

13+ Science Paper Sample Questions

Time Allowed: 1 HOUR

Special Instructions:

Attempt all questions.

For any calculations, show your working out and always show the units of measurement being used.

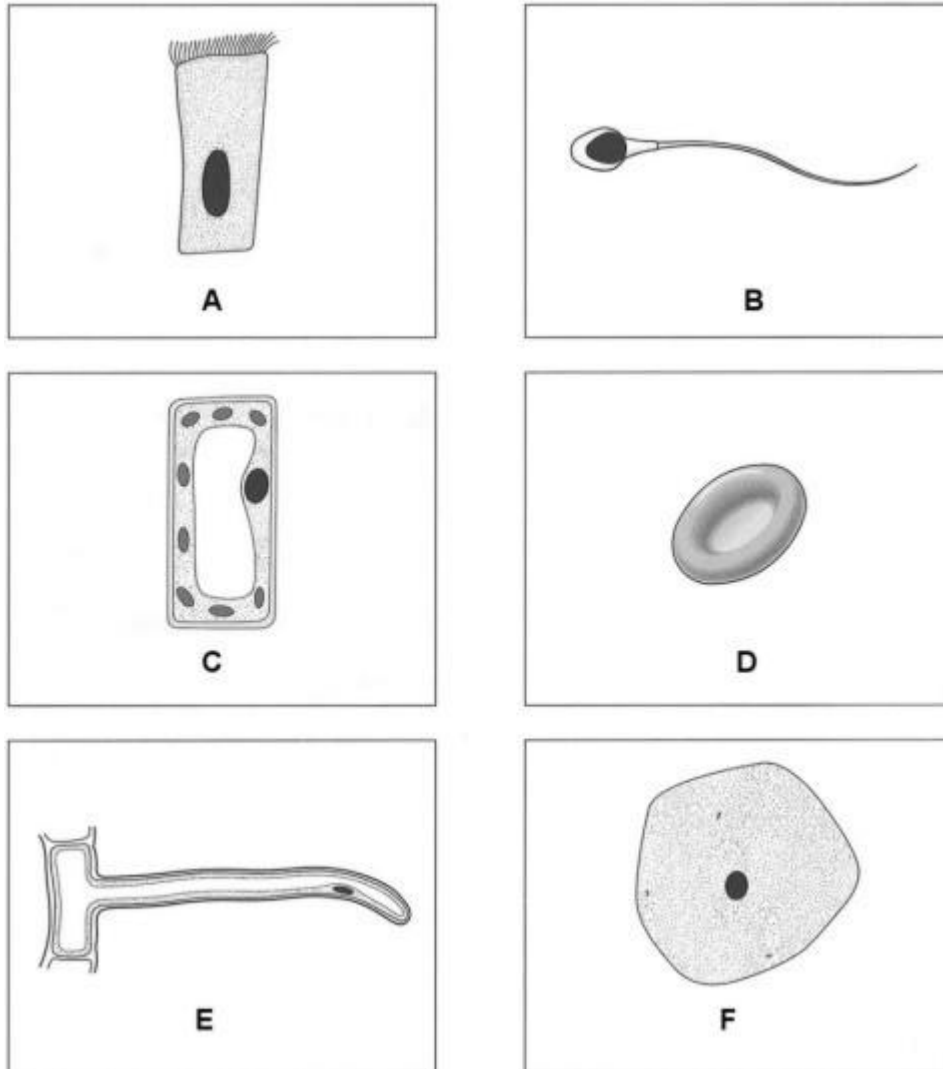
Marks allocated for each question or part question are shown at the right hand side of the paper.

Name:

Result:

Comment:

1. The diagram below shows six cells.



(a) (i) Give the letters of the **two** plant cells in the diagrams.

..... and

1 mark

(ii) Which **one** of these plant cells contains chloroplasts?
Give the letter.

.....

1 mark

continued

(iii) Give the function of chloroplasts.

.....
.....

1 mark

(b) (i) Give the letter of the ciliated cell.

.....

1 mark

(ii) In which part of the body are ciliated cells found?

.....

1 mark

(iii) What is the function of ciliated cells in this part of the body?

.....
.....

