SURNAME:

FIRST NAME:

PRESENT SCHOOL:

Stowe

2025 Entry

ACADEMIC SCHOLARSHIP PAPER: SCIENCES

Time Allowed: 1 hour 30 minutes

Total Marks: 100 marks

There are three parts to this examination:

Section A: Biology (34 marks) – 30 minutes

Section B: Chemistry (33 marks) – 30 minutes

Section C: Physics (33 marks) – 30 minutes

Please write answers in the spaces provided.

Candidates are allowed access to a calculator.

Section A

Biology

(34 Marks)

You are advised to spend no more than 30 minutes on this section

Multiple Choice Questions

a) What is the name for a structure where two or more bones meet?

- (a) Muscle
- (b) Joint
- (c) Tendon
- (d) Ligament

b) Which part of a plant absorbs water and minerals?

- (a) Stem
- (b) Leaves
- (c) Root
- (d) Flowers

c) An animal cell contains molecules of carbon dioxide. What part of the cell do carbon dioxide molecules have to pass through to leave the cell?

- (a) Cell wall
- (b) Mitochondria
- (c) Cell membrane
- (d) Nucleus

d) When a pollen grain lands on a stigma, a pollen tube grows down to the ovary. What is the name of the part of the flower that the pollen tube grows down through?

- (a) Style
- (b) Filament
- (c) Sepal
- (d) Anther

e) What is a short section of DNA called?

- (a) Chromatin
- (b) Chromosome
- (c) Nucleus
- (d) Gene

f) What are the products of photosynthesis?

- (a) Carbon dioxide and water
- (b) Glucose and oxygen
- (c) Glucose and water
- (d) Glucose and Carbon dioxide

g) Which of these statements best describes the term respiration?

- (a) The process of releasing energy from Glucose
- (b) All of the reactions that keep the body alive
- (c) The process of inhaling and exhaling
- (d) A process that can only take place in the presence of oxygen

h) Seed banks store the seeds of many different species of plant. What do plant seeds contain that determines which plant they grow into?

- (a) Genes
- (b) Sperm
- (c) Eggs
- (d) The environment

i) When toxic materials enter a food chain, which organisms tend to be worst affected?

- (a) Top carnivores
- (b) Producers
- (c) Primary consumers
- (d) Herbivores

j) Small, soluble molecules are absorbed from the alimentary canal into the blood during digestion In which organ of the digestive system does this process of absorption take place?

- (a) Large Intestine
- (b) Stomach
- (c) Small Intestine
- (d) Pancreas

Question 3

The table shows results of biochemical tests on four substances in food: **protein, starch, fat and sugar.**

Substance	Colour with Benedict's solution test	Colour with Iodine solution test	Colour with Biuret solution test	Colour with Emulsion test
A	Blue	Yellow-brown	Violet	Clear
B	Blue	Yellow-brown	Blue	Milky
C	Brick red	Yellow-brown	Blue	Clear
D	Blue	Bluey-black	Blue	Clear

Identify substances A, B, C, and D (4 marks)

A...

B...

C...

D..

Explain the following statements: (2 marks)

Removal of undigested food (faeces) is **<u>not</u>** a type of excretion.

....

....

A puffer fish inflating it's body in defence would **<u>not</u>** be thought of as growth.

....

....

Question 2

Read the following passage and answer the questions below.

The energy we receive in our food comes ultimately from the sun. This energy is captured in a chemical form that is useful to plants, in a process that occurs inside plant cells. Subsequently, we may eat the plant itself or eat animals that have eaten the plants and in this way the chemicals containing the trapped solar energy end up being used by our body cells. This passage of materials and energy from one organism to another and another is called a food chain. In a natural ecosystem, such as a pond or wood, there will be many links between numerous different food chains, to create a food web.

What is the name of the process in which the sun's energy is captured in a chemical form? **(1 mark)**

....

What is the name of the plant cell organelles in which this process occurs? **(1 mark)**

....

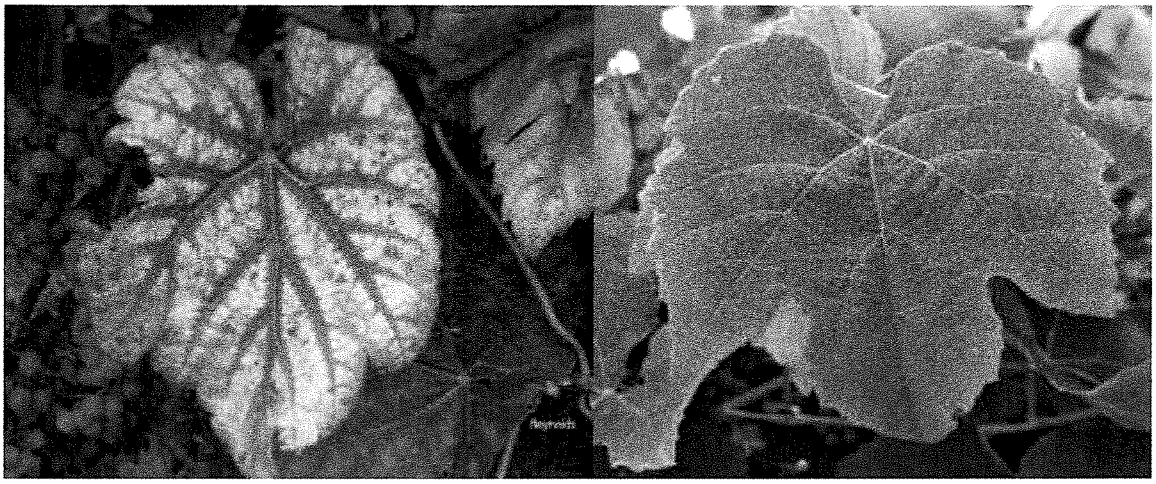
Name the useful substance created in the process that contain the trapped energy? **(1 mark)**

....

