Cambridge Assessment International Education

Science

Stage 9

Paper 1

2022

Cambridge Lower Secondary Progression Test

Name

Class

Date

45 minutes

No additional materials are needed.

INSTRUCTIONS

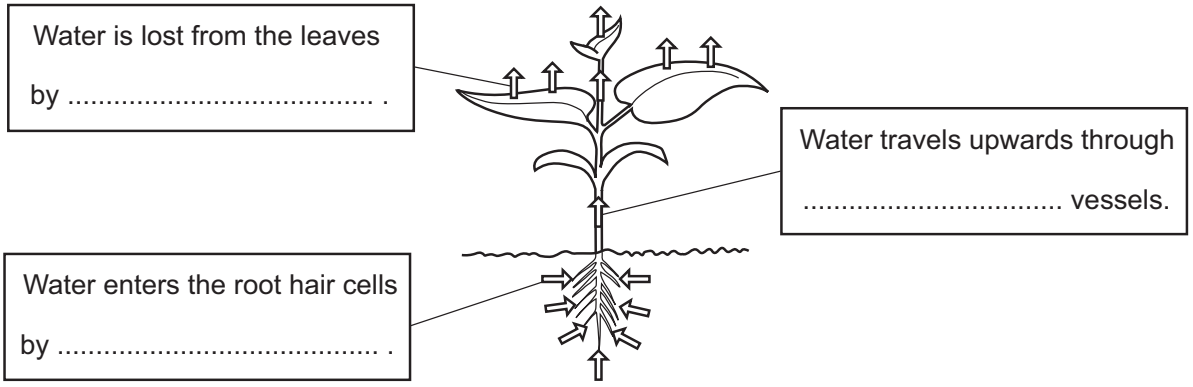
- Answer **all** questions.
- Write your answer to each question in the space provided.
- You should show all your working on the question paper.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

1 Look at the diagram of a plant.

It shows the movement of water through the plant.



(a) Complete the **three** labels on the diagram. [2]

(b) Minerals are dissolved in the water that moves through a plant.

Write down the name of the mineral needed to make chlorophyll.

..... [1]

2 Look at the diagram.

It shows part of the Periodic Table.

		H					He
Li	Be		B	C	N	O	F	Ne
Na	Mg		Al	Si	P	S	Cl	Ar
K	Ca	transition elements						

(a) Write down the chemical symbol for the element which has the electronic structure 2.8.4.

..... [1]

(b) Write down the chemical symbol for an element in the same **group** as Be.

..... [1]

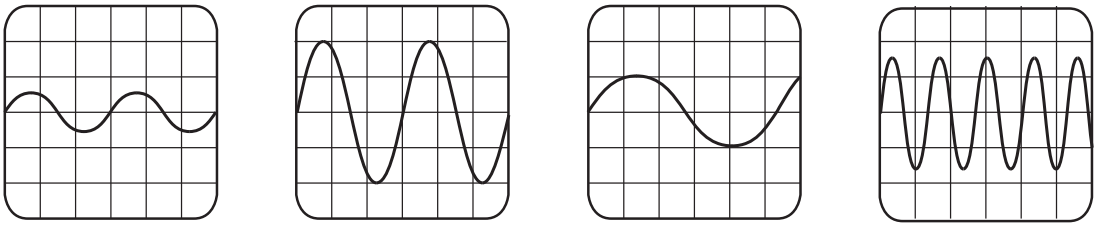
(c) Hydrogen and oxygen react together to make **molecules** of water.

Write down the **type** of bonding in a water molecule.

..... [1]

3 Angelique investigates four sounds **A**, **B**, **C** and **D** using an oscilloscope.

Look at her oscilloscope traces.



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

(a) Circle the **loudest** sound.

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

[1]

(b) Which of these will make the sound **louder**?

Tick (✓) the correct answer.

increasing the frequency	☐	decreasing the frequency	☐
increasing the amplitude	☐	decreasing the amplitude	☐

[1]

(c) Circle the sound with the **highest** pitch.

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

[1]

(d) Which of these **increases** the pitch of the sound?

