Cambridge Assessment International Education

Science

Stage 9

Paper 2

2023

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.

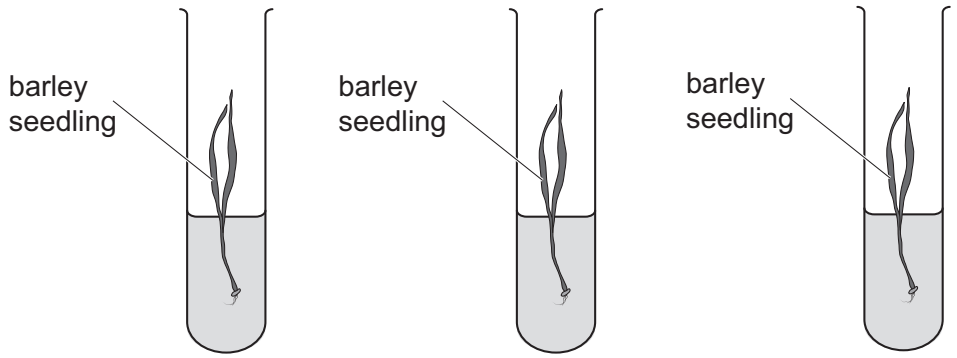
INFORMATION

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

1 Priya investigates the effect of nitrate ions and magnesium ions on the growth of barley seedlings.

Priya does three experiments.

In each experiment she puts one barley seedling and 3 cm^3 of a mineral solution into a test-tube.



mineral solution containing nitrate ions and magnesium ions

mineral solution containing magnesium ions and **no** nitrate ions

mineral solution containing nitrate ions and **no** magnesium ions

After four weeks Priya dries the seedlings in an oven and measures their dry mass.

Here are her results.

experiment	**dry mass of the barley seedling in g**
mineral solution containing nitrate ions and magnesium ions	3.8
mineral solution containing magnesium ions and **no** nitrate ions	1.9
mineral solution containing nitrate ions and **no** magnesium ions	2.8

Describe and explain the effect of nitrate ions and the effect of magnesium ions on the growth of barley seedlings.

Use information from the table in your answer.

.....

.....

.....

.....

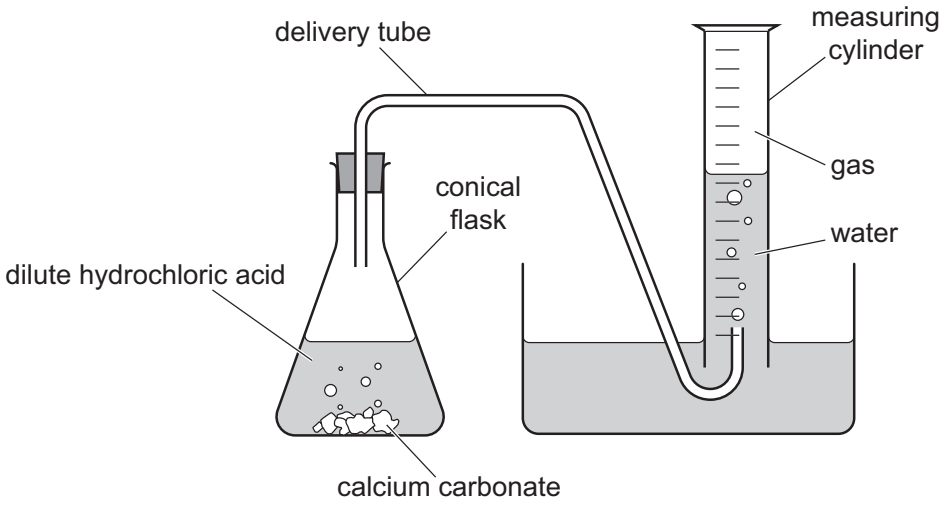
.....

[4]

2 Dilute hydrochloric acid reacts with calcium carbonate.

Blessy plans an investigation to find out the effect of concentration of acid on the rate of this reaction.

The diagram shows the equipment she uses.



(a) (i) Identify the independent variable in this investigation.

.....[1]

(ii) Describe how Blessy measures the dependent variable in this investigation.

dependent variable .....

how it is measured .....

.....

[1]

(iii) Identify **two** variables that Blessy must control.

1 .....

2 .....

