygienic food preparation and vectors
Name a viral disease Tobacco mosaic virus, HIV and measles	Name a bacterial disease Gonorrhoea and salmonella	Name a fungal disease Rose black spot	Name a protist disease Malaria	How do bacteria make you ill? Produce toxins that make you ill
How do viruses make you ill? Rapidly reproduce inside cells damaging and destroying them	What is the term for an organism that spread disease by carrying pathogens between people? Vector	State the physical barrier to infection in your body Skin	State the part of the body containing strong acid to kill pathogens Stomach	State the part of the body that secretes mucus to trap pathogens stopping them from entering the lungs Nose, trachea and bronchus
What three things can white blood cells do to kill pathogens? Produce antitoxins, antibodies and engulf pathogens	What type of drug is used to treat bacterial disease? Antibiotics	What disease is where layers of fatty material build up in the arteries, narrowing them and reducing oxygen flow? CHD	Which treatment consists of a device inserted into a blocked artery to keep it open and allow blood and oxygen to the heart? Stent	Which treatment consists of drugs that reduce blood cholesterol levels, slowing the rate of fatty material build up in arteries? Statins
How can faulty heart valves be treated? Replace faulty valves with mechanical valves	Give two risk factors that can affect health Diet, alcohol, smoking and carcinogens	What is cancer? Uncontrolled growth of cells	What are the two types of tumour? Benign and malignant	What is the name for a substance that can cause cancers to develop? Carcinogens

EXAM EXPOSURE

1

The image shows cross-sections of bronchioles of two people. Suggest why people with asthma often find it difficult to breathe.



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3

Use the correct ***word*** to complete the sentence.

antibodies ***antitoxins*** ***toxins***

Bacteria and viruses make us feel ill because they produce

_____

bacteria ***viruses*** ***fungi***

Antibiotics are medicines that kill _____

are short of food ***invade body cells*** ***mutate***

New strains are produced when pathogens _____

6

Dravet syndrome causes epileptic seizures. An epileptic seizure is caused by unusual brain activity. Describe the processes that then need to happen to test the new drug before it can be used to treat all children with Dravet syndrome.

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EXAM EXPOSURE

1

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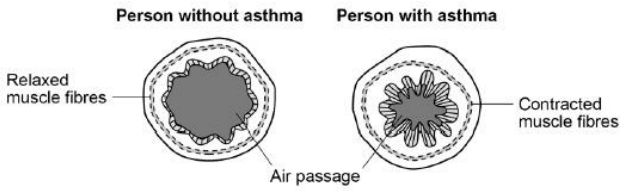


- narrow(er) / small(er) (air) passages / bronchioles
- less air / oxygen can pass through

3

Use the correct ***word*** to complete the sentence.

antibodies ***antitoxins*** ***toxins***

Bacteria and viruses make us feel ill because they produce toxins

bacteria ***viruses*** ***fungi***

Antibiotics are medicines that kill bacteria.

are short of food ***invade body cells*** ***mutate***

New strains are produced when pathogens mutate.

6

Dravet syndrome causes epileptic seizures. An epileptic seizure is caused by unusual brain activity. Describe the processes that than need to happen to test the new drug before it can be used to treat all children with Dravet syndrome.

Level 2: 4 – 6 marks

Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

Level 1: 1 – 3 marks

Facts, events or processes are identified and simply stated but their relevance is not clear.

No relevant content = **0 marks**

Indicative content

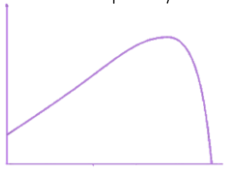
- pre-clinical trials of the new drug on cells / tissues / live animals
- to test for toxicity / dosage / efficacy
- clinical trials / tests on healthy volunteers
- clinical trials / tests on children with Dravet syndrome at very low doses
- so you can monitor for safety / side effects
- and only after these stages trial to find optimum dosage / test for efficacy
- trial could be double blind / use a placebo
- which does not contain the new drug
- children with Dravet syndrome would be randomly allocated to the test groups
- so no one knows who has the drug / placebo
- comparison to existing drugs
- peer review of data
- to help prevent false claims
- approval by NICE

to access level 2 the key ideas of testing on healthy volunteers followed by testing on patients must be given

BIOENERGETICS

Name the pigment found in chloroplasts that absorbs light energy	State the word equation for photosynthesis	Which substance needed for photosynthesis is taken in by osmosis in the root hair cells?	What type of energy is needed for photosynthesis to occur?	What are the three limiting factors of photosynthesis?
What does aerobic mean?	State the word equation for aerobic respiration	How does oxygen enter cells?	Where does aerobic respiration occur?	What is the purpose of respiration?
What does anaerobic mean?	State the word equation for anaerobic respiration	What is the term for the amount of oxygen the body needs after exercise to react with lactic acid?	What substance used in baking bread releases carbon dioxide to make the bread rise?	When does anaerobic respiration occur?
Which product of anaerobic respiration causes muscle fatigue?	Which type of respiration is more efficient?	Why do you breathe heavily when you exercise?	Why do you breathe heavily even after you have exercised?	Give two uses of glucose in cells.
What word is used to describe all the chemical reactions happening in an organism?	How does the body supply the muscles with more oxygenated blood?	What is anaerobic respiration in yeast cells called?	What do organisms need energy for?	Sketch the graph showing how temperature affects rate of photosynthesis

BIOENERGETICS

Name the pigment found in chloroplasts that absorbs light energy Chlorophyll	State the word equation for photosynthesis Carbon dioxide + water → glucose + oxygen	Which substance needed for photosynthesis is taken in by osmosis in the root hair cells? Water	What type of energy is needed for photosynthesis to occur? Light energy	What are the three limiting factors of photosynthesis? Light intensity, CO_2 levels and temperature
What does aerobic mean? Lots of oxygen present	State the word equation for aerobic respiration Oxygen + glucose → carbon dioxide + water	How does oxygen enter cells? Diffusion	Where does aerobic respiration occur? Mitochondria	What is the purpose of respiration? Provide energy to the cell
What does anaerobic mean? Little or no oxygen present	State the word equation for anaerobic respiration Glucose → lactic acid (in animals) Glucose → ethanol + carbon dioxide (in plants and yeast)	What is the term for the amount of oxygen the body needs after exercise to react with lactic acid? Oxygen debt	What substance used in baking bread releases carbon dioxide to make the bread rise? Yeast	When does anaerobic respiration occur? When there is very little or no oxygen present
Which product of anaerobic respiration causes muscle fatigue? Lactic acid	Which type of respiration is more efficient? Aerobic respiration	Why do you breathe heavily when you exercise? Muscles need more energy from respiration	Why do you breathe heavily even after you have exercised? Increase oxygen supply to react with lactic acid in muscle cells	Give two uses of glucose in cells Respiration, cellulose to strengthen cell wall, produce amino acids for protein synthesis, stored as fat or oil and converted to insoluble starch for storage
What word is used to describe all the chemical reactions happening in an organism? Metabolism	How does the body supply the muscles with more oxygenated blood? Heart rate, breathing rate and breath volume increases	What is anaerobic respiration in yeast cells called? Fermentation	What do organisms need energy for? Building large molecules in chemical reactions, muscle contraction for movement and keeping warm	Sketch the graph showing how temperature affects rate of photosynthesis 

EXAM EXPOSURE

2

Respiration can happen aerobically or anaerobically. Respiration transfers energy from glucose. Draw one line from each type of respiration in human cells to the correct information.

Type of respiration in human cells	Information
	Produces ethanol
Aerobic respiration	Uses oxygen
Anaerobic respiration	Uses carbon dioxide
	Produces lactic acid

3

Aerobic respiration and anaerobic respiration are the two types of cell respiration.
Give three differences between aerobic and anaerobic respiration.

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6

The sweet potatoes found underground contain starch.
Explain how starch in the sweet potato is produced from carbon dioxide in the air.