Tick (✓) the correct answer.

increasing the frequency	☐	decreasing the frequency	☐
increasing the amplitude	☐	decreasing the amplitude	☐

[1]

4 This question is about stars and star systems.

(a) Stars can be classified according to their properties.

Look at the table of the properties of some stars.

star type	colour	average mass (the Sun = 1)	average radius (the Sun = 1)	average luminosity (the Sun = 1)
O	blue	60	15	1 400 000
B	blue	18	7	66 000
A	blue	3.2	2.5	80
F	blue to white	1.7	1.3	6
G	white to yellow	1.1	1.1	1.2
K	orange to red	0.8	0.9	0.4
M	red	0.3	0.4	0.04

Rigel is a star with:

- mass 18 times that of the Sun
- luminosity 66 000 times that of the Sun.

Write down the **star type** and the **colour** of Rigel.

star type .....

colour .....

[1]

(b) Scientists have developed a model to explain how star systems form.

- Clouds of dust and gas collapse due to gravity.
- Most of the mass collects in the centre forming a star.
- The rest of the mass forms a flattened disc.
- Planets and other objects are formed from this mass.
- Collisions occur between planets and other objects in the star system.

(i) Write down the name given to clouds of dust and gas that collapse due to gravity.

..... [1]

(ii) Charon is a satellite moon of the dwarf planet Pluto.

Use the model to suggest how Charon may have been formed.

.....

.....

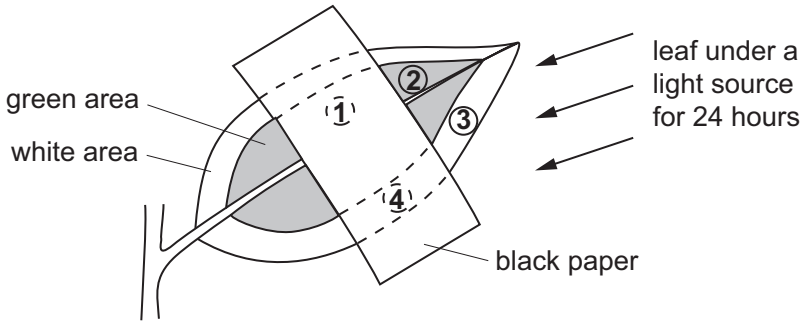
..... [2]

5 Pierre investigates photosynthesis.

Look at the leaf. It has some areas that are green and other areas that are white.

Pierre:

- puts a small strip of black paper across part of the leaf
- puts the leaf under a light source for 24 hours.



Pierre then:

- cuts out the four different parts of the leaf labelled **1**, **2**, **3** and **4**
- adds these parts to separate test-tubes containing a small volume of ethanol
- heats each test-tube to remove any green colour from the leaf parts
- tests parts **1**, **2**, **3** and **4** for starch with iodine solution.

(a) Ethanol is a flammable liquid.

Describe how Pierre safely heats each test-tube containing ethanol.

.....

..... [1]

(b) When starch is present iodine turns black.

Look at the results.

part	1	2	3	4
	○	●	○	○

Starch is made after photosynthesis happens.

Explain how the results show that both light and chlorophyll must be present for photosynthesis.

light .....

.....

chlorophyll .....

.....

[2]

6 Iron is a solid at room temperature.

A block of iron has a volume of 40 cm^3.

The mass of the block is 316 g.

(a) Calculate the density of iron in g/cm^3.

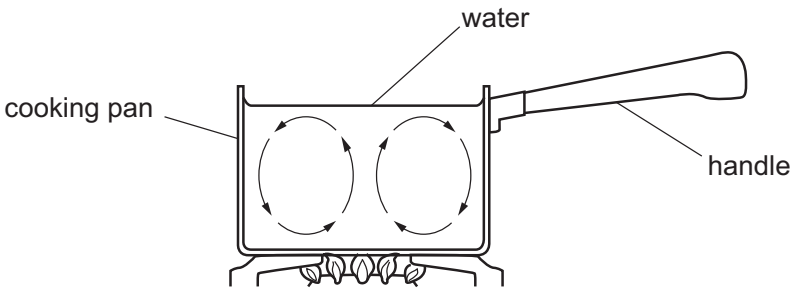
density of iron = ... g/cm^3 [2]

(b) Hydrogen is a gas at room temperature.