[1]

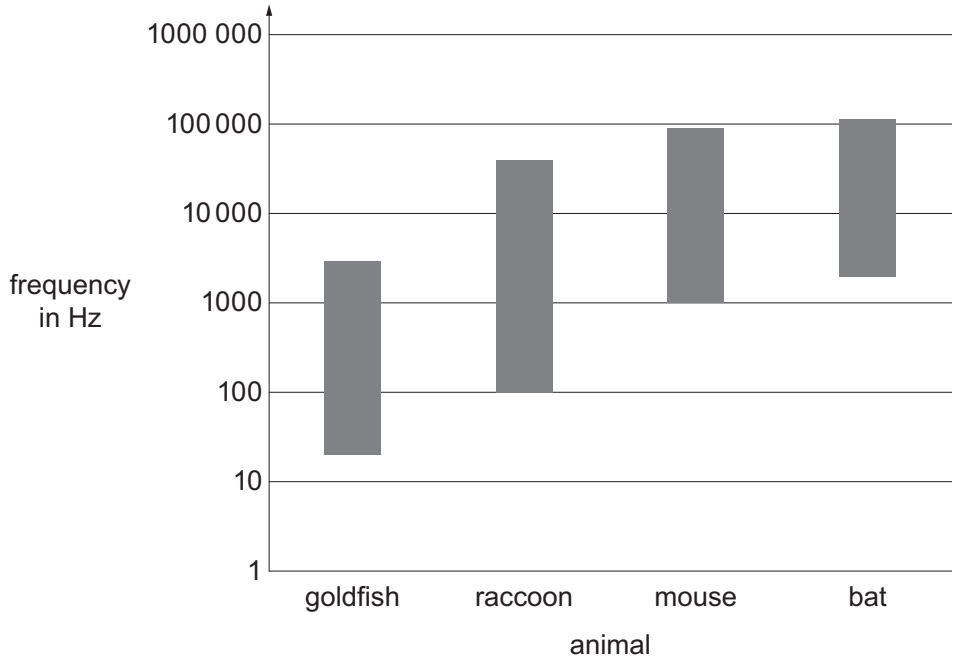
(b) Identify **one** safety risk in the investigation and describe how to control the risk.

safety risk .....

how to control the risk .....

[2]

3 The diagram shows the range of frequencies of sound waves that different animals hear.



(a) Write down the **lowest** frequency of sound a racoon hears.

..... Hz

[1]

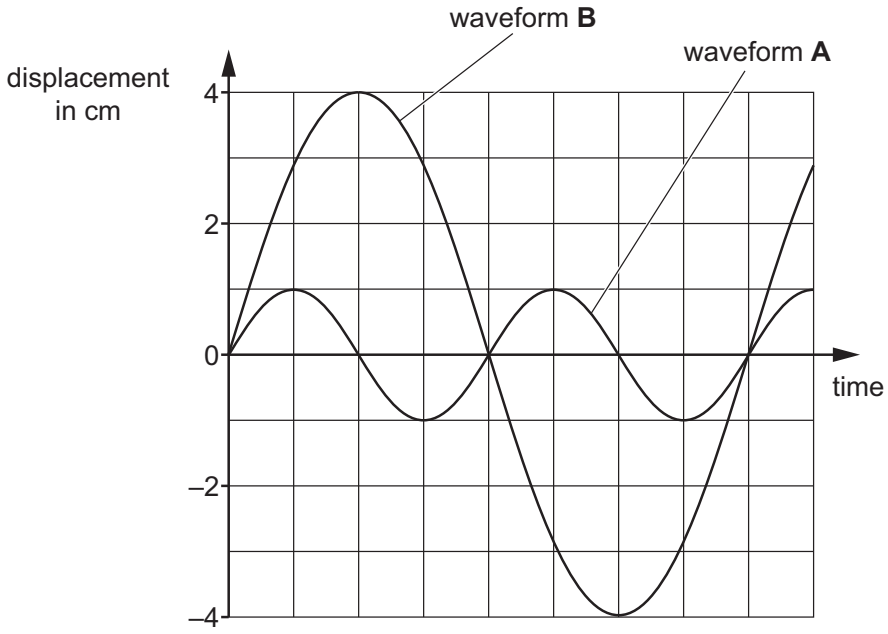
(b) Estimate the range of frequencies a mouse hears.

..... Hz

[1]

(c) Look at the graph showing the waveforms of two sound waves.