1 mark

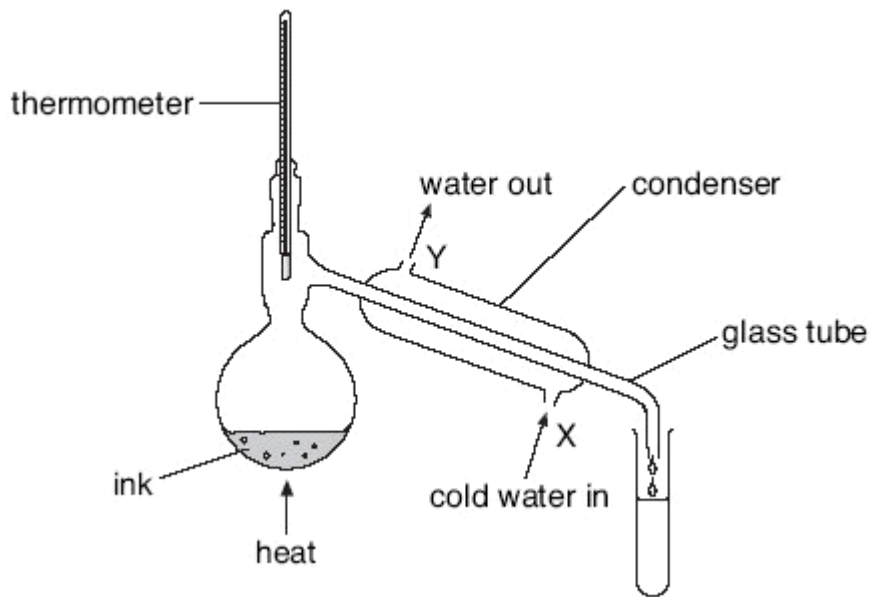
(c) Give the letter of the cell which transfers genetic information from father to offspring.

.....

1 mark

maximum 7 marks

2. Rema used the apparatus below to distil 100 cm³ of water-soluble ink.



apparatus A

not to scale

- (a) Which processes occur during distillation?
Tick the correct box.

- | | |
|-------------------------------|--------------------------|
| condensation then evaporation | <input type="checkbox"/> |
| evaporation then condensation | <input type="checkbox"/> |
| melting then boiling | <input type="checkbox"/> |
| melting then evaporation | <input type="checkbox"/> |

1 mark

- (b) Give the name of the colourless liquid that collects in the test-tube.

.....

1 mark

- (c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

.....°C

1 mark

- (d) (i) Water at 15°C enters the condenser at X.
 Predict the temperature of the water when it leaves the condenser at Y.

.....°C

Explain this change of temperature.

.....

1 mark

- (ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

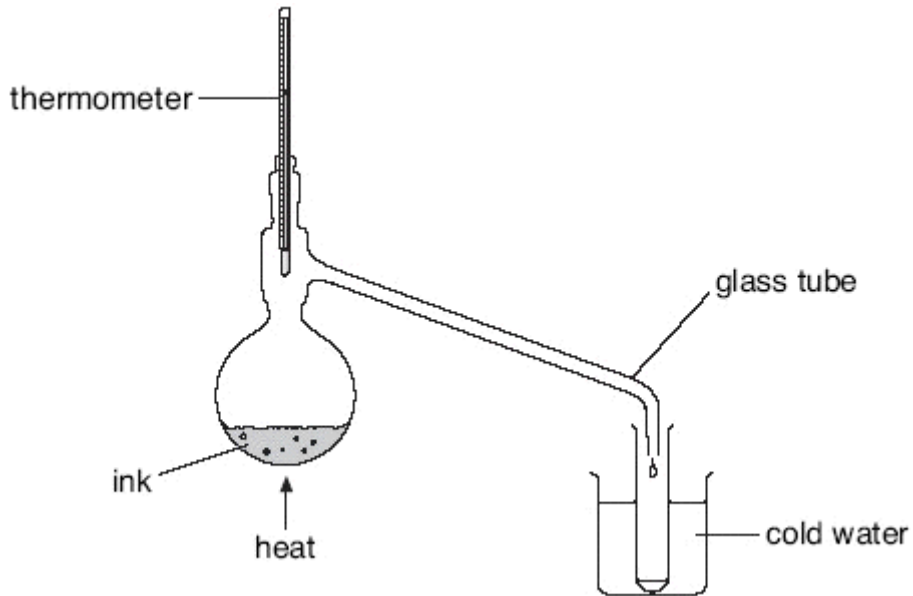
1.

1 mark

2.

1 mark

- (e) Peter used the apparatus below to distil 100 cm³ of water-soluble ink.



apparatus B

not to scale

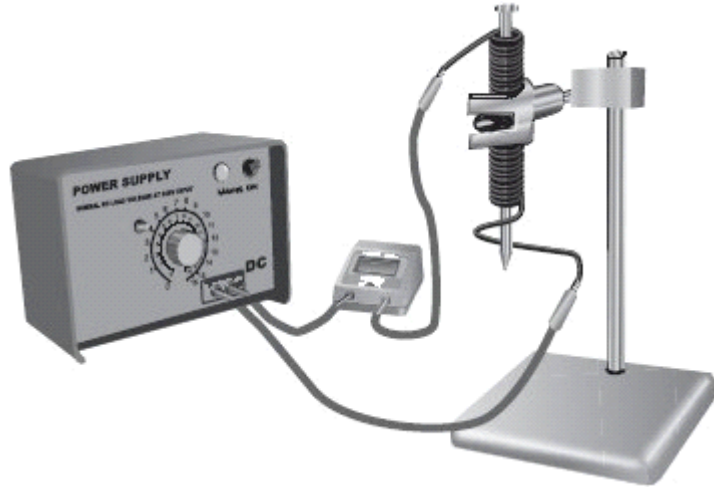
Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

.....