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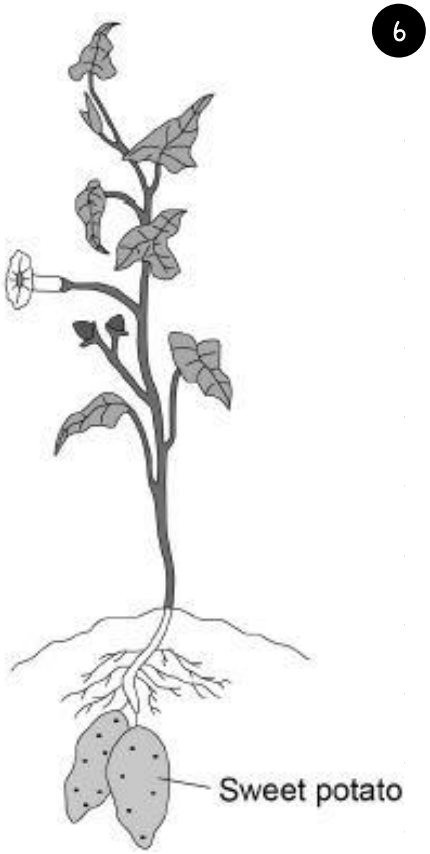

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3

Aerobic respiration and anaerobic respiration are the two types of cell respiration.
Give three differences between aerobic and anaerobic respiration.

any three from:
(aerobic)
- uses / needs / requires oxygen (and anaerobic does not)
- transfers more energy (than anaerobic)

allow releases more energy (than anaerobic)
do not accept energy is created / produced / made

- produces carbon dioxide / water (anaerobic does not)
- does not produce lactic acid (anaerobic does)
- does not cause an oxygen debt (anaerobic does)

allow aerobic takes place in mitochondria and anaerobic takes place in cytoplasm
allow converse in terms of anaerobic

6

The sweet potatoes found underground contain starch.
Explain how starch in the sweet potato is produced from carbon dioxide in the air.

Level 3: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account **5 – 6 marks**

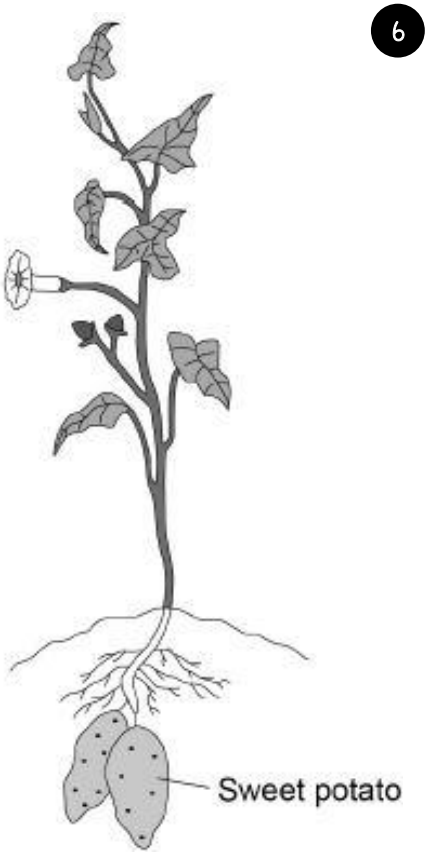
Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear **3 – 4 marks**

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. **1 – 2 marks**

No relevant content **0 marks**

Indicative content

- carbon dioxide enters the leaf through stomata
- glucose / sugars produced by photosynthesis (in leaves)
- some detail of photosynthesis
- transport / translocation (of glucose / sugars)
- in phloem
- glucose is converted to starch
- (starch is a) long chain of glucose / sugar molecules
- starch as storage (of glucose / sugars)



ATOMIC STRUCTURE & PERIODIC TABLE

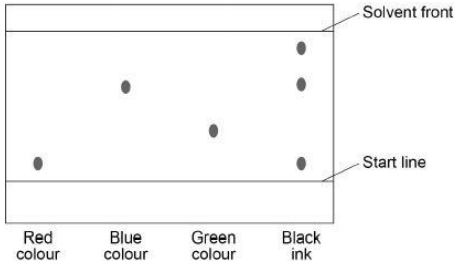
What type of substance contains two or more elements chemically combined?	What type of substance is made of only one type of atom?	What type of substance contains two or more elements or compounds not chemically combined?	What is an atom with the same number of protons but a different number of neutrons?	What is an atom that has lost or gained an electron to become a charged particle?
List the alkali metals in order of increasing reactivity	What is the charge on a Group 1 ion?	Why are group 1 elements called alkali metals?	Why does the melting point decrease down the group?	Why does reactivity increase as you go down group 1?
List the halogens Is in order of increasing reactivity	What is the charge on a Group 7 ion?	What happens to the colour of the elements as you go down group 7?	Why can chlorine not displace fluorine in a compound?	Why does reactivity decrease as you go down group 7?
What word means that an element does not react with other elements?	Why is helium used in balloons?	What type of separation technique is used to separate in insoluble solids from liquid?	What type of separation technique requires a Liebig condenser?	What is the equation to calculate R_f value?
State the charge of each sub atomic particle.	State the order of discovery of the sub atomic particles	What type of particle did Rutherford fire at the gold foil?	What did most of these particles do?	How you could separate a mixture of several liquids with different boiling points?

ATOMIC STRUCTURE & PERIODIC TABLE

What type of substance contains two or more elements chemically combined? Compound	What type of substance is made of only one type of atom? Element	What type of substance contains two or more elements or compounds not chemically combined? Mixture	What is an atom with the same number of protons but a different number of neutrons? Isotope	What is an atom that has lost or gained an electron to become a charged particle? Ion
List the alkali metals in order of increasing reactivity Li, Na, K, Rb, Cs, Fr	What is the charge on a Group 1 ion? 1+	Why are group 1 elements called alkali metals? They react with water to make alkaline solutions	Why does the melting point decrease down the group? Forces of attraction decrease the bigger the size of the atom increases. Less forces means less energy needed to overcome the forces.	Why does reactivity increase as you go down group 1? Distance between nucleus and outermost shell increases, shielding increases and easier to lose electrons
List the halogens Is in order of increasing reactivity F, Cl, Br, I, At	What is the charge on a Group 7 ion? 1-	What happens to the colour of the elements as you go down group 7? The elements get darker	Why can chlorine not displace fluorine in a compound? Fluorine is more reactive	Why does reactivity decrease as you go down group 7? Distance between nucleus and outermost shell increases, shielding increases and harder to gain electrons
What word means that an element does not react with other elements? Inert	Why is helium used in balloons? Helium is less dense than air so it will float	What type of separation technique is used to separate in insoluble solids from liquid? Filtration	What type of separation technique requires a Liebig condenser? Distillation	What is the equation to calculate R_f value? $R_f = \frac{\text{distance travelled by solute}}{\text{distance travelled by solvent}}$
State the charge of each sub atomic particle. Proton = +1 Neutron = 0 (no charge) Electron = -1	State the order of discovery of the sub atomic particles Electron Proton Neutron	What type of particle did Rutherford fire at the gold foil? Alpha particle	What did most of these particles do? Passed straight through the gold foil	How you could separate a mixture of several liquids with different boiling points? Fractional distillation

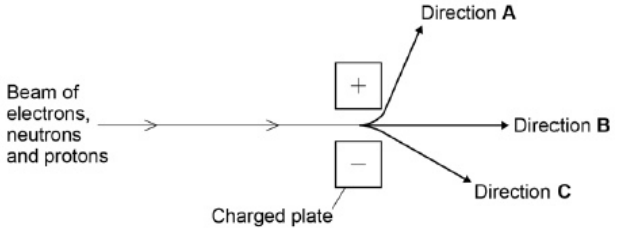
EXAM EXPOSURE

A student used paper chromatography to identify the colours in a black ink. The diagram below shows the student's results. What colours are in the black ink? **2**



A beam of electrons, neutrons and protons can be separated by passing them through an electric field. **2**

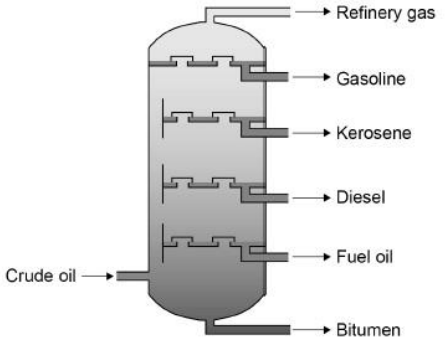
The image below shows the directions of the three particles after entering the electric field.