Waveform **A** and waveform **B** have different frequencies and different amplitudes.



(i) Describe how increasing the frequency of a sound wave changes the sound we hear.

.....[1]

(ii) Describe how increasing the amplitude of a sound wave changes the sound we hear.

.....[1]

(d) (i) Calculate how many times bigger the **amplitude** of waveform **B** is than waveform **A.**

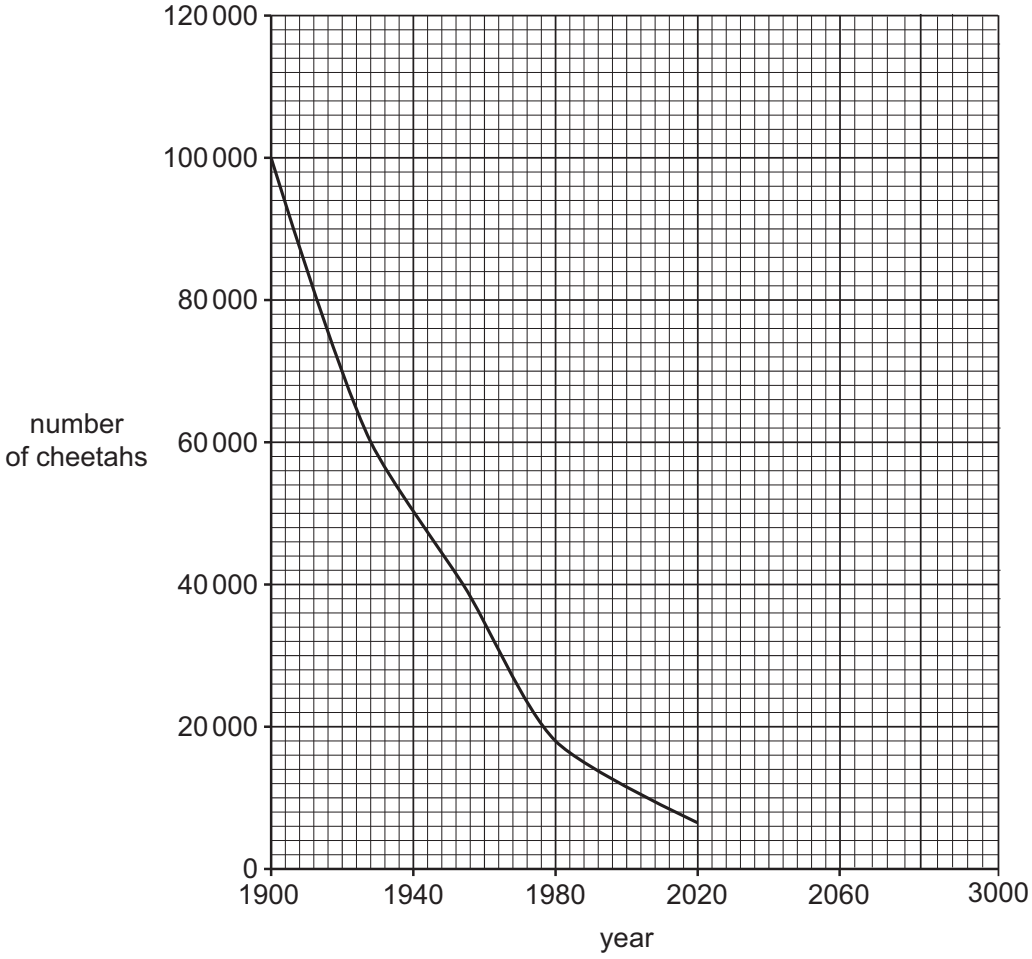
.....[1]

(ii) Calculate how many times bigger the **frequency** of waveform **A** is than waveform **B**.

.....[1]

4 This question is about the population of cheetahs and sea turtles.

(a) Look at the graph showing the change in the number of cheetahs since 1900.



(i) Describe the change in the number of cheetahs between 1900 and 2020.

.....

..... [1]

(ii) Draw an extension to the line of best fit to the *x*-axis.

Estimate the year when the cheetah becomes extinct.

year ..... [2]

(iii) The change in the number of cheetahs may be due to natural selection.

Describe the theory of natural selection.

.....

.....

.....

..... [2]

(b) Carbon dioxide levels in the atmosphere are linked to increased Earth surface temperature and rising sea levels.