1 mark

maximum 7 marks

3. Alex makes an electromagnet.
She winds insulated wire around an iron nail.
She connects the wire to a power supply.
She uses the electromagnet to pick up some steel paper-clips.



This is her prediction.

The more turns of wire around the iron nail the stronger the electromagnet becomes.

- (a) (i) Give the **one** factor she should change as she investigates her prediction.

.....
.....

1 mark

- (ii) Give **one** factor she should keep the same.

.....
.....

1 mark

- (iii) Describe how she could use the paper-clips to measure the strength of the electromagnet.

.....
.....

1 mark

(b) Alex wrote a report of her investigation.


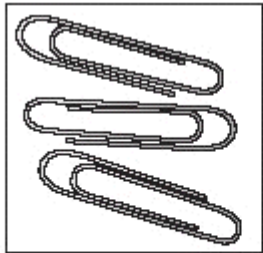
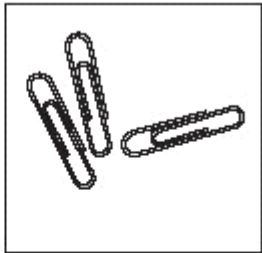
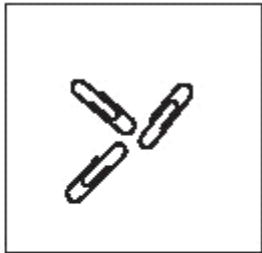
My report.
My results are accurate because I can't see any odd results.

What would an odd result suggest?

.....
.....

1 mark

(c) (i) Which size paper-clips would Alex use to make her results more accurate?
Tick the correct box.

			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 mark

(ii) Give a reason for your choice.

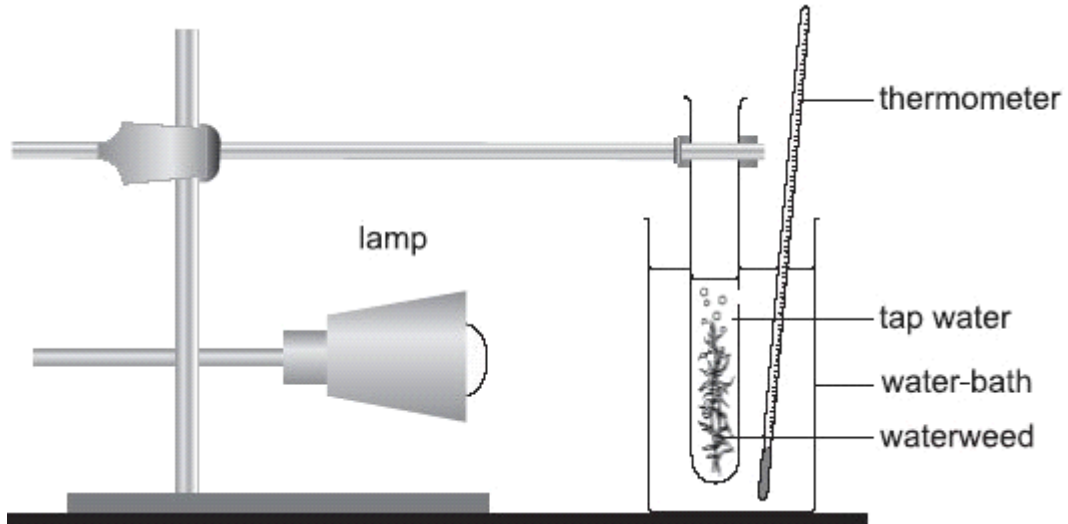
.....
.....
.....

1 mark

maximum 6 marks

4. Suzi investigated how temperature affects the number of bubbles produced by waterweed in one minute.

She set up the experiment as shown below.



When the temperature of the water was 10°C the waterweed did **not** produce bubbles.