Charged particles are attracted to the oppositely charged plate in the electric field.

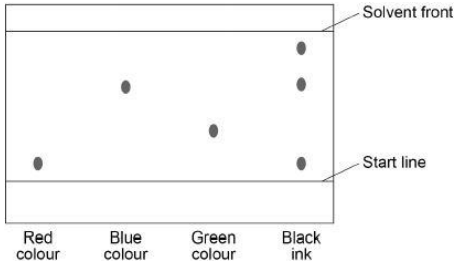
Particle	Direction
Electron	
Proton	
Neutron	

The diagram shows the separation of crude oil in a fractionating column. Explain how crude oil is separated into different fractions by fractional distillation. **6**



EXAM EXPOSURE

A student used paper chromatography to identify the colours in a black ink. The diagram below shows the student's results. What colours are in the black ink? **2**

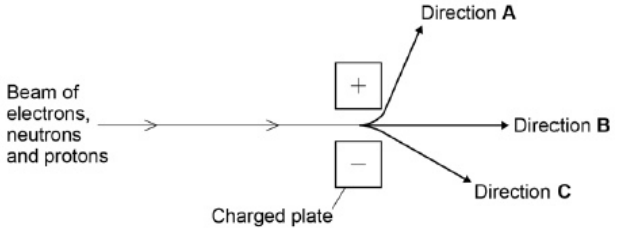


Red and blue (1)

Unknown (1)

A beam of electrons, neutrons and protons can be separated by passing them through an electric field. **2**

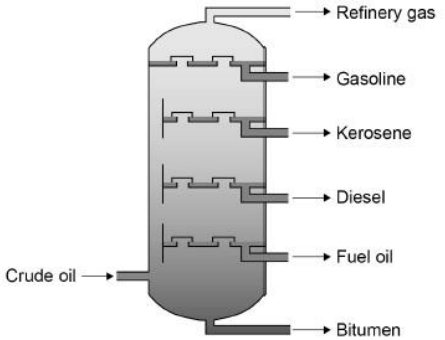
The image below shows the directions of the three particles after entering the electric field.



Charged particles are attracted to the oppositely charged plate in the electric field.

Particle	Direction
Electron	A
Proton	C
Neutron	B

The diagram shows the separation of crude oil in a fractionating column. Explain how crude oil is separated into different fractions by fractional distillation. **6**



Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account **5 – 6 marks**

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear **3 – 4 marks**

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking **1 – 2 marks**

No relevant content **0 marks**

Indicative content

- crude oil is heated
- hydrocarbons/compounds vaporise
- vapours enter the fractionating column near the bottom
- there is a temperature gradient in the column or the column is hotter at the bottom and cooler at the top
- vapours / hydrocarbons / fractions condense
- to become liquid
- at their boiling points
- different substances have different boiling points
- so the different fractions collect at different levels
- hydrocarbons / fractions with smallest molecules have lowest boiling points
- collect as gases at top of the column where temperature is lower
- hydrocarbons / fractions with larger molecules have higher boiling points
- so collect nearer the bottom
- where temperature is higher

STRUCTURE AND BONDING

What are the three types of bonding?	How do covalent bonds form?	What type of elements form covalent bonds?	What structure is made up of billions of atoms joined together by covalent bonds?	Why do giant covalent substances have high melting points?
Why do most covalent structures not conduct electricity?	Which covalent structure is arranged in layers and has free electrons?	Give two properties of graphene	Give one use of fullerenes	What type of elements form ionic bonds?
What is an atom that has lost or gained an electron to become a charged particle?	What charge do ions from group 2 elements form?	What charge do ions from group 7 elements form?	What forces hold ions together in an ionic bond?	What type of structure do giant ionic structures form?
Why do ionic structures have high melting points?	Why do ionic structures only conduct electricity when molten or dissolved?	Describe the structure of a pure metal	What is an alloy?	Describe the bonding between metals
Why are pure metals malleable?	Give two properties of metals	Why can metals conduct electricity?	What is a polymer?	Give one property of a simple covalent molecule

STRUCTURE AND BONDING

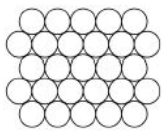
What are the three types of bonding? Ionic, covalent and metallic	How do covalent bonds form? Shared pair of electrons	What type of elements form covalent bonds? Two or more non-metals	What structure is made up of billions of atoms joined together by covalent bonds? Giant covalent structure	Why do giant covalent substances have high melting points? Lots of energy required to break strong covalent bonds between atoms
Why do most covalent structures not conduct electricity? No free electrons to carry charge	Which covalent structure is arranged in layers and has free electrons? Graphite	Give two properties of graphene Strong and conducts electricity	Give one use of fullerenes Lubricants, drug delivery and high tech electronics	What type of elements form ionic bonds? Metals and non-metals
What is an atom that has lost or gained an electron to become a charged particle? Ion	What charge do ions from group 2 elements form? 2+	What charge do ions from group 7 elements form? 1-	What forces hold ions together in an ionic bond? Electrostatic	What type of structure do giant ionic structures form? Giant lattices
Why do ionic structures have high melting points? Strong electrostatic forces need lots of energy to overcome	Why do ionic structures only conduct electricity when molten or dissolved? Ions are free to move and carry charge when molten or dissolved, ions are fixed in a solid	Describe the structure of a pure metal Layers of positive metal ions surrounded by sea of delocalised electrons	What is an alloy? Mixture of metal atoms with atoms of another element	Describe the bonding in pure metals Strong electrostatic forces between positive metal ions and delocalised electrons
Why are pure metals malleable? Layers easily slide over each other when force is applied	Give two properties of metals Hard, shiny, malleable, ductile, sonorous and good conductors of thermal energy and electricity.	Why can metals conduct electricity? Delocalised electrons free to move through whole structure and charry a charge	What is a polymer? Very large molecules made up of repeating monomer units	Give one property of a simple covalent molecule Low melting and boiling point, gas at room temperature and don't conduct electricity

EXAM EXPOSURE

1

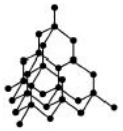
Copper is a metal. Which structure represents the arrangement of atoms in pure copper? Tick **one** box.

A

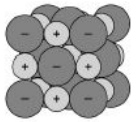


B

C



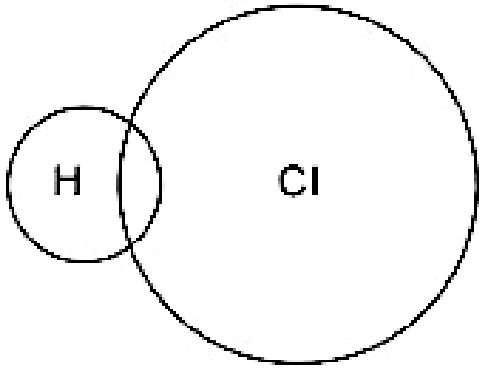
D



❑ A ❑ B ❑ C ❑ D

2

A hydrogen atom contains 1 electron and a chlorine atom contains 17 electrons. Complete the diagram to show a dot and cross diagram for a hydrogen chloride molecule. Show the outer electrons only.



6

Potassium can be reacted with iodine to produce potassium iodide.

potassium + iodine → potassium iodide

The diagram shows how this happens. Only the outer electrons are shown. The dots (●) and crosses (×) are used to represent electrons. Use the diagram to help you answer this question. Describe, as fully as you can, what happens when potassium reacts with iodine to produce potassium iodide. To get full marks you should use the words atom, electron and ion in your answer.