Sea turtles live in the ocean and come to shore to build nesting sites in the sand.

The sex of the sea turtle offspring is linked to the surface temperature of the sand.

At warmer temperatures more of the offspring are female than male.

(i) The population of the sea turtles might change because of an increase in the **surface temperature** of **sand**.

Complete the sentences.

The population of sea turtles might **increase** because .....

.....

The population of sea turtles might **decrease** because .....

.....

[2]

(ii) Suggest how the **rising sea level** will affect the population of the sea turtles.

Write down **two** reasons for your answer.

effect on the population .....

reason 1 .....

.....

reason 2 .....

.....

[2]

5 Chen measures the mass and volume of some substances.

He calculates the density of each substance.

The table shows his results.

substance	mass in g	volume in cm^3	density in g/cm^3
A	395	50	7.9
B	0.22	100	0.0022
C	452	40	11
D	328	45	7.3
E	340	38	

(a) Calculate the density of substance **E**.

Give your answer to **two** significant figures.

density of substance **E** = ... g/cm^3 [3]

(b) Which substance in the table is a gas?

Explain your answer.

substance .....

explanation .....

.....

[2]

6 Perspiration is a watery liquid produced by the skin.

The water evaporates to cool the skin.

Explain the cooling effect of evaporation.

Use ideas about particles.

.....

.....

.....

..... [3]

7 This question is about the carbon cycle.

(a) Draw a straight line to match the **process** to its correct **description**.

process	description
combustion	carbohydrate moves from one organism to another organism
decomposition	the breakdown of dead and decaying waste material
feeding	the burning of fossil fuels
photosynthesis	the release of energy from the breakdown of glucose
respiration	the formation of glucose and oxygen by green plants

[4]

(b) Name the process in the carbon cycle that decreases the amount of carbon in the atmosphere.

..... [1]

8 The Earth's crust is split into large pieces of rock.

These large pieces of rock float on top of the molten magma in the mantle.

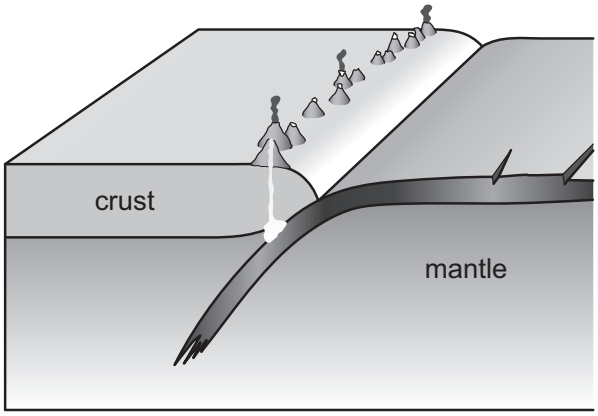
(a) Write down the name of these large pieces of floating rock.

.....[1]

(b) Convection currents in the mantle cause these floating rocks to move.

(i) Look at the diagram showing the formation of volcanoes.

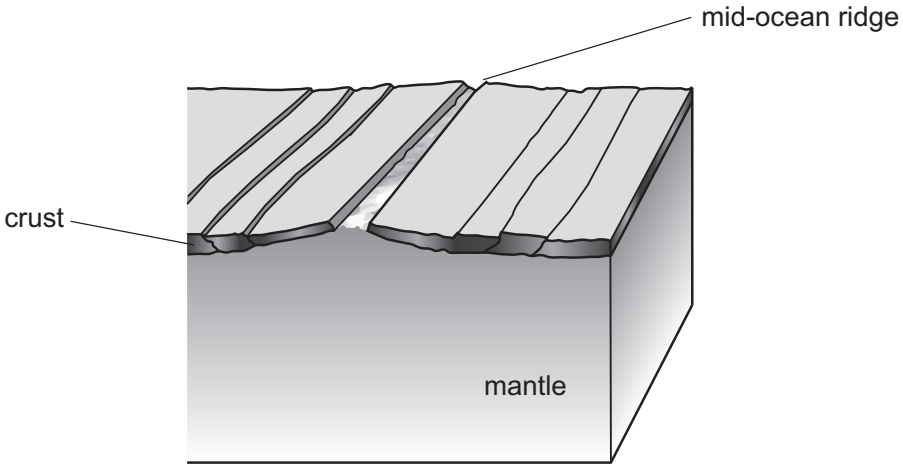
Draw arrows on the diagram to show the pathway of the convection currents in the mantle.



