

45 minutes

# Science Paper 1

Stage 9

Name .....

Additional materials: Ruler  
Calculator

## READ THESE INSTRUCTIONS FIRST

Answer **all** questions in the spaces provided on the question paper.

You should show all your working on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 50.

For Teacher's Use	
Page	Mark
1	
2	
3	
4	
5	
6	
7	
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9	
10	
11	
12	
13	
14	
<b>Total</b>	



1 Sodium and lithium are both elements in Group 1 of the Periodic Table.

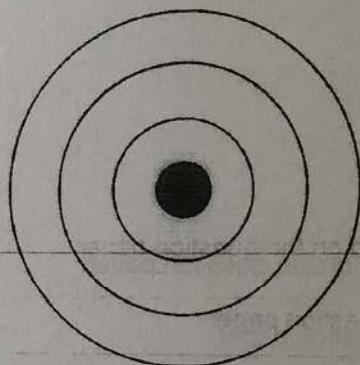
<b>H</b> hydrogen 1	
<b>Li</b> lithium 3	<b>Be</b> beryllium 4
<b>Na</b> sodium 11	<b>Mg</b> magnesium 12
<b>K</b> potassium 19	<b>Ca</b> calcium 20

					<b>He</b> helium 2
<b>B</b> boron 5	<b>C</b> carbon 6	<b>N</b> nitrogen 7	<b>O</b> oxygen 8	<b>F</b> fluorine 9	<b>Ne</b> neon 10
<b>Al</b> aluminium 13	<b>Si</b> silicon 14	<b>P</b> phosphorus 15	<b>S</b> sulfur 16	<b>Cl</b> chlorine 17	<b>Ar</b> argon 18

(a) Write down the number of protons in a sodium atom.

..... [1]

(b) Complete the diagram to show how the electrons are arranged in a sodium atom.



NOT TO SCALE

[2]

(c) Describe how lithium reacts with cold water.

.....  
 .....  
 ..... [2]

2 Some animals, such as race horses, have been produced by selective breeding.

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(a) Abdul wants to own fast race horses.

Describe how he uses selective breeding to produce fast race horses.

.....

.....

.....

..... [3]

(b) Characteristics of race horses can be inherited only, acquired only, or inherited and acquired.

Complete the table.

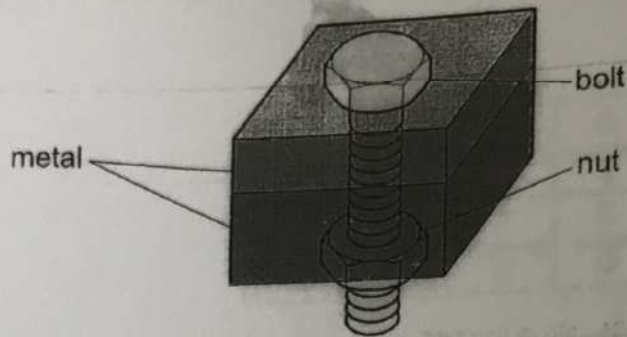
Put a tick (✓) in the correct column.

One has been done for you.

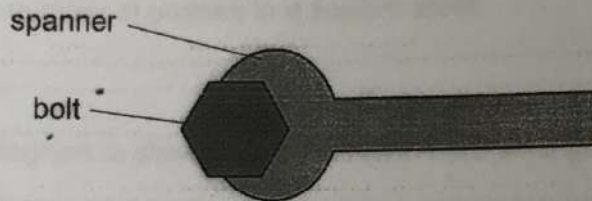
characteristic	how it is developed		
	inherited only	acquired only	inherited and acquired
length of tail			✓
scars on skin			
eye colour			
strength of muscles			

[2]

- 3 A nut and bolt can be used to hold two pieces of metal together as shown in the diagram.



A spanner is a tool that is used to turn a bolt.



- (a) A spanner uses the principle of moments.

What is meant by the principle of moments?

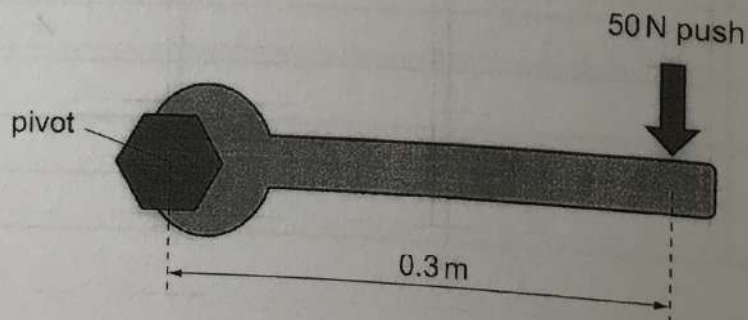
.....

.....