Describe how the density of hydrogen compares to the density of iron.

..... [1]

7 Carlos heats water in a cooking pan.



(a) Write down the name of the thermal energy transfer process shown by the arrows on the diagram.

..... [1]

(b) Carlos puts a lid on his cooking pan.

The water in the cooking pan heats up faster.

Explain why.

.....

..... [1]

(c) Some pans have steel handles.

Other pans have wooden handles.

Which material, steel or wood, is best for making the handles of pans?

.....

Explain your answer.

.....

[1]

8 Scientists believe a collision between the Earth and a huge asteroid happened millions of years ago.

They think that large clouds of dust blocked the light of the Sun for many years.

Scientists believe this caused the extinction of the dinosaurs.

Suggest **three** reasons why this collision caused the extinction of the dinosaurs.

1 .....

.....

2 .....

.....

3 .....

.....

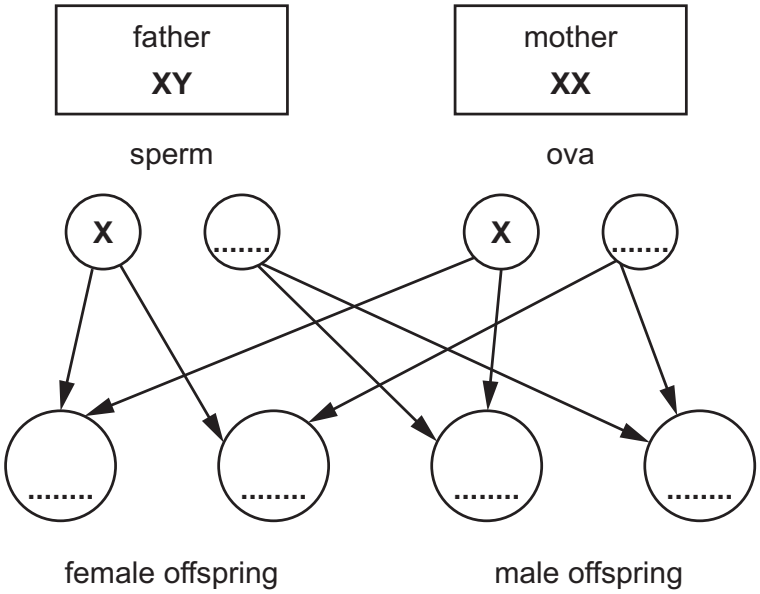
[3]

9 This question is about inheritance and variation.

(a) In humans, sex is determined by a pair of sex chromosomes.

There are two different sex chromosomes, **X** and **Y**.

Complete the diagram to show how these two chromosomes are inherited in humans.



[2]

(b) Humans and rabbits show variation.

Look at the pictures of three rabbits.

(i) One example of variation is length of leg.

Write down **one other** example of variation seen in these rabbits.

.....

[1]

(ii) What is the cause of this variation?

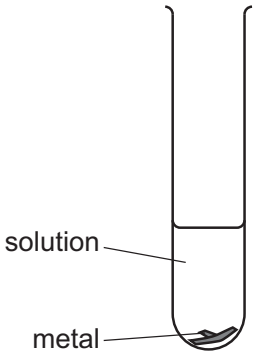
.....

[1]

10 Blessy investigates the displacement reactions of four metals.

The metals are copper, magnesium, zinc and iron.

She puts the metals into solutions of metal salts and identifies if there is a reaction.



Look at her table of results.

key
✓ = reaction
× = no reaction

metal	**solution**			
	copper sulfate	magnesium sulfate	zinc sulfate	iron sulfate
copper	×	×	×	×
magnesium	✓	×	✓	✓
zinc	✓	×	×	✓
iron	✓	×	×	×

(a) Write down the order of reactivity of these **four** metals.

most reactive .....

.....

.....

least reactive .....

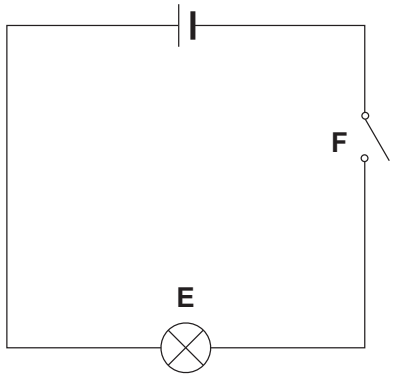
[1]

(b) Complete the word equation for the reaction between zinc and copper sulfate.

zinc + copper sulfate → .... + ...