_____

_____

_____

_____

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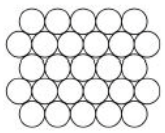
EXAM EXPOSURE

1

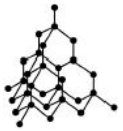
Copper is a metal. Which structure represents the arrangement of atoms in pure copper? Tick **one** box.

A

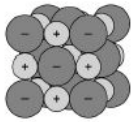


B

C



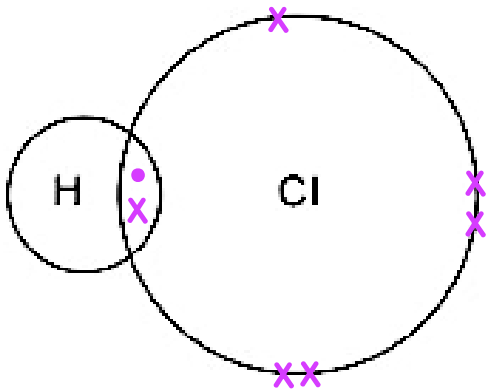
D



☑ A ☐ B ☐ C ☐ D

2

A hydrogen atom contains 1 electron and a chlorine atom contains 17 electrons. Complete the diagram to show a dot and cross diagram for a hydrogen chloride molecule. Show the outer electrons only.



4

Potassium can be reacted with iodine to produce potassium iodide.

potassium + iodine → potassium iodide

The diagram shows how this happens. Only the outer electrons are shown. The dots (●) and crosses (×) are used to represent electrons. Use the diagram to help you answer this question. Describe, as fully as you can, what happens when potassium reacts with iodine to produce potassium iodide. To get full marks you should use the words atom, electron and ion in your answer.

any four from:

If atom or ion omitted = max 3

sharing / covalent / metallic

= max 3

ignore reference to full outer shells

- potassium (atom) loses (an electron) and iodine (atom) gains (an electron)
- 1 electron
- iodide (ion) has negative charge

allow iodine ion

- potassium (ion) has positive charge
- electrostatic attraction or ionic bonding

accept stable (structure) or noble gas (structure)

QUANTITATIVE CHEMISTRY

What law states that matter cannot be created or destroyed just rearranged?	When a metal forms a metal oxide why does the mass increase?	When a metal reacts with an acid why does the mass decrease?	What is defined as the sum of relative atomic mass of each atom in a substance?	What are the four state symbols and what do they stand for?
What is the equation that links volume, concentration and mass?	What is the unit for concentration?	How can you tell when a symbol equation is balanced?	How do you convert cm^3 to dm^3?	If the amount of solute in a solution increases, what happens to the concentration?

EXAM EXPOSURE

Calculate the relative formula mass (M_r) of lithium oxide (Li_2O). **1**

Relative atomic masses (A_r): Li = 7 O = 16

_____

_____

_____

Relative formula mass = _____

Hydrogen peroxide decomposes to produce water and oxygen. Balance the chemical equation. **1**

_____ H_2O_2 → _____ $H_2O + O_2$

6.8 g of hydrogen peroxide decomposes to produce 3.6 g of water. **2**

Calculate the mass of oxygen produced when 68 g of hydrogen peroxide decomposes.

_____

_____

_____

_____

Mass of oxygen = _____ g

The copper chloride solution used in the investigation contained 300 grams per dm^3 of solid $CuCl_2$ dissolved in 1 dm^3 of water. The students used 50 cm^3 of copper chloride solution in each experiment. Calculate the mass of solid copper chloride used in each experiment. **3**

_____

_____

_____

_____

_____

_____

Mass = _____ g

QUANTITATIVE CHEMISTRY

What law states that matter cannot be created or destroyed just rearranged? Conservation of mass	When a metal forms a metal oxide why does the mass increase? Atoms of oxygen from air added	When a metal reacts with an acid why does the mass decrease? Gas is produced and escapes	What is defined as the sum of relative atomic mass of each atom in a substance? Relative formula mass (Mr)	What are the four state symbols and what do they stand for? (s) solid (l) liquid (g) gas (aq) aqueous
What is the equation that links volume, concentration and mass? concentration = mass ÷ volume	What is the unit for concentration? g/dm^3	How can you tell when a symbol equation is balanced? there is equal amounts of atoms on each side of the equation.	How do you convert cm^3 to dm^3? ÷ 1000	If the amount of solute in a solution increases, what happens to the concentration? concentration increases

EXAM EXPOSURE

Calculate the relative formula mass (M_r) of lithium oxide (Li_2O).

Relative atomic masses (A_r): Li = 7 O = 16

1

(Mr) = (2 × 7) + 16

= 30

Hydrogen peroxide decomposes to produce water and oxygen. Balance the chemical equation.

1

4 H_2O_2 → 2 H_2O + O_2

6.8 g of hydrogen peroxide decomposes to produce 3.6 g of water.

2

Calculate the mass of oxygen produced when 68 g of hydrogen peroxide decomposes.

3.2 g of O_2 produced from 6.8 g of H_2O_2

32 (g)

The copper chloride solution used in the investigation contained 300 grams per dm^3 of solid $CuCl_2$ dissolved in 1 dm^3 of water. The students used 50 cm^3 of copper chloride solution in each experiment. Calculate the mass of solid copper chloride used in each experiment.

3

50/1000 or 1/20 or 0.05 (1 mark)

(0.05) × 300 (1 mark)

the second mark is dependent on the first mark being scored

15 (g) (1 mark)

or

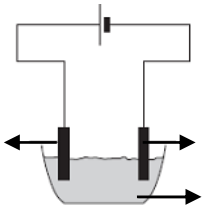
(0.3) × 50 (1 mark)

the second mark is dependent on the first mark being scored

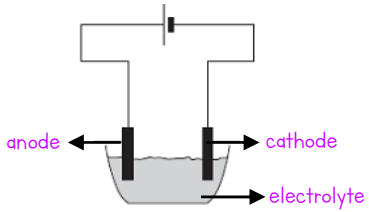
15 (g) (1 mark)

if no other mark awarded allow 150 or 15 000 for 1 mark

CHEMICAL CHANGES

State the reactivity series from most to least reactive	What is described as how vigorously something reacts?	In terms of oxygen, what is oxidation?	In terms of oxygen, what is reduction?	What can be used to measure the pH of a solution?
	What is described as a substance with a pH lower than 7?	What is described as a substance with a pH higher than 7?	What substances form H^+ ions when dissolved in water?	What substances form OH^- ions when dissolved in water?
Label the equipment in the electrolysis practical 	What is described as the process of using electricity to extract elements from a compound?	What is the name of the positive electrode?	What is the name of the negative electrode?	What is defined as a liquid or solution that contains ions so can conduce electricity?
	Where are metals formed in electrolysis?	Where are non-metals formed in electrolysis?	What type of ionic substance cannot be electrolysed because the ions are not able to move?	In the electrolysis of aluminium oxide, why is the aluminium oxide mixed with cryolite?
In electrolysis of solutions, when is a metal not produced at the negative electrode?	Why are some metals not able to be electrolysed using carbon electrodes?	When an acid reacts with a metal, what is oxidised?	When an acid reacts with a metal what is reduced?	What is the general equation for a neutralisation reaction?