What waste substance if produced by this process? **(1 mark)**

....

Here are two broad leaves. Leaf A has grown in soil deficient in magnesium. Leaf B has been grown in soil containing magnesium. **(2 marks)**



Leaf A Leaf B

Suggest why the **absence** of magnesium in the soil might result in leaf A's appearance being different from leaf B.

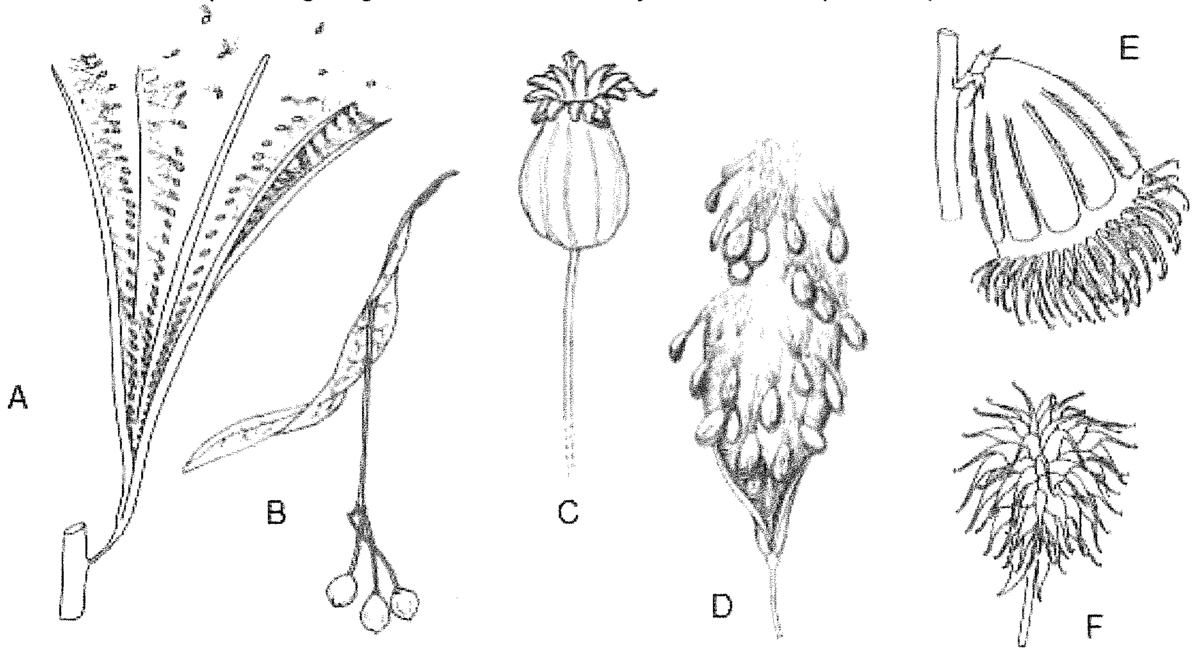
....

....

....

Question 4

The drawings show seeds or fruits of different plants. From the appearance of the structures, suggest at how each one is dispersed giving a reason for each of your answers. **(6 marks)**



A - Method of dispersal ....

Reasoning :

....

....

B - Method of dispersal ....

Reasoning:

....

....

C- Method of dispersal ....

Reasoning:

....

....

D- Method of dispersal ....

Reasoning:

....

....

E- Method of dispersal ....

Reasoning:

....

....

F - Method of dispersal ....

Reasoning:

....

....

END OF BIOLOGY QUESTIONS

Section B

Chemistry

(33 Marks)

You are advised to spend no more than 30 minutes on this section

QUESTION ONE - Multiple Choice Questions

(a) Substances can exist in three states of matter.

$$\text{Solid} \rightleftharpoons \text{Liquid} \underset{\textbf{Y}}{\rightleftharpoons} \text{Gas}$$

What is change of state Y called?

- (a) Condensing
- (b) Evaporating
- (c) Freezing
- (d) Melting

(b) Which of the following is an example of a **chemical** change?

- (a) an ice cube melting on a warm day
- (b) adding sugar to a cup of tea
- (c) cooking an egg
- (d) chopping wood

(c) The melting point of bromine is −7°C.
The boiling point of bromine is 59°C.
What state would bromine be at room temperature?

- (a) Aqueous
- (b) Gas
- (c) Liquid
- (d) Solid

(d) What is the name of the gas made when copper carbonate reacts with hydrochloric acid?

- (a) carbon dioxide
- (b) chlorine
- (c) hydrogen
- (d) oxygen

(e) What is the major source of carbon monoxide in the Earth's atmosphere?