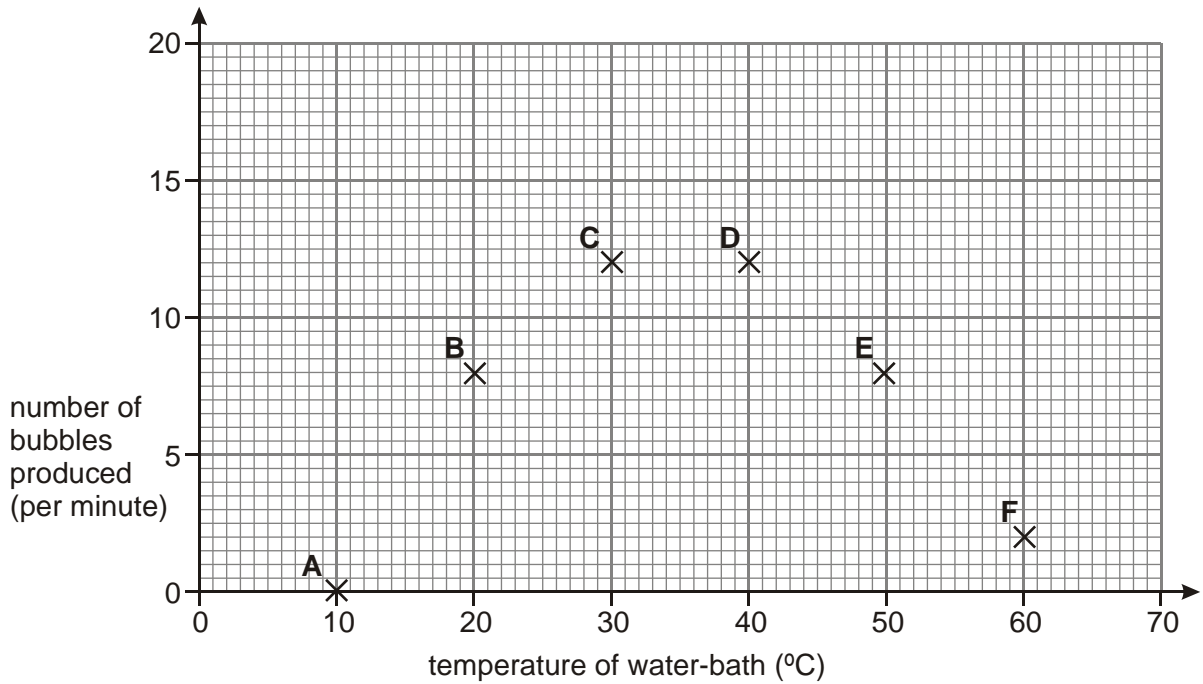
- (a) Suzi increased the temperature of the water in the water-bath to 20°C.
The waterweed started to produce bubbles.
She waited two minutes before starting to count the bubbles.

Explain why she waited for two minutes before she started to count the bubbles.

.....

1 mark

- (b) Suzi counted the number of bubbles produced at six different temperatures.
Her results are shown on the graph on the next page.



(i) Draw a smooth curve on the graph.

1 mark

(ii) Use your curve to find the temperature of water which produced the most bubbles per minute.

.....°C

1 mark

(c) Suzi predicted that the higher the temperature the more bubbles would be produced.

Which points on the graph support Suzi's prediction?

.....

1 mark

(d) Suzi's data does **not** show clearly the exact temperature at which most bubbles were produced.

How could she improve the data she collects to find this temperature?

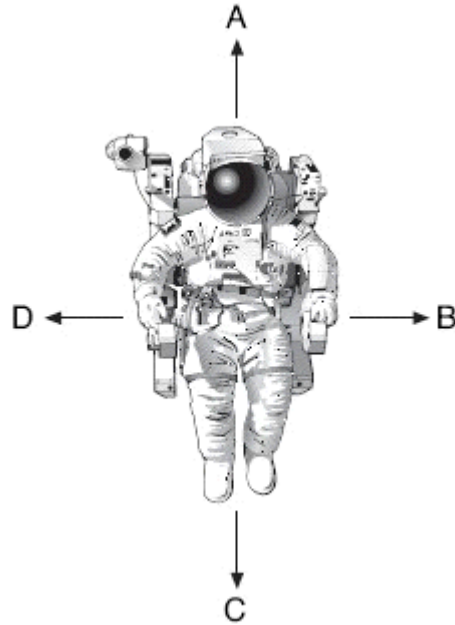
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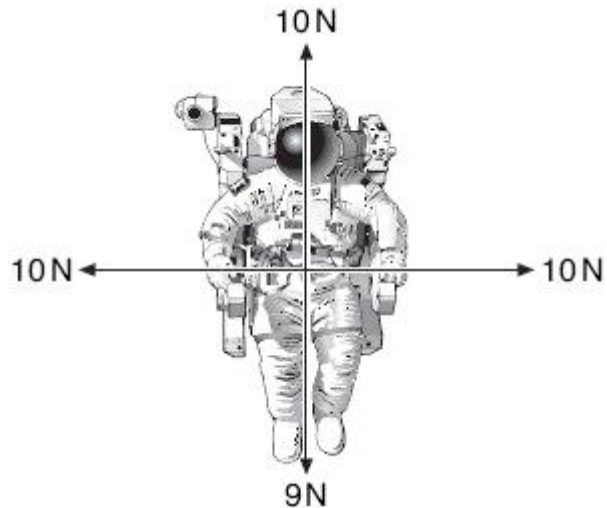
1 mark

maximum 5 marks

5. The drawing below shows an astronaut in space. He has four small jets attached to his space suit. These jets produce forces on the **astronaut** in the directions A, B, C and D.