CHEMICAL CHANGES

State the reactivity series from most to least reactive Potassium Sodium Lithium Calcium Magnesium Aluminium Carbon Zinc Iron Hydrogen Copper Silver Gold	What is described as how vigorously something reacts? Reactivity	In terms of oxygen, what is oxidation? Addition of oxygen	In terms of oxygen, what is reduction? Removal of oxygen	What can be used to measure the pH of a solution? Universal indicator/pH probe/phenolphthalein
	What is described as a substance with a pH lower than 7? Acid	What is described as a substance with a pH higher than 7? Alkali	What substances form H^+ ions when dissolved in water? Acid	What substances form OH^- ions when dissolved in water? Alkali
Label the equipment in the electrolysis practical  	What is described as the process of using electricity to extract elements from a compound? Electrolysis	What is the name of the positive electrode? Anode	What is the name of the negative electrode? Cathode	What is defined as a liquid or solution that contains ions so can conduce electricity? Electrolyte
	Where are metals formed in electrolysis? Cathode/negative electrode	Where are non-metals formed in electrolysis? Anode/positive electrode	What type of ionic substance cannot be electrolysed because the ions are not able to move? Solid	In the electrolysis of aluminium oxide, why is the aluminium oxide mixed with cryolite? Cryolite dissolves aluminium oxide to allow electrolysis to happen (melting point too high for cost effectiveness)
In electrolysis of solutions, when is a metal not produced at the negative electrode? Metal is less reactive than hydrogen.	Why are some metals not able to be electrolysed using carbon electrodes? If the metal is less reactive than carbon.	When an acid reacts with a metal, what is oxidised? Metal	When an acid reacts with a metal what is reduced? Hydrogen	What is the general equation for a neutralisation reaction? Acid + Base → Salt + Water

EXAM EXPOSURE

1

Why does iron not react with aluminium oxide?

2

Many sea creatures have shells containing calcium carbonate. The seas are becoming more acidic. Suggest and explain how acids affect the shells of sea creatures.

Crab

© twobluedogs/iStock

Whelk

© Edward Westmacott

Scallop

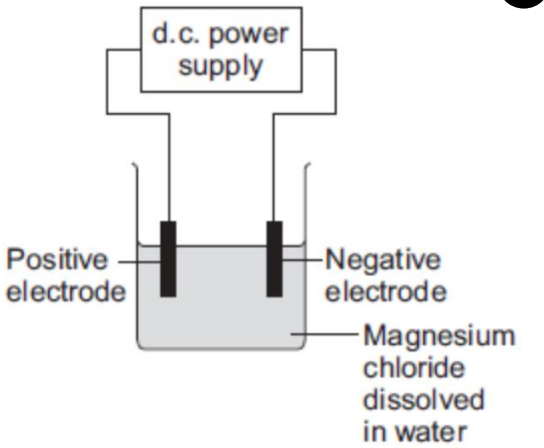
© BobWes/iStock

4

Magnesium chloride can be electrolysed. Explain the process of the electrolysis of magnesium chloride solution.

You should:

- state products of electrolysis
- explain how products are formed



EXAM EXPOSURE

1

Why does iron not react with aluminium oxide?

Iron is less reactive than aluminium.

2

Many sea creatures have shells containing calcium carbonate. The seas are becoming more acidic. Suggest and explain how acids affect the shells of sea creatures.

Crab

© twobluedogs/iStock

Whelk

© Edward Westmacott

Scallop

© BobWes/iStock

(acids) react with calcium carbonate / shells (1)

(so) shells will be (chemically) eroded (1)

do not allow melts

allow dissolved / are thinner / worn away / corroded

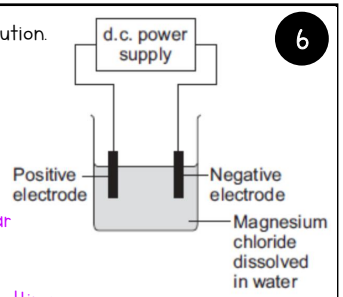
ignore weakened / break down

6

Magnesium chloride can be electrolysed. Explain the process of the electrolysis of magnesium chloride solution.

You should:

- state products of electrolysis
- explain how products are formed



Level 3: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. (5–6 marks)

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. (3–4 marks)

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. (1–2 marks)

No relevant content (0 marks)

Indicative content

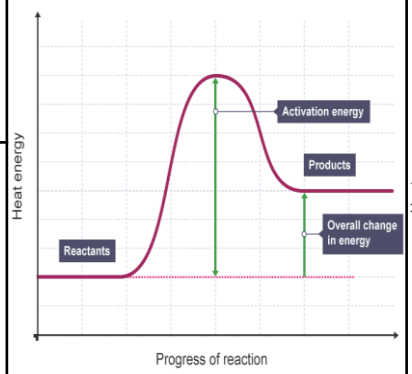
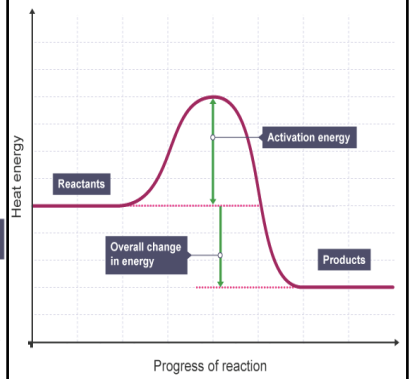
Positive electrode (anode):

- Chloride ions are negative (-1 charge)
- Hydroxide ions are negative
- Chloride ions attracted to anode/positive electrode
- Hydroxide ions (OH^-) attracted to anode/positive electrode
- Chloride ions discharge electrons (are oxidised) at anode/positive electrode
- Chlorine gas produced at anode/positive electrode

Negative electrode (cathode):

- Magnesium ions are positive (+2 charge)
- Hydrogen ions are positive (+1 charge)
- Magnesium ions attracted to cathode/negative electrode
- Hydrogen ions (H^+) attracted to cathode/negative electrode
- Hydrogen ions gain electrons (are reduced) at cathode/negative electrode
- Hydrogen gas produced at cathode/negative electrode

ENERGY CHANGES

What type of reaction is described as a reaction where energy is given off to the surroundings?	What is activation energy?	What happens to the temperature of the surroundings in an exothermic reaction?	What type of reaction profile is shown below? 	What type pf reaction profile is shown below? 
What type of reaction is described as a reaction where energy is taken in from the surroundings?	What is described as a diagram which shows how the energy changes as the reaction takes place?	What happens to the temperature of the surroundings in an endothermic reaction?		

EXAM EXPOSURE

The reaction between carbon and oxygen is exothermic. (1)

What does exothermic reaction mean?

Select the correct word to complete the sentence. (1)

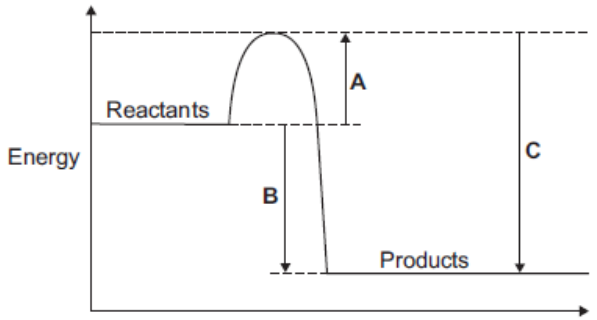
In an exothermic reaction, the temperature...

❑ increases ❑ decreases ❑ stays the same

Figure 1 shows a reaction profile. (3)

Name what each arrow shows.

Figure 1



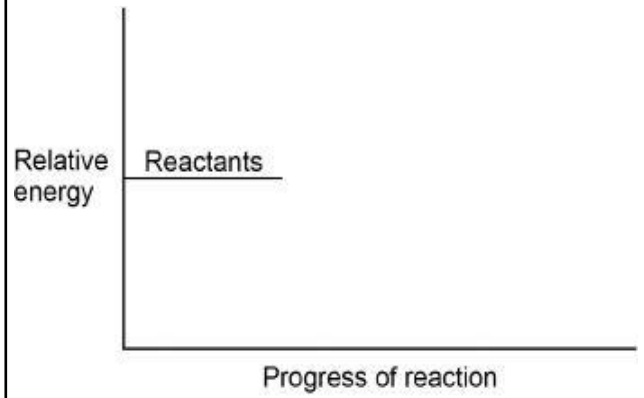
Change in energy = _____

Total energy lost = _____

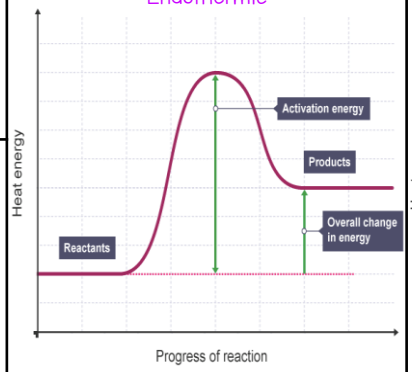
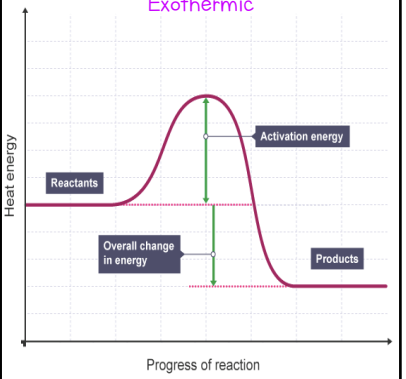
Activation energy = _____

The reaction between sodium and chlorine is an exothermic reaction. (2)

Complete the reaction profile for the reaction between sodium and chlorine.