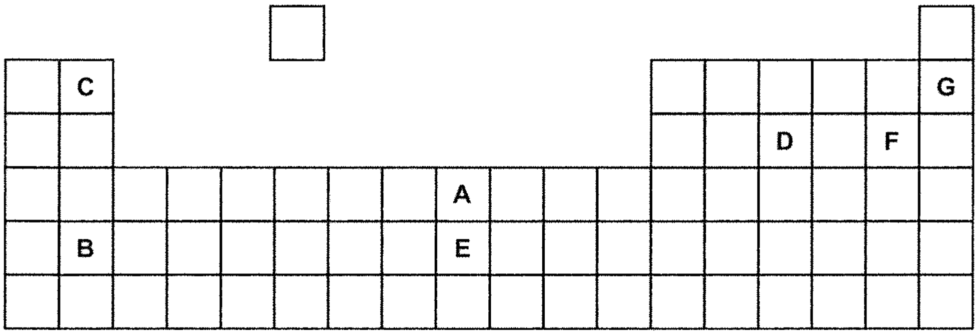
- (a) Incomplete combustion of fossil fuels and wood.
- (b) Production in a nuclear power station.
- (c) The combustion of impurities in coal.
- (d) The combustion of impurities in natural gas.

(f) Which of these pH values shows the pH of a strong acid?

(a) pH 1 (b) pH 4 (c) pH 7 (d) pH 10 (e) pH 14

(g) The positions of some elements in the Periodic Table are shown by the letters A to G.

The letters shown are not the symbols of the elements.



Which elements are in Period 2?

- (a) A and E
- (b) C and B
- (c) C and G
- (d) D and F

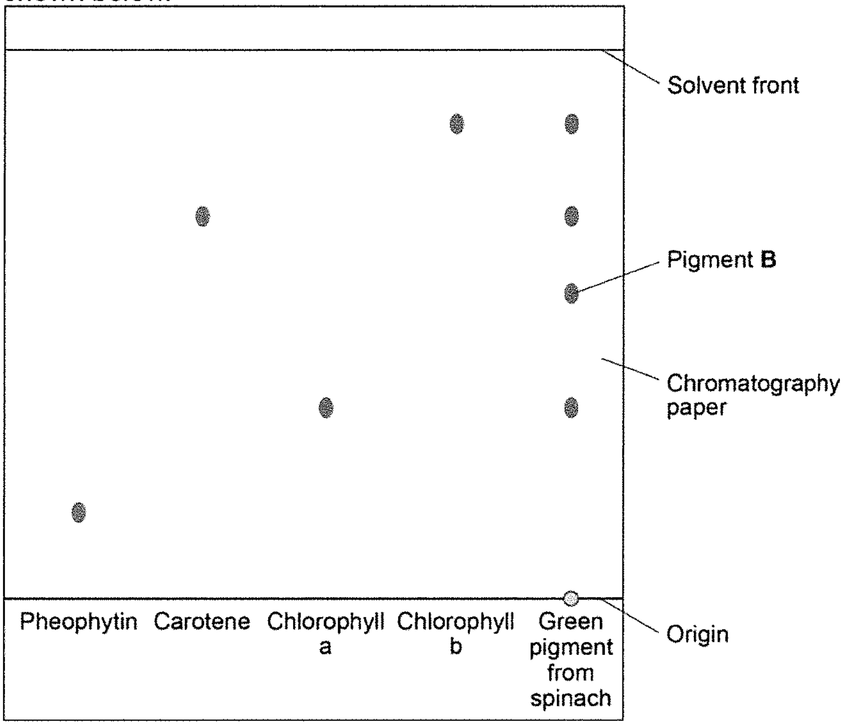
(h) Which statement describes the test for hydrogen gas?

- (a) A glowing splint re-lights.
- (b) Limewater turns milky.
- (c) A lighted splint makes a squeaky pop.
- (d) Damp litmus paper is bleached.

QUESTION TWO

A student used chromatography to identify the pigments in spinach leaves.
She used propanone as a solvent.

The student's results are shown below.



(a) What do the results tell you about the green pigment from spinach? (3 marks)

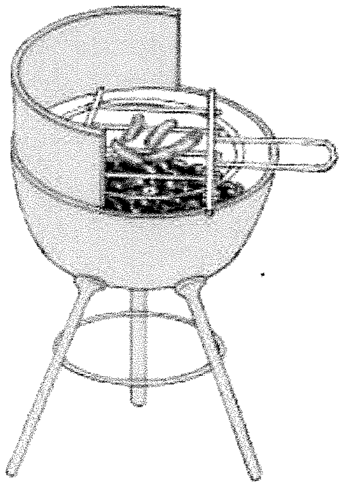
(b) Use the following equation to calculate the R_f value for pigment **B**.

$$Rf = \frac{distance\ moved\ by\ substance}{distance\ moved\ by\ solvent}$$

Give your answer to **two** decimal places. (3 marks)

QUESTION THREE

Susie cooked sausages on a barbecue.



(a) Fat and water in the sausages changed state.

Draw **one** line from each statement to the correct change of state.
Draw only **two** lines. (2 marks)

statement	change of state
	liquid to gas
fat melted	gas to liquid
	liquid to solid
water evaporated	solid to liquid
	solid to gas

(b) Susie uses charcoal as the fuel for the barbecue.