- (a) The drawing below shows the size and direction of four forces acting on the astronaut.



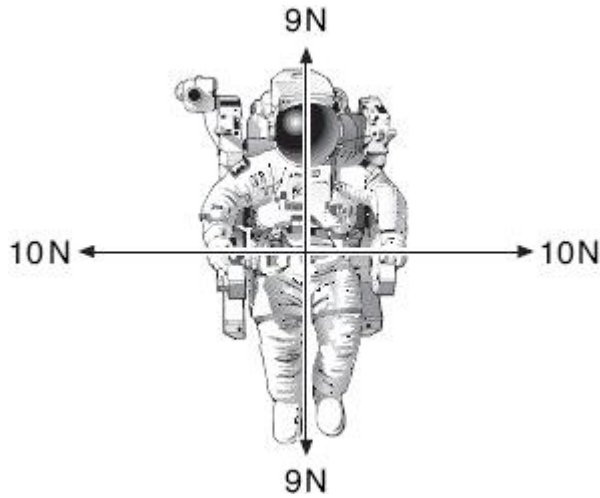
In which direction, A, B, C or D, will the astronaut move?

Give the letter.

.....

1 mark

- (b) The drawing below shows the size and direction of four different forces acting on the astronaut.



What will happen to the astronaut when the jets produce these four forces?

.....

1 mark

Explain your answer.

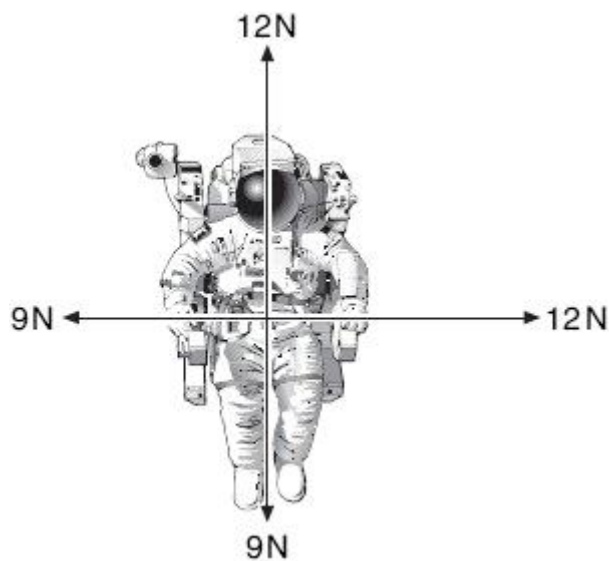
.....

.....

1 mark

- (c) The drawing below shows the size and direction of four different forces acting on the astronaut.

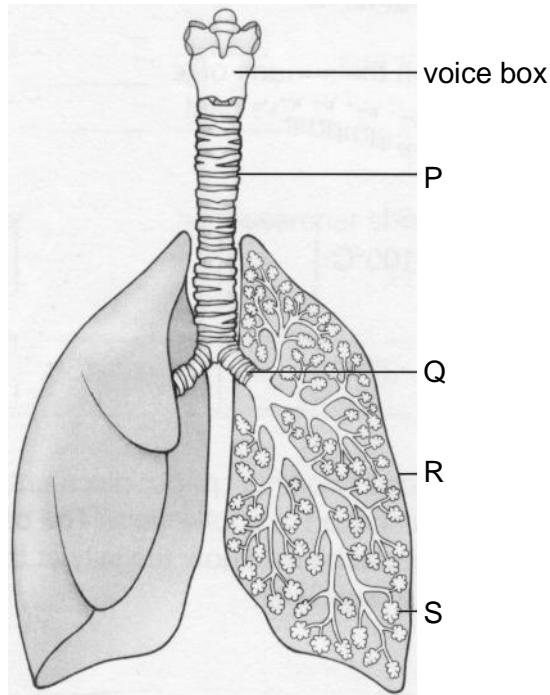
Draw an arrow on the diagram below to show the direction in which he will move.



1 mark

maximum 4 marks

6. The diagram below shows part of the respiratory system.



(a) From the diagram, give the letters which label:

(i) the trachea;

1 mark

(ii) alveoli.

1 mark

(b) (i) Which gas passes into the blood from the alveoli?