[1]

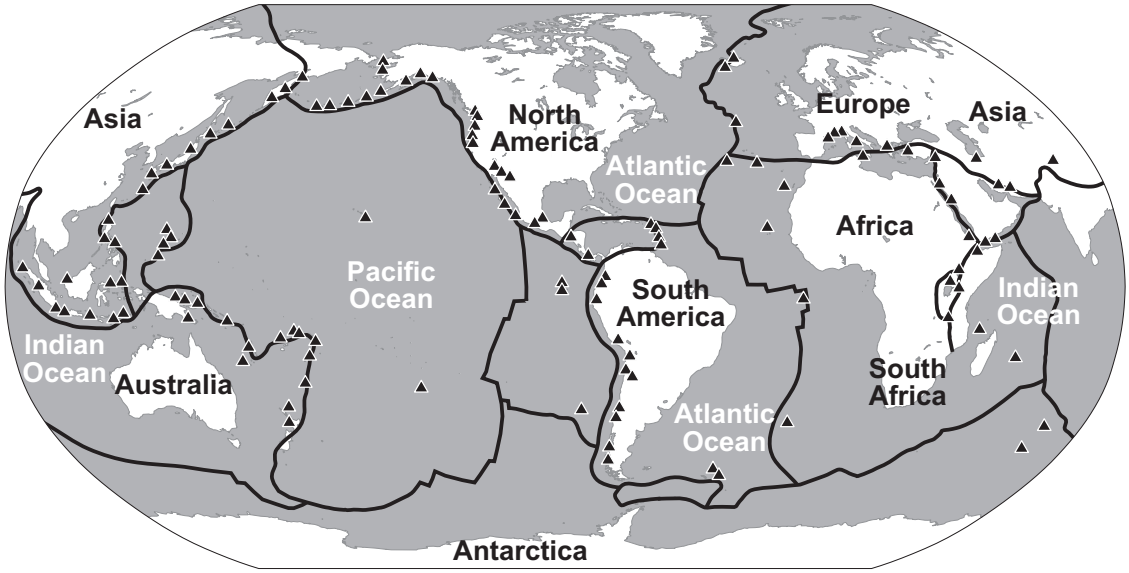
(ii) Look at the diagram showing the formation of a mid-ocean ridge.

Draw arrows on the diagram to show the pathway of the convection currents which cause the formation of the mid-ocean ridge.



[1]

(c) Look at the map showing the position of active volcanoes and the boundaries of floating rock in the Earth's crust.



key
▲ active volcano
— boundary of floating rocks

(i) Why are active volcanoes used as evidence for the location of the boundaries of the floating rocks?

.....

..... [1]

(ii) Suggest why there are **no** active volcanoes near South Africa.

.....

..... [1]

9 Copper oxide reacts with dilute nitric acid to make a salt and water.

(a) What is name of the salt made in this reaction?

..... [1]

(b) The mass is conserved during this reaction.

What is the meaning of the words **mass is conserved**?

.....

..... [1]

(c) Water molecules are made in this reaction.

Name and describe the type of bond present in a water molecule.

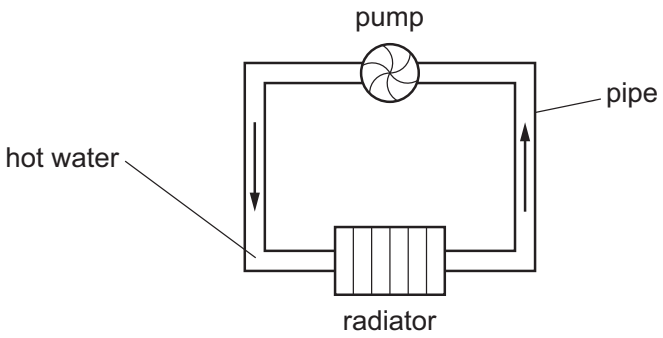
name .....

description .....

.....

[2]

10 Look at the diagram showing a model to help explain how an electrical circuit works.



(a) The radiator in the model represents a lamp in the circuit.

What is represented in the electrical circuit by the pump and the hot water?

pump .....

hot water .....

[2]

(b) Write down **one strength** and **one limitation** of this model of an electrical circuit.

strength .....

.....

limitation .....

.....

[2]