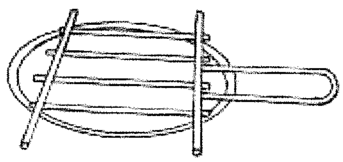
(i) Which statement is true about all fuels?
Tick the correct box. (1 mark)

All fuels are sources of energy.	☐	All fuels are black.	☐
All fuels are made from wood.	☐	All fuels are solid.	☐

(ii) Which gas in the air is needed for fuels to burn?
Tick the correct box. (1 mark)

water vapour	☐	oxygen	☐
nitrogen	☐	carbon dioxide	☐

(c) The metal grill of the barbecue is made of steel.
Six properties of steel are given below.

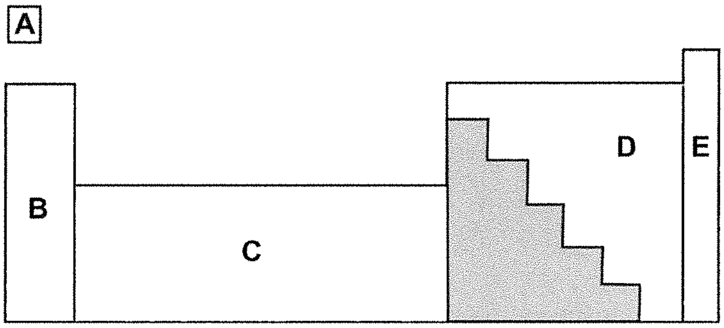


Which properties are needed for the metal grill?
Tick **two** correct boxes. (2 marks)

It conducts electricity.	☐	It is rigid.	☐
It has a very high melting point.	☐	It is magnetic.	☐
It is shiny.	☐	It rusts.	☐

QUESTION FOUR

(a) The diagram below shows part of the periodic table of elements.



The shaded area contains **only** metal elements.

Two other areas also contain **only** metal elements.

Which areas contain only metal elements?
Tick the **two** correct boxes. (1 mark)

A ☐ B ☐ C ☐ D ☐ E ☐

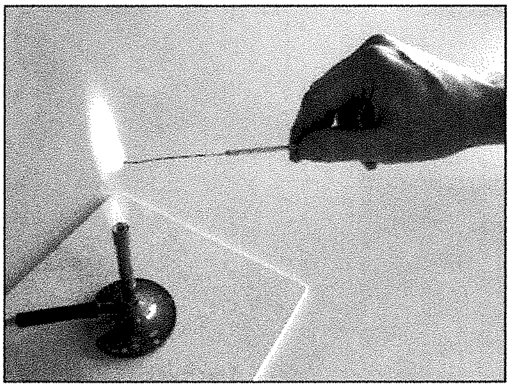
(b) Copper is a metal.

At room temperature copper is a strong solid.
Give **two** other properties of copper that show it is a metal. (2 marks)

1. ____________________

2. ____________________

(c) When copper metal is heated it reacts with a gas in air.



What is the chemical name of the product formed when copper reacts with a gas in air?
(1 mark)

____

d) Which statement below describes what happens in a **chemical change** but **not** in a physical change?

Tick the correct box. (1 mark)

The product is a solid.	☐
The change only happens at a high temperature.	☐
The atoms have combined in a different way to make a new substance.	☐
The types of atoms at the start are the same as in the end product.	☐

QUESTION FIVE

Solder is a mixture of lead and tin.
The melting point of solder depends on the amount of tin in the mixture.

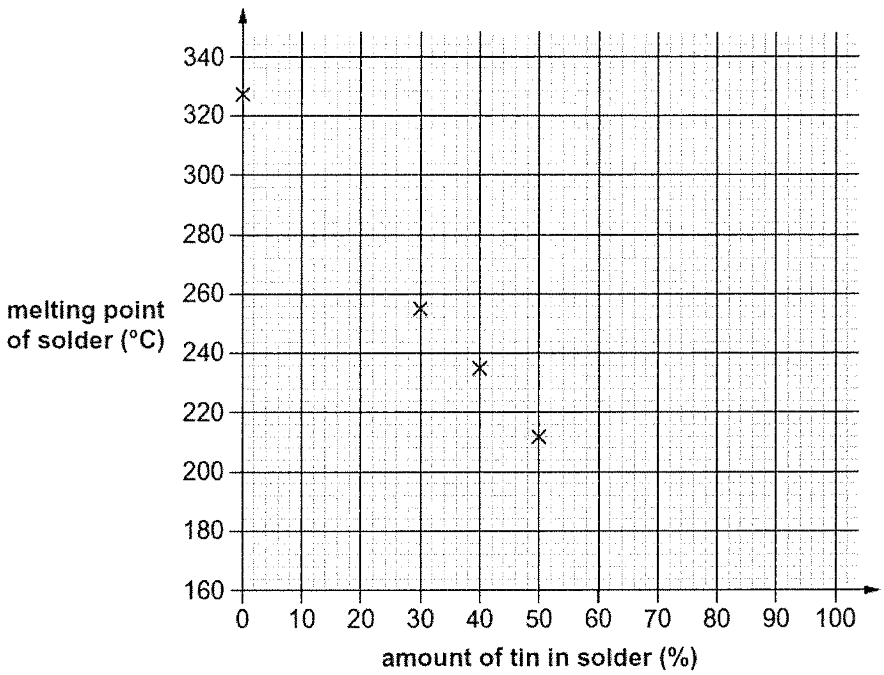
(a) Look at the table below.

amount of tin in solder (%)	melting point of solder (°C)
0	327
30	255
40	235
50	212
60	188
70	192
80	205
90	220
100	232

(i) The melting point of pure tin is 232°C.
What is the melting point of pure lead? (1 mark)