[1]

11 Look at the circuit diagram.



(a) Which electrical component is shown by **E**?

.....[1]

(b) Which electrical component is shown by **F**?

.....[1]

(c) The current in the circuit is 0.50 A.

The voltage is 12 V.

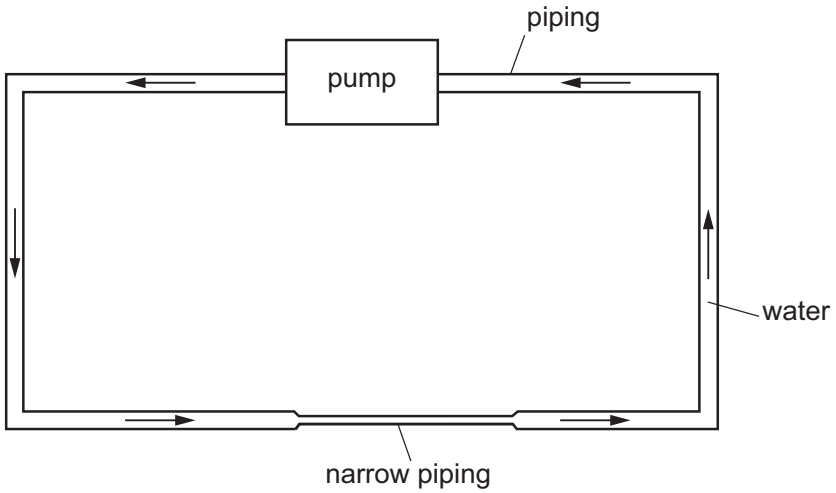
Calculate the resistance of component **E**.

resistance = ... Ω [1]

(d) Electrical circuits can be modelled using water flowing through pipes.

Look at the diagram.

The arrows show the direction of water flow.



Water is pumped around the piping.

(i) Which part of an electrical circuit is modelled by the pump?

.....[1]

(ii) Which part of an electrical circuit is modelled by the narrow pipe?

.....[1]

(iii) Complete the sentence.

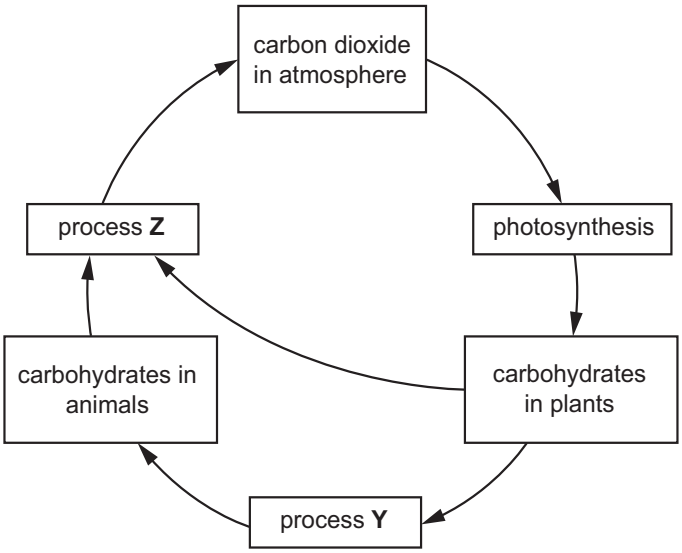
Choose from the list.

current **power** **resistance** **voltage**

The flow of water models the ..... in an electrical circuit. [1]

12 **(a)** This question is about carbon dioxide in the atmosphere.

Look at the diagram of the carbon cycle.



(i) Write down the name of process **Y**.