ENERGY CHANGES

What type of reaction is described as a reaction where energy is given off to the surroundings? Exothermic	What is activation energy? Energy required to start a chemical reaction/for particles to successfully collide	What happens to the temperature of the surroundings in an exothermic reaction? Temperature of surroundings increases	What type of reaction profile is shown below? Endothermic 	What type pf reaction profile is shown below? Exothermic 
What type of reaction is described as a reaction where energy is taken in from the surroundings? Endothermic	What is described as a diagram which shows how the energy changes as the reaction takes place? Reaction profile/energy level diagram	What happens to the temperature of the surroundings in an endothermic reaction? Temperature of surroundings decreases		

EXAM EXPOSURE

The reaction between carbon and oxygen is exothermic.
What does exothermic reaction mean? (1)

A reaction that transfers energy to the surroundings.

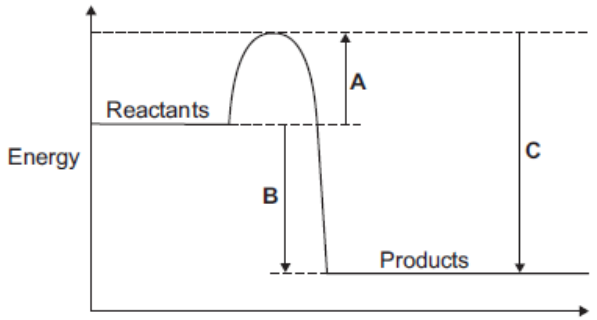
Select the correct word to complete the sentence. (1)

In an exothermic reaction, the temperature...

☑ increases ☐ decreases ☐ stays the same

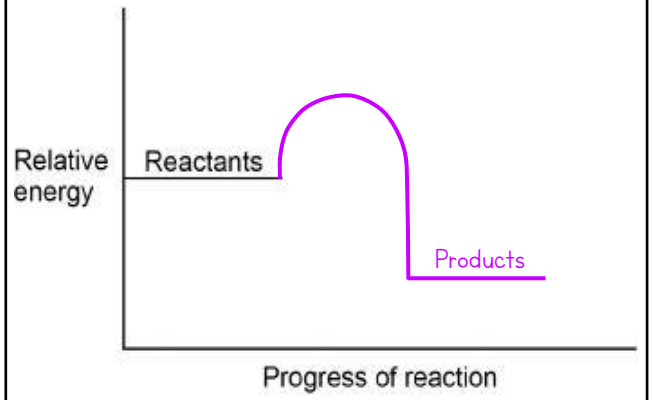
Figure 1 shows a reaction profile.
Name what each arrow shows. (3)

Figure 1

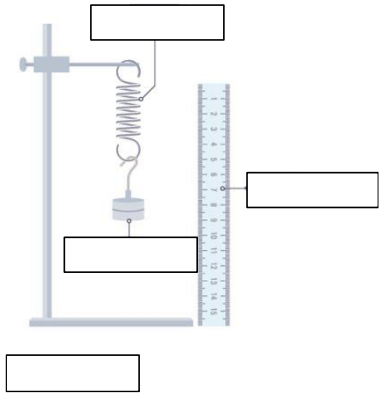


Change in energy = B
Total energy lost = C
Activation energy = A

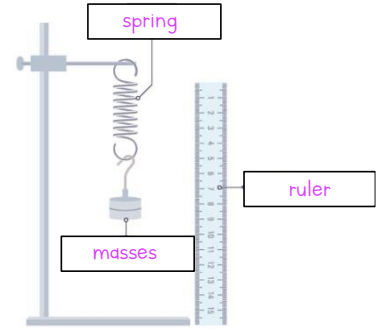
The reaction between sodium and chlorine is an exothermic reaction. (2)
Complete the reaction profile for the reaction between sodium and chlorine.



ENERGY

State the 8 energy stores	What are the four energy transfers?	What equation is used to calculate gravitational potential energy?	What equation is used to calculate kinetic energy?	What equation is used to calculate energy efficiency?
	What equation is used to calculate work done?	What equation is used to calculate power?	What equation defines Hooke's law?	What is defined as the energy required to increase the temperature of 1kg of a substance by 1°C?
Label the equipment 	What are the three methods of heating?	What type of heating only occurs in solids?	What is transferred when particles bump into each other?	What do metals have that make them good conductors?
	Is nuclear power renewable or non-renewable?	What are the three fossil fuels?	Give three examples of renewable energy resources.	What energy resource is produced by controlling the flow of water through a turbine?
What is described as the point beyond which Hooke's law is no longer true when stretching a material?	Describe the relationship between force and extension for objects that obey Hooke's law.	Give two disadvantages of fossil fuels.	Give one advantage of fossil fuels.	Give two disadvantages of wind turbines.

ENERGY

State the 8 energy stores Magnetic Internal Chemical Kinetic Electrostatic Gravitational potential Elastic potential Nuclear	What are the four energy transfers? Mechanical work Electrical work Heating Radiation	What equation is used to calculate gravitational potential energy? GPE = m g h	What equation is used to calculate kinetic energy? KE = ½ m v^2	What equation is used to calculate energy efficiency? efficiency = $\frac{\text{useful output}}{\text{total input}}$
	What equation is used to calculate work done? W = F d	What equation is used to calculate power? $P = \frac{E}{t}$ $P = \frac{W}{t}$	What equation defines Hooke's law? F = k e	What is defined as the energy required to increase the temperature of 1kg of a substance by 1°C? specific heat capacity
Label the equipment  	What are the three methods of heating? conduction convection radiation	What type of heating only occurs in solids? conduction	What is transferred when particles bump into each other? energy	What do metals have that make them good conductors? delocalised electrons
	Is nuclear power renewable or non-renewable? non-renewable	What are the three fossil fuels? coal oil gas	Give three examples of renewable energy resources. geothermal wind solar hydroelectricity tidal	What energy resource is produced by controlling the flow of water through a turbine? hydroelectricity
What is described as the point beyond which Hooke's law is no longer true when stretching a material? limit of proportionality	Describe the relationship between force and extension for objects that obey Hooke's law. directly proportional	Give two disadvantages of fossil fuels. non-renewable resource – will run out, combustion of fossil fuels increases CO_2 emissions, extraction of fuels damages landscape and habitats.	Give one advantage of fossil fuels. releases energy quickly, can be used in vehicles as well as power stations, can respond to demand and increase electricity produced, reliable	Give two disadvantages of wind turbines. will only produce electricity when there is wind (unpredictable), spoils the view (visual pollution), noisy (noise pollution), expensive to set up

EXAM EXPOSURE

1

Give one environmental advantage to turning off electrical appliances when they are not being used.

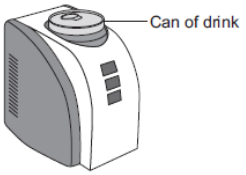
_____

_____

2

A 'can-chiller' is used to make a can of drink colder. The can-chiller decreases the temperature of the liquid in the can by 15 °C. The mass of liquid is 0·33 kg. The specific heat capacity of the liquid is 4200 J/kg°C. Calculate the energy transferred from the liquid as it cools.