______________ °C

(ii) Use the data in the table to plot the points on the grid below.
Four of the points are plotted for you.
Draw **two straight lines of best fit**. (3 marks)



(b) Use your graph to estimate the amount of tin needed to make solder with the lowest melting point. (1 mark)

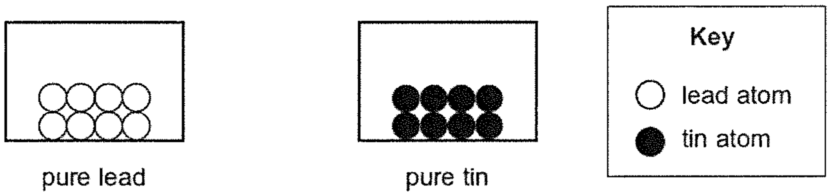
_______________ %

(c) Describe how the melting point of solder changes with the amount of tin in the solder. (2 marks)

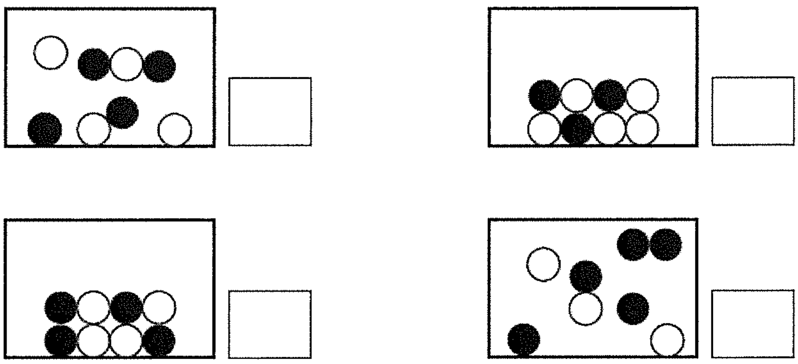
____

____

(d) The diagrams below show the arrangement of atoms in solid samples of pure lead and pure tin.



Which box shows the correct arrangement of the lead atoms and tin atoms in a sample of solder that has a melting point of 212°C at room temperature?
Use the table on the opposite page.
Tick the correct box. (1 mark)



Section C

Physics

(33 Marks)

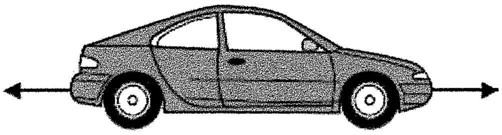
You are advised to spend no more than 30 minutes on this section

Q1. The picture shows a child kicking a football. The football falls to the ground after it has been kicked.

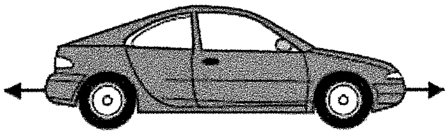
Which is the correct reason why the football falls to the ground?

(a) **A.** the force of gravity acts between the Earth and the football
(b) **B.** the force of gravity acts between the Earth and the child
(c) **C.** the force of gravity acts between the child's foot and the football
(d) **D.** the force of gravity acts between the child's head and the football

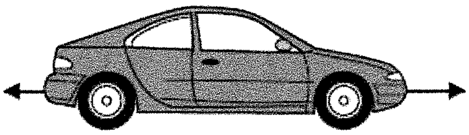
Q2. The diagrams show two forces acting on a car that is moving forward. **In which diagram is the car speeding up?**



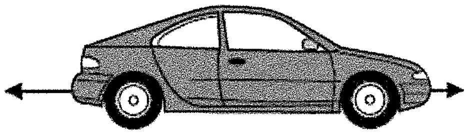
☐ A



☐ B

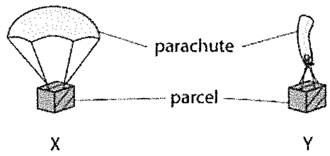


☐ C



☐ D

Q3. Two parcels, X and Y, of the same size and mass are dropped from an aeroplane at the same time.Each parcel has a parachute attached.
The parachute on parcel X opens correctly.
The parachute on parcel Y does not open correctly



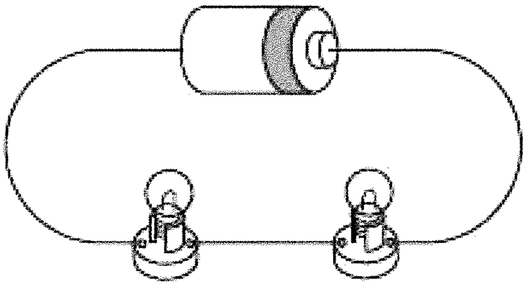
(a) **A.** Y lands first because it has the least air resistance
(b) **B.** X lands first because the parachute reduces air resistance
(c) **C.** Y lands first because the parachute decreases the force of gravity on the parcel
(d) **D.** X lands first because the parachute increases the force of gravity on the parcel

Q4. Which statement about weight is true?

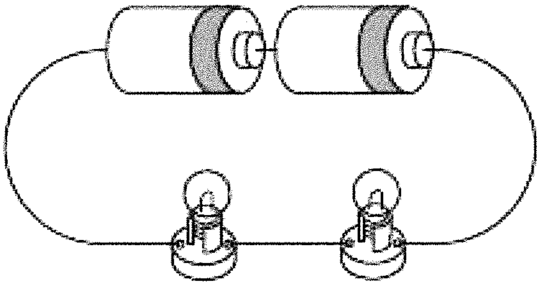
(a) **A.** it is an area
(b) **B.** it is a force
(c) **C.** it is a length
(d) **D.** it is a volume

Q5. In which circuit will the bulbs be brightest?
All cells and all bulbs are identical.