.....

1 mark

(ii) Which gas passes out of the blood into the alveoli?

.....

1 mark

(c) The walls of the capillaries and the alveoli are very thin. Why do they need to be thin?

.....
.....

1 mark

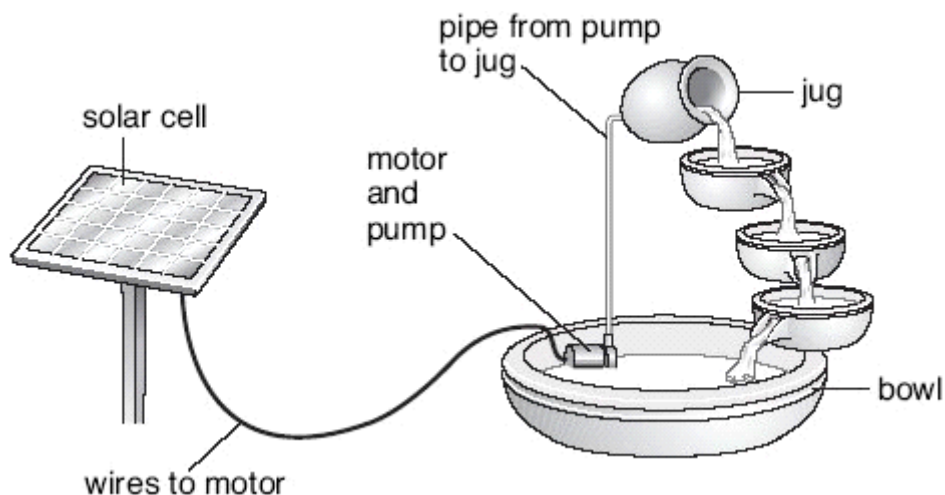
(d) There are millions of alveoli in the lungs. They provide a very large surface area. Why is a large surface area necessary?

.....
.....

1 mark

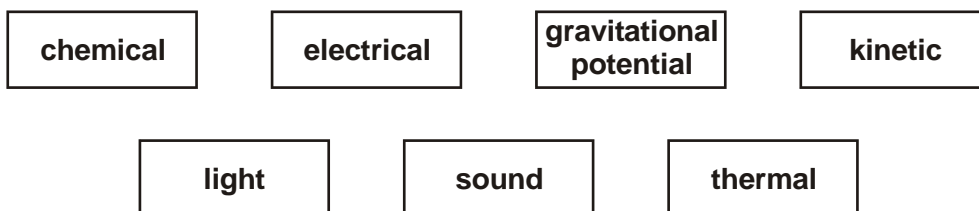
Maximum 6 marks

7. The drawing below shows a garden water feature. It is solar-powered.



The solar cell absorbs energy from the Sun.
 The solar cell is connected to a motor in the bowl.
 The motor drives a pump.
 Water is pumped up to the jug and it flows back down to the bowl.

- (a) Use the information above to help you to complete the following sentences.
 Choose words from the list.



- (i) The useful energy change in the solar cell is from
 light to energy.
- (ii) The useful energy change in the motor is from
 electrical energy to energy.
- (iii) As the water flows from the jug to the bowl energy
 is changed into energy.

1 mark

1 mark

2 marks

- (b) Give **one** advantage and **one** disadvantage of using a solar cell to power the water feature.

advantage

.....

1 mark

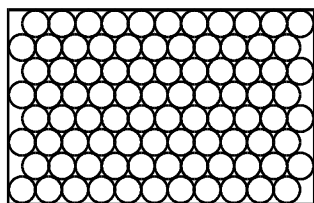
disadvantage

.....

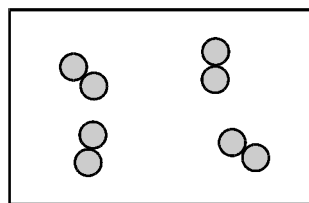
1 mark

maximum 6 marks

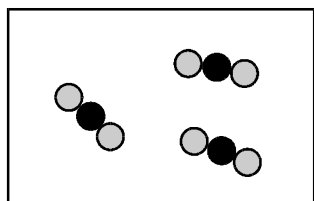
8. The diagrams represent the arrangement of atoms or molecules in four different substances, A, B, C and D.



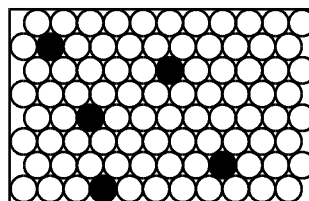
A



B



C



D

not to scale

Each of the circles, ○, ◐ and ● represents an atom of a different element.

- (a) (i) Which substance is a compound?

.....

1 mark

- (ii) Which substance is a mixture?

.....

1 mark

- (iii) Which **two** substances are elements?