..... [2]

- (b) David uses a spanner to try to turn a bolt.

He pushes the spanner with a force of 50 N at a distance of 0.3 m from the pivot, as shown in the diagram.



(i) Calculate the moment which results from this push on the spanner.

Show your working.

moment ..... Nm [2]

(ii) The bolt does **not** turn with this push of 50 N.

David knows that using a **longer** spanner will make the bolt more likely to turn with the same push of 50 N.

Explain why.

.....  
.....  
..... [2]

4 Calcium carbonate reacts with hydrochloric acid.

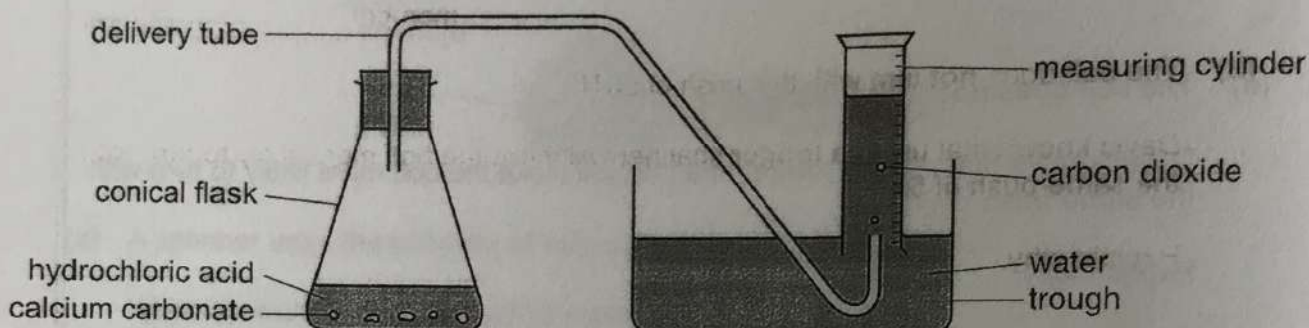
Calcium chloride, carbon dioxide and water are the products of this reaction.

(a) Write a word equation for this reaction in the space below.

..... [1]

(b) Amal investigates the rate of this reaction.

Here is the apparatus she uses.



She wants to find out how the rate of reaction depends on the concentration of the hydrochloric acid.

She starts by using:

- 25 cm<sup>3</sup> of dilute hydrochloric acid
- 1 g calcium carbonate.

Write down **two** measurements Amal should take to find out the rate of this reaction.

1 .....

2 .....

[2]

(c) Next, she uses concentrated hydrochloric acid.

Write down **two** variables she should keep the same as in the first test with dilute hydrochloric acid.

1 .....

2 .....

[2]

5 The diagram shows a plant which reproduces sexually.



(a) Insects are involved in the sexual reproduction of this plant.

Describe how insects are involved.

.....  
.....  
..... [2]

(b) The diagram shows the seeds of this plant being dispersed by wind.



(i) Write down **one other** method of plant seed dispersal.

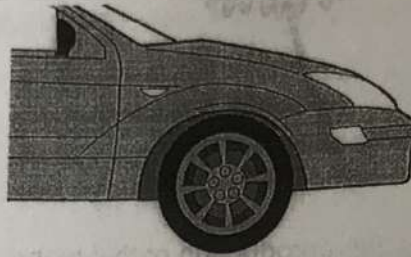
.....  
..... [1]

(ii) Explain the advantage to plants of being able to disperse their seeds.

.....  
.....  
..... [1]

6 Car tyres are filled with air.

The air is at higher pressure than the air outside the tyre.



(a) Explain how the air exerts pressure on the inside surface of the tyre.

.....  
.....  
..... [2]

(b) When a car moves, the temperature of the tyres increases.

State what will happen to the pressure in the tyres **and** explain your answer.

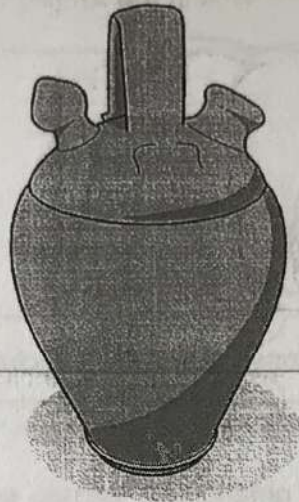
The pressure will .....

because .....

..... [2]

7 The picture shows a container called a water cooler.

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The container is made of clay.

(a) The water in the container soaks into the clay, making the outside wet.

Water evaporates from the outside, cooling the container.

Explain how evaporation cools a liquid.