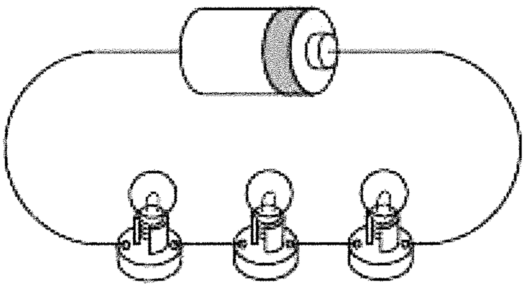
ⓐ **A**



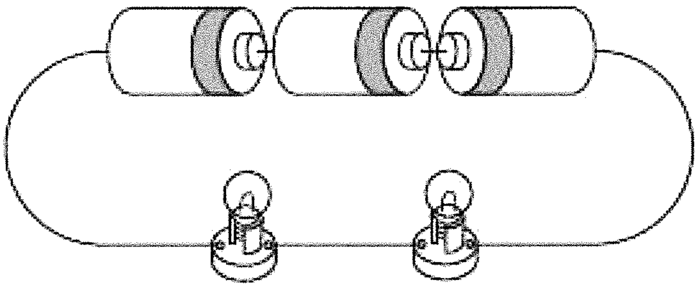
ⓑ **B**



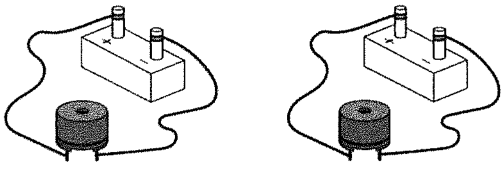
ⓒ **C**



ⓓ **D**



Q6. The diagram shows two electrical circuits, A and B. Each circuit has a cell connected to an identical buzzer.

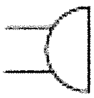
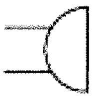


circuit A circuit B

The buzzer in circuit A is louder than the buzzer in circuit B.
Which is the correct reason why the buzzer in circuit A is louder?

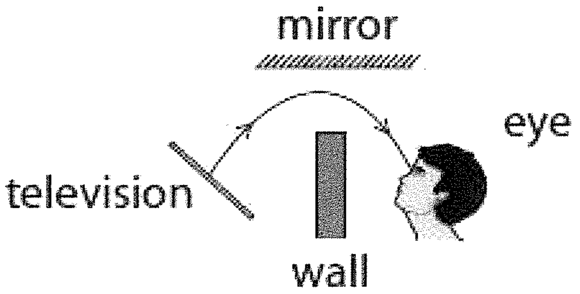
- (a) **A.** the voltage in circuit A and in circuit B is zero
- (b) **B.** the voltage in circuit A is greater than the voltage in circuit B
- (c) **C.** the voltage in circuit A is less than the voltage in circuit B
- (d) **D.** the voltage in circuit A is the same as the voltage in circuit B

Q7. Which row of the table shows the correct circuit symbols for a bulb and a cell?

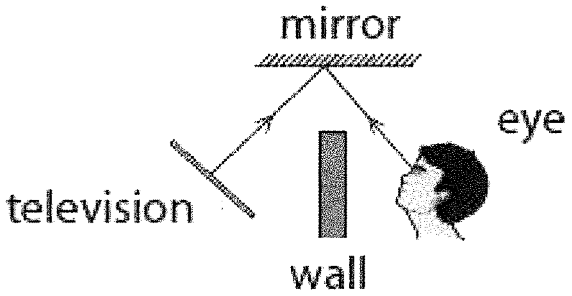
☐	**A**		
☐	**B**		
☐	**C**		
☐	**D**		

Q8. Which shows a correct ray diagram for light travelling from the television to the viewer's eye?