Figure 1



_____

_____

Energy = _____ J

3

Use the correct ***word*** to complete the sentences.

current ***efficiency*** ***energy*** ***force*** ***frequency***

Step-up transformers are used to increase the potential difference, which causes a decrease in the _____

This means that the temperature of the cables is lower, so there is less wasted _____

This increases the _____ of the power transmission process.

6

A farmer plans to generate all the electricity needed on her farm, using either a biogas generator or a small wind turbine. The biogas generator would burn methane gas. The methane gas would come from rotting the animal waste produced on the farm. When burnt, methane produces carbon dioxide. The biogas generator would cost £18 000 to buy and install. The wind turbine would cost £25 000 to buy and install. The average power output from the wind turbine would be the same as the continuous output from the biogas generator. Evaluate the advantages and disadvantages of the two methods of generating electricity. Conclude, with a reason, which system would be better for the farmer to buy and install.

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EXAM EXPOSURE

1

Give one environmental advantage to turning off electrical appliances when they are not being used.

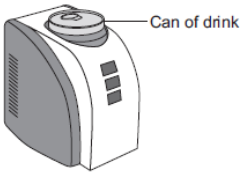
Less greenhouse gases released

Less contribution to global warming

2

A 'can-chiller' is used to make a can of drink colder. The can-chiller decreases the temperature of the liquid in the can by 15 °C. The mass of liquid is 0·33 kg. The specific heat capacity of the liquid is 4200 J/kg°C. Calculate the energy transferred from the liquid as it cools.

Figure 1



E = 0.33 x 4200 x 15

E = 20790 J

3

Use the correct ***word*** to complete the sentences.

current ***efficiency*** ***energy*** ***force*** ***frequency***

Step-up transformers are used to increase the potential difference, which causes a decrease in the current.

This means that the temperature of the cables is lower, so there is less wasted energy.

This increases the efficiency of the power transmission process.

6

A farmer plans to generate all the electricity needed on her farm, using either a biogas generator or a small wind turbine. The biogas generator would burn methane gas. The methane gas would come from rotting the animal waste produced on the farm. When burnt, methane produces carbon dioxide. The biogas generator would cost £18 000 to buy and install. The wind turbine would cost £25 000 to buy and install. The average power output from the wind turbine would be the same as the continuous output from the biogas generator. Evaluate the advantages and disadvantages of the two methods of generating electricity. Conclude, with a reason, which system would be better for the farmer to buy and install.

Label 3: There is a clear and detailed comparison of the two systems.

There must be a clear conclusion of which system would be best with at least one comparative reason given for the choice made.

(5-6 marks)

Level 2: There is a description of some advantages and / or disadvantages for biogas

and / or wind or there is a direct comparison between the two systems and at least one advantage / disadvantage or a detailed evaluation of one system only with a conclusion. (3-4 marks)

Level 1: There is a brief description of one advantage or disadvantage of using either biogas or wind or makes a conclusion with a reason. (1-2 marks)

No relevant content (0 marks)

Indicative content:

Advantages of both methods:

both renewable sources of energy

both have no fuel (cost)

both have very small (allow 'no') running costs

no carbon dioxide produced accept carbon neutral, accept no greenhouse gases, accept doesn't contribute to global warming

Advantages of wind:

higher average power output produces more energy is insufficient

Advantages of hydroelectric:

constant / reliable power (output)

lower (installation) cost

Disadvantages of wind:

higher (installation) cost

variable / unreliable power output

(may) kill birds / bats

Disadvantages of hydroelectric:

lower power output

(may) kill fish or (may) damage habitats

more difficult to set up (within river)

Disadvantages of both methods:

(may be) noisy

visual pollution ignore payback time unless no other relevant points made, ignore time to build for both

ELECTRICITY

Draw the symbol for an LED.	What is current?	What is potential difference?	What is charge flow?	What is the difference between series and parallel circuits?
Which piece of equipment is used to measure current?	What piece of equipment is used to measure potential difference?	What is electrical resistance?	List all the types of resistors.	What is the purpose of the cell or battery in a circuit?
What is the rule for current in a series circuit?	What is the rule for current in a parallel circuit?	What is the rule for potential difference in a series circuit?	What is the rule for potential difference in a parallel circuit?	What is power?
What colour are each of the wires in a plug?	What does the live wire do?	What does the neutral wire do?	What does the earth wire do?	What does a fuse do?
What equation links time, charge flow and current?	What equation links current, potential difference and resistance?	What equation links power, potential difference and current?	What equation links current, power and resistance?	Why are the plug casings made of plastic?

ELECTRICITY

Draw the symbol for an LED. 	What is current? Rate of flow of electrical charge	What is potential difference? How much energy is transferred between two points on a circuit	What is charge flow? Property of a particle that experiences a force in a magnetic field.	What is the difference between series and parallel circuits? Series = one path for current to flow Parallel = multiple paths for current to flow
Which piece of equipment is used to measure current? Ammeter	What piece of equipment is used to measure potential difference? Voltmeter	What is electrical resistance? Opposition to the flow of current.	List all the types of resistors. Fixed resistor Variable resistor Light dependent resistor (LDR) Thermistor	What is the purpose of the cell or battery in a circuit? Transfer potential difference to the charges (electrons)
What is the rule for current in a series circuit? Current is the same everywhere in a series circuit	What is the rule for current in a parallel circuit? Current splits along the different paths in a parallel circuit	What is the rule for potential difference in a series circuit? Potential difference splits between the components in a series circuit	What is the rule for potential difference in a parallel circuit? Potential difference is the same on each path in a parallel circuit	What is power? The amount of energy transferred each second
What colour are each of the wires in a plug? Brown = live Blue = neutral Green and Yellow = earth	What does the live wire do? Carries current into the device	What does the neutral wire do? Completes the circuit	What does the earth wire do? Provides a path for current to flow from the case of the device to the ground if there is a fault	What does a fuse do? Glass or ceramic canister containing a thin wire that melts if the current gets too high
What equation links time, charge flow and current? Charge flow = current x time	What equation links current, potential difference and resistance? Potential difference = current x resistance	What equation links power, potential difference and current? Power = current x potential difference	What equation links current, power and resistance? Power = current^2 x resistance	Why are the plug casings made of plastic? Plastic is a good insulator

EXAM EXPOSURE

Use the correct ***word*** to complete the sentence. **1**

atoms ***protons*** ***electrons*** ***ions***

Metals are good conductors of electricity because electrical charge is transferred by delocalised _____

When the potential difference across the resistor was 0.80 V, the current in the resistor was 0.020 A
Calculate the power dissipated by the resistor.
Use the equation: **2**

power = potential difference × current

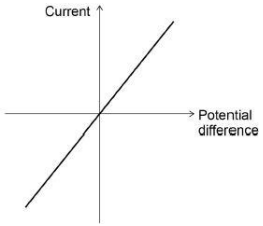
_____

_____

Power = _____ W

The diagram below shows a sketch graph of the student's results. The LDR was in a constant bright light. **2**

The student concluded that the current in the LDR is inversely proportional to the potential difference across the LDR. Explain why the student's conclusion is incorrect.



_____

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_____

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate. Information about the two electricity generation systems is given in the table. Compare the advantages and disadvantages of the two methods of generating electricity. Use your knowledge of energy sources as well as information from the table. **4**

The wind turbine costs £50 000 to buy and install.
The hydroelectric generator costs £20 000 to buy and install.
The average power output from the wind turbine is 10 kW.
The hydroelectric generator will produce a constant power output of 8 kW.

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EXAM EXPOSURE

1

Use the correct ***word*** to complete the sentence.

atoms ***protons*** ***electrons*** ***ions***

Metals are good conductors of electricity because electrical charge is transferred by delocalised electrons.

2

When the potential difference across the resistor was 0.80 V, the current in the resistor was 0.020 A

Calculate the power dissipated by the resistor.