..... and

1 mark

- (iv) Which **two** substances could be good thermal conductors?

..... and

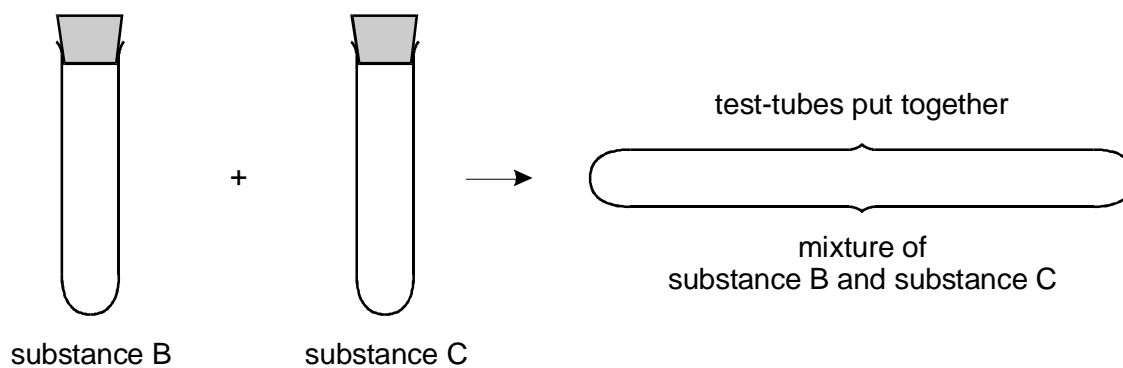
1 mark

- (v) Which substance could be carbon dioxide?

.....

1 mark

- (b) The following experiment was set up. Test-tubes containing substances B and C were placed together as shown. The substances did **not** react. They were left for five minutes.

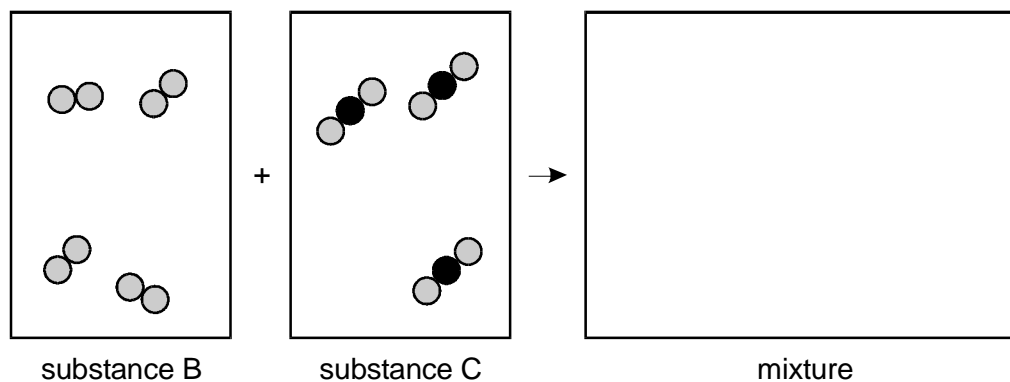


- (i) How many molecules are there in the mixture compared to the total number in substances B and C?

.....

1 mark

- (ii) Complete the diagram which is a model of this experiment.



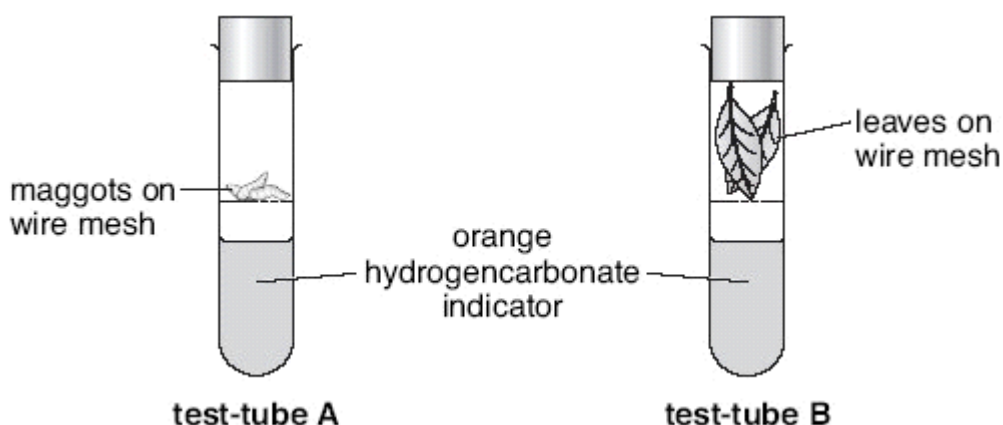
1 mark

Maximum 7 marks

9. The table shows how hydrogencarbonate indicator solution changes colour when the concentration of carbon dioxide in it changes.

concentration of carbon dioxide	colour change
increases	orange to yellow
decreases	orange to purple

Sunil set up the experiment shown below and put both test-tubes on a window-sill.