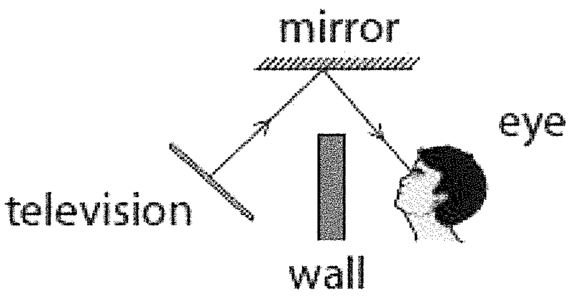
ⓐ **A**



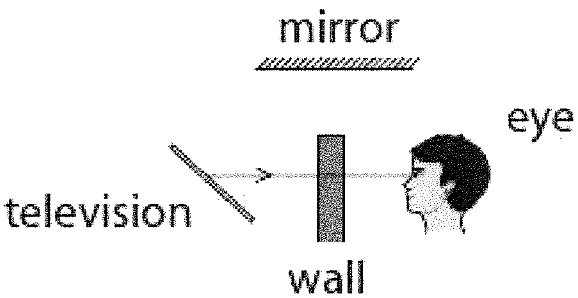
ⓑ **B**



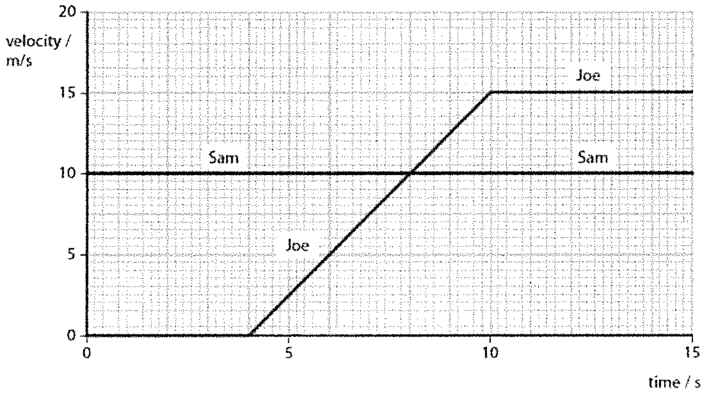
ⓒ **C**



ⓓ **D**



Q9. Sam and Joe are on their bikes. They are on a flat, straight road.
(a) Joe is stationary when Sam rides past at a constant velocity of 10 m/s.
Joe waits for 4 s and then follows Sam.
This is a velocity/time graph of their motion.



(i) How far did Sam travel during these 15 s?
distance = velocity × time

- (a) **A.** 1.5 m
- (b) **B.** 10 m
- (c) **C.** 100 m
- (d) **D.** 150 m

(ii) At which of these times is the resultant force on Joe bigger than the resultant force on Sam?

- (a) **A.** at 3 s
- (b) **B.** at 7 s
- (c) **C.** at 11 s
- (d) **D.** at 15 s

(iii) For how many seconds was Joe accelerating? (1)

number of seconds = ... s

(b) The diagram shows the horizontal forces acting on Joe at one point while he is accelerating.

(i) Calculate the size of the resultant horizontal force acting on Joe and his bike. **(2)**

size of resultant force = ... N

(ii) The total mass of Joe, his heavy bag, and his bike is 55 kg.
Calculate the total weight. If Weight equals Mass x Gravitational Field Strength.
Gravitational field strength, g = 10 N/kg **(1)**

total weight = ... N

(c) On another day, Joe is riding the same bike on the same piece of road.
This time he does not have the heavy bag on his back.
He finds that it is easier to accelerate.
Explain why Joe finds it easier to accelerate. **(2)**

....

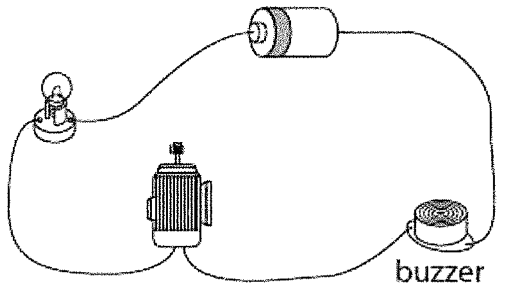
....

....

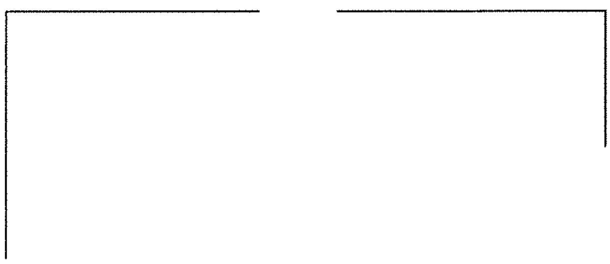
....

(Total for Question = 8 marks)

Q10. The drawing shows an electrical circuit.



(a) Complete the circuit diagram for this circuit. Use the correct scientific symbols for each component. **(2)**



(b) Explain why electrical cables are made from a copper wire inside a plastic covering.

(Source: © Ilya Bolotov/Shutterstock)

(2)

....

....

....

....

(Total for question = 4 marks)

Q11. (a) A day on Jupiter lasts 10 hours.
A day on Earth lasts 24 hours.
Explain why Jupiter has a shorter day than Earth. **(2)**

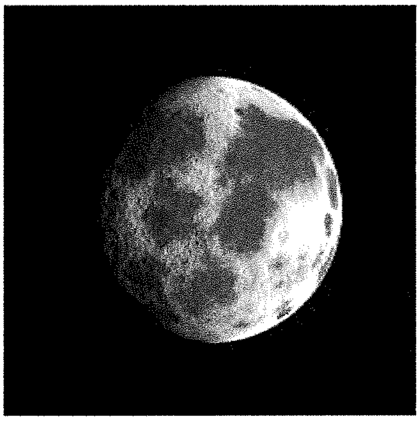
....

....

....

....

(b) At night, when it is dark on Earth, the Moon can be seen in the sky.



(Source: LeStudio / Shutterstock)

The Moon is not a source of light.