Use the equation:

power = potential difference × current

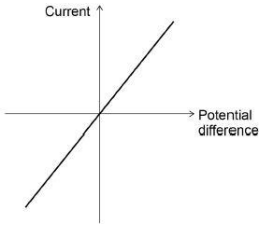
0.80 x 0.020 = 0.016

Power = 0.016 W

2

The diagram below shows a sketch graph of the student's results. The LDR was in a constant bright light.

The student concluded that the current in the LDR is inversely proportional to the potential difference across the LDR. Explain why the student's conclusion is incorrect.



(graph shows) direct proportion (1)

(because) it is a straight line through the origin (1)

allow inverse proportion would show a curve with a negative gradient

4

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate. Information about the two electricity generation systems is given in the table. Compare the advantages and disadvantages of the two methods of generating electricity.

Use your knowledge of energy sources as well as information from the table.

The wind turbine costs £50 000 to buy and install.
The hydroelectric generator costs £20 000 to buy and install.
The average power output from the wind turbine is 10 kW.
The hydroelectric generator will produce a constant power output of 8 kW.

Label 3: Clear comparison of advantages and disadvantages of each method (5-6 marks)

Level 2: At least one advantage and one disadvantage is stated for one method and a different advantage or disadvantage is stated for the other method (3-4 marks)

Level 1: At least one advantage or one disadvantage of either method (1-2 marks)

No relevant content (0 marks)

Indicative content:

Advantages of both methods:

- both renewable sources of energy
- both have no fuel (cost)
- both have very small (allow 'no') running costs
- no carbon dioxide produced *accept carbon neutral, accept no greenhouse gases, accept doesn't contribute to global* warming

Advantages of wind:

- higher average power output *produces more energy is insufficient*

Advantages of hydroelectric:

- constant / reliable power (output)
- lower (installation) cost

Disadvantages of wind:

- higher (installation) cost
- variable / unreliable power output
- (may) kill birds / bats

Disadvantages of hydroelectric:

- lower power output
- (may) kill fish or (may) damage habitats
- more difficult to set up (within river)

Disadvantages of both methods:

- (may be) noisy
- visual pollution *ignore payback time unless no other relevant points made, ignore time to build for both*

PARTICLE MODEL OF MATTER

What are the three states of matter?	Describe the arrangement of particles in a solid.	Describe the arrangement of particles in a liquid.	Describe the arrangement of particles in a gas.	What is density?
What is the equation that links mass, density and volume?	What piece of equipment is used to measure the density of an irregularly shaped object?	How can you tell when a symbol equation is balanced?	What two types of energy is internal energy the sum of?	What is described as the amount of energy needed to change the state of one kg of a substance?

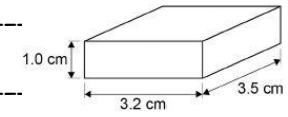
EXAM EXPOSURE

1 Use the following equation to calculate the volume of stone B in cm^3.

volume = length × width × height

_____

_____



2 The mass of stone B is 56 grams. Use your answer from above to calculate the density of stone B in g/cm^3

_____

_____

3 A scientist cooled the air inside a container. The temperature of the air changed from 20 °C to 0 °C. The volume of the container of air stayed the same. Explain how the motion of the air molecules caused the pressure in the container to change as the temperature decreased.

_____

_____

_____

_____

_____

_____

PARTICLE MODEL OF MATTER

What are the three states of matter? Solid, liquid and gas	Describe the arrangement of particles in a solid. Lattice structure Particles touching Vibrate around fixed point Low energy	Describe the arrangement of particles in a liquid. Randomly arranged Particles touching Particles move around each other Moderate energy	Describe the arrangement of particles in a gas. Randomly arranged Particles far apart Particles move quickly in all directions High energy	What is density? How closely packed the particles are in a solid, liquid or gas
What is the equation that links mass, density and volume? density = mass ÷ volume	What piece of equipment is used to measure the density of an irregularly shaped object? eureka can	How can you tell when a symbol equation is balanced? there is equal amounts of atoms on each side of the equation.	What two types of energy is internal energy the sum of? Kinetic energy and potential energy	What is described as the amount of energy needed to change the state of one kg of a substance? Specific latent heat

EXAM EXPOSURE

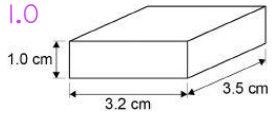
1

Use the following equation to calculate the volume of stone B in cm^3.

volume = length × width × height

volume = 3.5 × 3.2 × 1.0

= 11.2



2

The mass of stone B is 56 grams. Use your answer from above to calculate the density of stone B in g/cm^3

56 ÷ 11.2 = 5

Density = 5 g/cm^3

3

A scientist cooled the air inside a container. The temperature of the air changed from 20 °C to 0 °C. The volume of the container of air stayed the same. Explain how the motion of the air molecules caused the pressure in the container to change as the temperature decreased.

pressure decreased (1)

because molecules have less (kinetic) energy (1) *allow less speed/velocity*

so fewer collisions (with the wall/container each second) (1) *allow collide with less force, allow less force on the walls*

ATOMIC STRUCTURE AND RADIATION

Name the 3 types of radiation.	What is an isotope?	What is an alpha particle?	What is an beta particle?	What is gamma radiation?
What is meant by half life?	What is described as exposing objects to beams of radiation?	What is described as if an object has a radioactive material introduced into it?	Why do some isotopes go through nuclear decay?	What protection methods do we put in place to keep us safe from radiation poisoning?

EXAM EXPOSURE

1

Complete the nuclear equation to show the radioactive decay of polonium-210
Use the periodic table to help you.

$$^{210}_{84}Po \longrightarrow \_\_\_\_ + {}^{4}_{2}He$$

2

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it. Explain why the teacher stood as far away from the apparatus as possible.

6

Ionising radiation can be used to treat patients in hospital. People working in hospitals must limit their exposure to ionising radiation. Explain how the use of ionising radiation in hospitals can be both useful and harmful.

ATOMIC STRUCTURE AND RADIATION

Name the 3 types of radiation. alpha, beta and gamma	What is an isotope? an atom with the same number of protons but a different number of neutrons	What is an alpha particle? 2 protons and 2 neutrons or helium nucleus	What is an beta particle? high speed electron	What is gamma radiation? electromagnetic wave
What is meant by half life? time taken for activity to half or for half the radioactive nuclei to decay	What is described as exposing objects to beams of radiation? irradiation	What is described as if an object has a radioactive material introduced into it? contamination	Why do some isotopes go through nuclear decay? they have and unstable nucleus / the decay stabilises the nucleus	What protection methods do we put in place to keep us safe from radiation poisoning? radiation suit, keeping your distance from the source, only working with the source for short periods of time, storing sources in lead lined box

EXAM EXPOSURE

1

Complete the nuclear equation to show the radioactive decay of polonium-210
Use the periodic table to help you.

$$^{210}_{84}Po \longrightarrow \underset{82}{\overset{206}{Pb}} + {}^{4}_{2}He$$

2

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it. Explain why the teacher stood as far away from the apparatus as possible.

to reduce the amount of radiation received (1)
allow to reduce irradiation (of the teacher)
because radiation increases the risk of cancer or (genetic) mutation (1)
allow causes cancer or (genetic) mutation, ignore references to contamination

3

Ionising radiation can be used to treat patients in hospital. People working in hospitals must limit their exposure to ionising radiation. Explain how the use of ionising radiation in hospitals can be both useful and harmful.

Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account (5-6 marks)

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear. (3-4 marks)

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. (1-2 marks)

Indicative content:

Uses

- used to diagnose problems
- X-rays and CT scans
- sterilising instruments/killing bacteria
- Radiotherapy
- to treat cancer
- used to kill cancer cells
- medical tracers
- gamma knives

Harm

- can change / mutate DNA
- causing cells to grow uncontrollably
- causing tumours / cancer
- from regular exposure causing increased dose
- to eggs / sperm / embryos