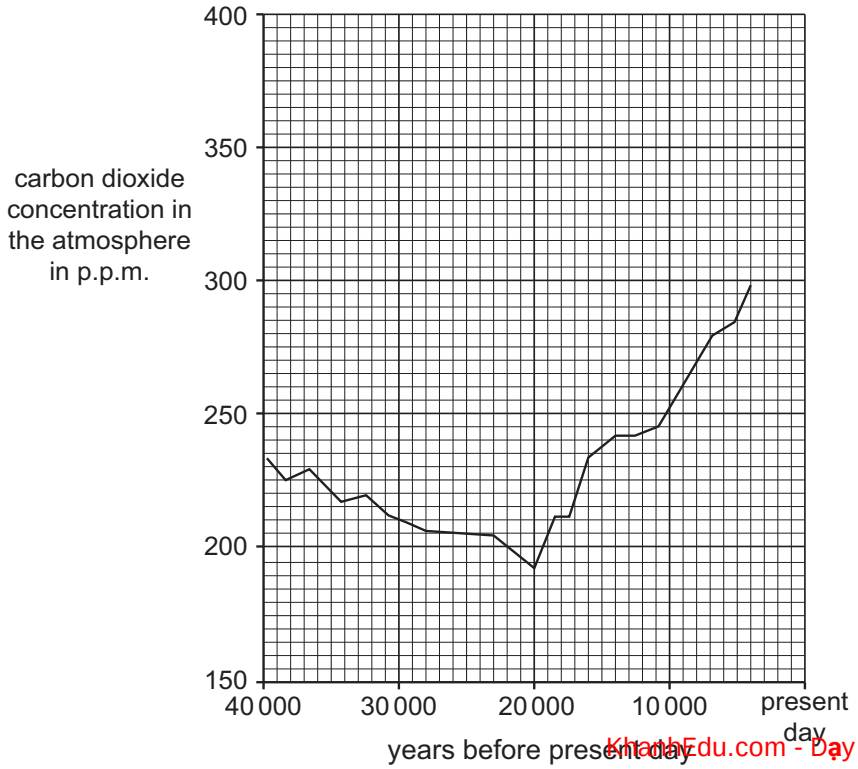
..... [1]

(ii) Write down the name of the gas needed for process **Z**.

..... [1]

(b) Look at the graph.

It shows the carbon dioxide concentration in the atmosphere during the last 40 000 years.



(i) Look at the carbon dioxide concentration in the atmosphere between 40 000 years and 4000 years before present day.

Describe how the carbon dioxide concentration in the atmosphere changes during these years.

.....

..... [2]

(ii) The carbon dioxide concentration in the air during the last 4000 years is not shown on the graph.

Draw a line on the graph to show the carbon dioxide concentration from 4000 years ago to present day. [1]

(c) Carbon dioxide levels in the atmosphere are linked to increases in global temperature.

Describe **one other** effect that the predicted carbon dioxide concentration might have in the future.

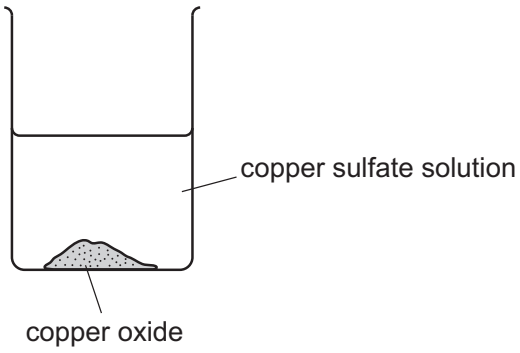
..... [1]

13 Ahmed makes some copper sulfate crystals.

He adds an excess of copper oxide to warm dilute sulfuric acid in a beaker.

After the reaction the beaker contains copper sulfate solution and the excess copper oxide.

Copper oxide is insoluble in water.



Describe how Ahmed makes copper sulfate crystals from the contents of the beaker.

.....

.....

.....

..... [3]

14 Look at the information about some Group 1 elements.

element	electronic structure	melting point in °C
lithium	2.1	181
sodium	2.8.1	98
potassium	2.8.8.1	64
rubidium		

Gabriella makes some predictions about rubidium.

Rubidium is below potassium in the Periodic Table.

(a) Predict the number of electrons in the outer orbit (shell) of an atom of rubidium.

..... [1]

(b) Predict the melting point of rubidium.

melting point = ... °C [1]

(c) Predict how the reactivity of rubidium compares to lithium, sodium and potassium.

..... [1]