.....  
.....  
..... [2]

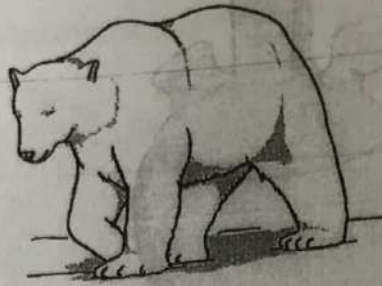
(b) When the outside cools down, heat energy is transferred through the clay.

Heat travels from the inside of the container through the clay by conduction.

Explain how heat energy is conducted through solids.

.....  
.....  
..... [2]

8 The polar bear is a large predator which lives in the Arctic.



The polar bear shows several adaptations to its habitat, including:

- white fur
- small ears.

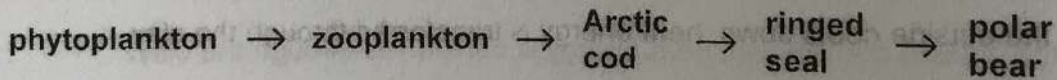
(a) Explain how each of these adaptations helps the polar bear to survive.

white fur .....

small ears .....

[2]

(b) The diagram shows one of the food chains in the Arctic food web.



The population of each organism decreases in numbers along this food chain.

Explain why.

.....  
.....  
..... [1]

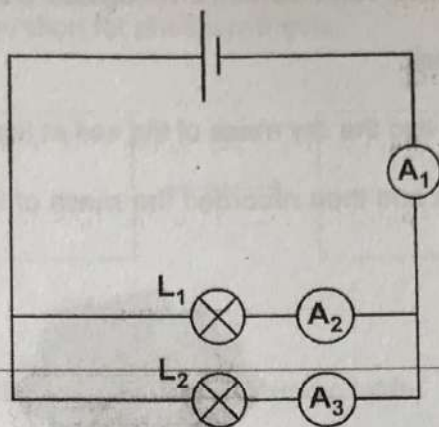
(c) The polar bear feeds on other animals as well as ringed seals.

Suggest how this helps the polar bear to survive.

.....  
.....  
..... [1]

9 Look at the circuit diagram.

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(a) Tick (✓) the box next to the correct relationship for the current readings of ammeters  $A_1$ ,  $A_2$  and  $A_3$ .

$$A_1 = A_2 = A_3$$

$$A_1 + A_2 = A_3$$

$$A_1 = A_2 + A_3$$

$$A_1 = A_2 - A_3$$

[1]

(b) Write down **two** changes that could be made to the circuit which would **increase** the current reading on ammeter  $A_3$ .

1 .....

2 .....

[2]

10 In the 17th Century a scientist called Von Helmont investigated plant growth.

He planted a tree in a pot full of soil.

He recorded the mass of the tree and the dry mass of the soil at the start of the investigation.

He watered the tree for five years and then recorded the mass of the tree and the dry mass of the soil again.



**start of investigation**  
tree mass = 25 kg  
soil dry mass = 140 kg



**after 5 years**  
tree mass = 100 kg  
soil dry mass = 139 kg

(a) Calculate the increase in mass of the tree.

Show your working.

answer ..... kg

[2]

(b) Some people believed that plants grew by only taking minerals from the soil.

Von Helmont said his results proved that the tree could not have grown by only taking minerals from the soil.

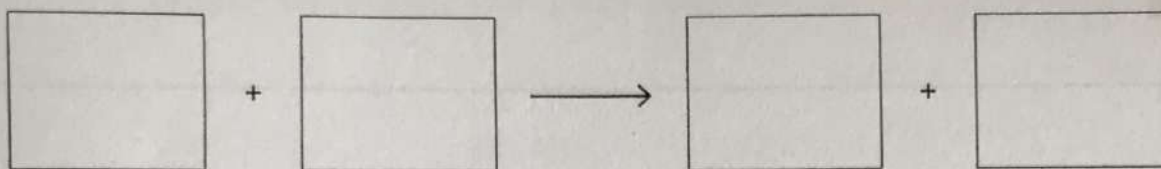
Explain why he concluded this.

.....  
.....  
.....  
..... [2]

(c) We now know that plants use photosynthesis to grow.

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Complete the word equation for photosynthesis.



[2]

11 The diagram shows an outline of part of the periodic table.

	1	2											3	4	5	6	7	0	
1																			
2																			
3																			
4																			
5																			
6																			
7																			

(a) Name the shaded part of this periodic table.

..... [1]

(b) Answer the rest of this question on the diagram.

(i) Shade **group 7** of this periodic table. [1]

(ii) Put a letter **X** in the space occupied by a **noble gas**. [1]

(iii) Put a letter **Z** in the space occupied by the element with **six protons**. [1]

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The image shows a large grid of graph paper. The grid is approximately 10 columns wide and 10 rows high. A rectangular area in the upper left corner, roughly from column 1 to 4 and row 1 to 4, is shaded grey. The rest of the grid is white with faint grid lines.