Use information in the table to help you answer the questions below.

- (a) The indicator in test-tube A changed from orange to yellow.

- (i) What process, in the cells of the maggots, caused this colour change?

.....

1 mark

- (ii) Explain what happens in this process to cause the colour change.

.....

.....

1 mark

- (b) The indicator in test-tube B changed from orange to purple.

- (i) What process, in the cells of the leaves, caused this colour change?

.....

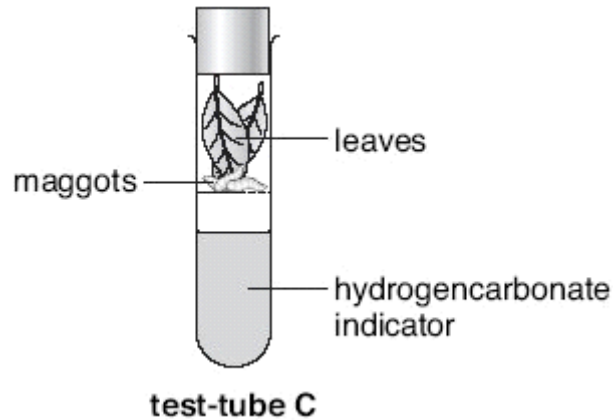
1 mark

- (ii) Explain what happens in this process to cause the colour change.

.....

.....

- (c) Sunil then put two fresh leaves into test-tube C containing 30 cm³ of orange hydrogencarbonate indicator. He added some maggots on a piece of wire mesh as shown below. He put the test-tube on a window-sill.



The indicator remained orange. Explain why.

.....

.....

.....

1 mark
maximum 5 marks

10. Part of the reactivity series of metals is shown below.

most reactive	potassium
	sodium
	magnesium
	aluminium
	iron
	lead
least reactive	copper

- (a) Dan added a piece of magnesium to a solution of copper sulphate. A displacement reaction took place.

The word equation for the reaction is shown below.

magnesium + copper sulphate → magnesium sulphate + copper

Why is this called a displacement reaction?

.....

.....

1 mark

- (b) Look at each pair of chemicals in the table below.

Use the reactivity series to predict whether a displacement reaction would take place.

Write **yes** or **no** in the second column and give the reason for your decision.

pairs of chemicals	Does a displacement reaction take place? yes or no	reason
iron + sodium chloride		
magnesium + lead nitrate		

2 marks

(c) Dan wanted to find out where zinc should be placed in the reactivity series.

(i) What tests should Dan do to find the correct position of zinc in the reactivity series?

.....
.....
.....

1 mark

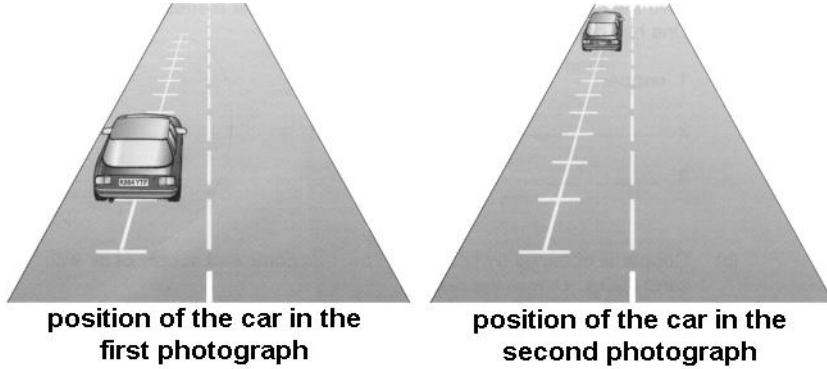
(ii) How would Dan use his test results to decide where to put zinc in the reactivity series?

.....
.....
.....

1 mark

maximum 5 marks

11. Speed cameras are used to detect motorists who break the speed limit. A number of lines 2 m apart are painted on the road. As a speeding car crosses the painted lines, the camera takes two photographs, 0.5 s apart.



- (a) (i) How far did the car move between the two photographs?
Give the correct unit.

.....

1 mark

- (ii) How fast is the car in the photographs moving?

.....
 **m/s**

1 mark

- (b) It takes 0.0002 s to take each photograph.
How far does the car move while the speed camera is taking **one** photograph?

.....
 **m**

1 mark

- (c) The speed camera gives out bright flashes to provide enough light for the photographs.
How does the light from the flash get back to the camera to produce the photographs?

.....

1 mark

Maximum 4 marks

END OF EXAMINATION