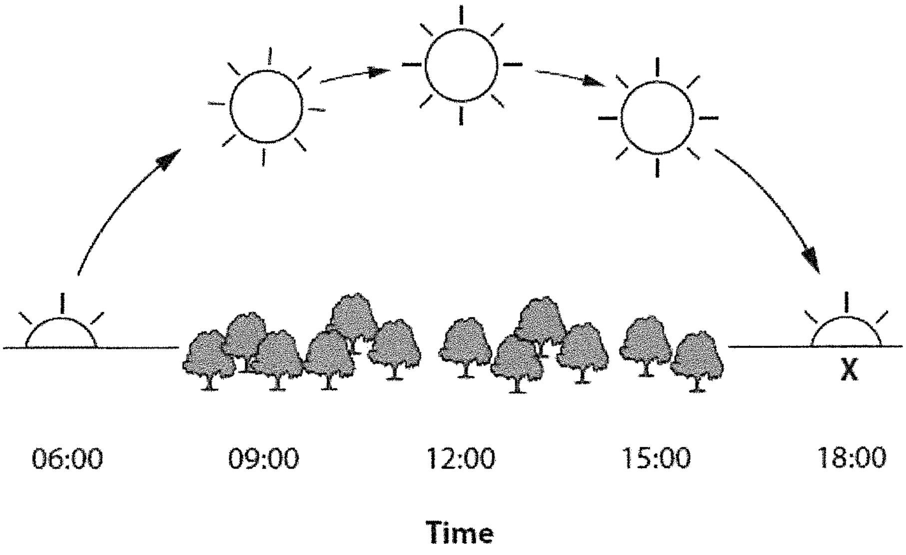
Why can the Moon be seen at night? **(1)**

....

....

(Total for question = 3 marks)

Q12. (a) The diagram shows how the Sun appears to move across the sky when observed from Earth at different times of the day.



(i) State why the Sun appears to move across the sky. **(1)**

....

(ii) State what is taking place at point **X**on the diagram. (1)

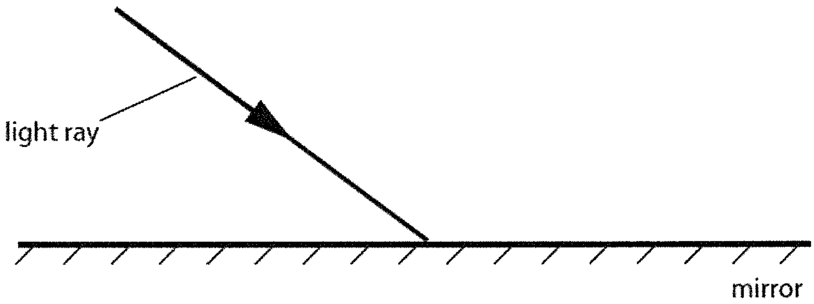
....

(b) State the relationship between the length of a shadow and the position of the Sun in the sky. (1)

....

(Total for question = 3 marks)

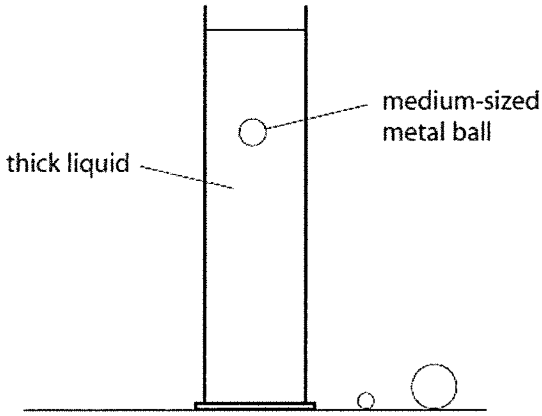
Q13. The diagram shows a light ray hitting the surface of a mirror.



Complete the diagram by adding the normal and the reflected ray of light.

(Total for question = 3 marks)

Q14. The diagram shows the equipment a student used to investigate how long it takes three different-sized metal balls to travel through a thick liquid.



(a) They use the following method.
Step 1: pour the thick liquid into a tall container.
Step 2: hold the metal ball just above the surface of the liquid.
Step 3: release the metal ball and time how long it takes to reach the bottom of the container.
Step 4: repeat the experiment with the other two metal balls.
(i) Name the force that causes the metal ball to fall to the bottom of the container.

.... (1)

(ii) Name the piece of equipment needed in Step 3.

.... (1)

The table shows the student's results.

Size of metal ball	Time to travel to the bottom of the container in seconds (s)
medium	12
small	24
large	6

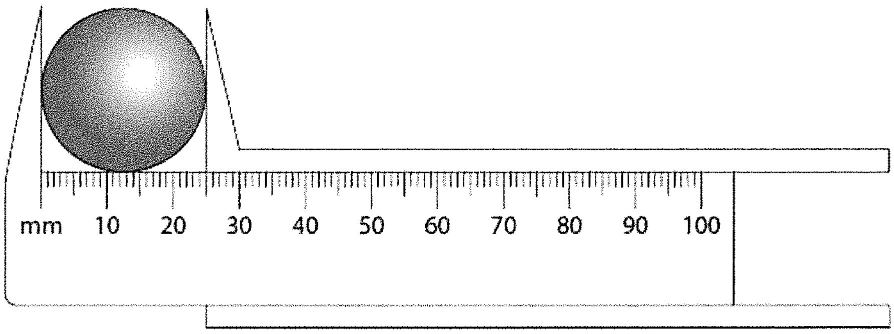
Before the student started the experiment they were given four predictions.
Prediction 1: the smallest metal ball will take the least time.
Prediction 2: the smallest metal ball will take three-times longer than the largest metal ball.
Prediction 3: the medium-sized metal ball will travel slowest.
Prediction 4: the largest metal ball will travel the fastest.
(b) Which prediction was correct?

.... (1)

To improve the experiment, the student measured the diameter of the metal balls.
(c) What is the diameter of the metal ball shown in the diagram below?

(1)

.... mm



(Total for question = 4 marks)