



Write your name here

Surname

Other names

# Scholarship Paper

**Subject: Science**

**Paper: Science**

**Time: 45 Minutes**

**You must have:**

Pen  
Pencil

**Total Marks**

45

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - *There may be more space than you need.*
- Show all the steps in any calculations and state the units.

## Information

- The total mark for this paper is 45
- Each multiple choice question is a mark
- The marks for **each** question are shown in brackets
  - *Use this as a guide as to how much time to spend on each question.*

## Advice

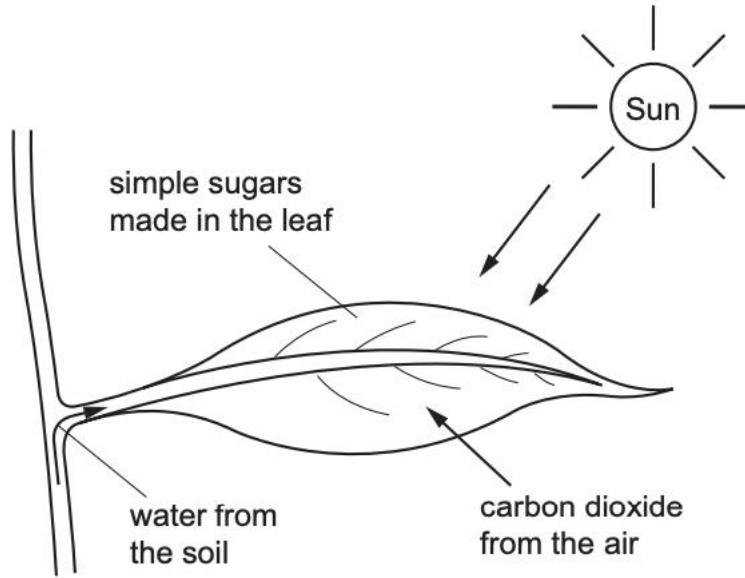
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

**Biology Section (15 marks)**

1.

The diagram shows a leaf on a plant.

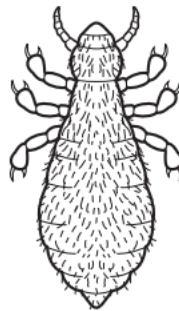


Which characteristic of life is represented by this diagram?

- A excretion
- B nutrition
- C respiration
- D sensitivity

2.

The diagram shows an insect.



What is the insect?

- 1 insect has no wings ..... go to 2
- insect has wings ..... go to 3
- 2 legs longer than, or as long as the body ..... **A**
- legs shorter than the body ..... **B**
- 3 abdomen long and thin ..... **C**
- abdomen shorter and wider ..... **D**

3.

Which features are possessed by **all** plant cells?

	a cell wall	chloroplasts	
<b>A</b>	✓	✓	key ✓ = present x = absent
<b>B</b>	✓	x	
<b>C</b>	x	✓	
<b>D</b>	x	x	

4.

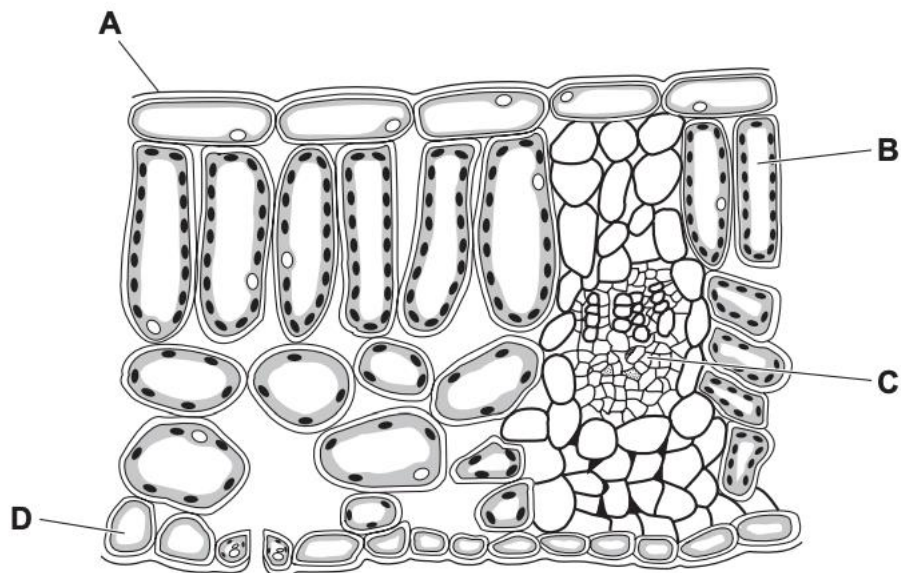
Which organ is part of the digestive system?

- A** colon
- B** larynx
- C** trachea
- D** ureter

5.

The diagram shows a cross-section of a leaf as seen under a microscope.

Which structure is a palisade mesophyll cell?

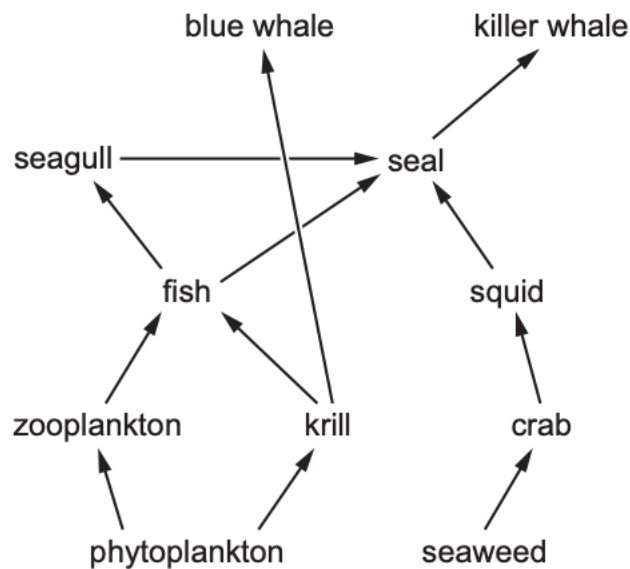


6. What process uses the principal source of energy input to biological systems?

- A ingestion
- B decomposition
- C photosynthesis
- D respiration

7.

The diagram shows an aquatic food web.



Which statement is correct?

- A There are two producers and three herbivores.
- B There are two primary consumers and two secondary consumers.
- C There are three producers and two primary consumers.
- D There are two herbivores and two tertiary consumers.

8.

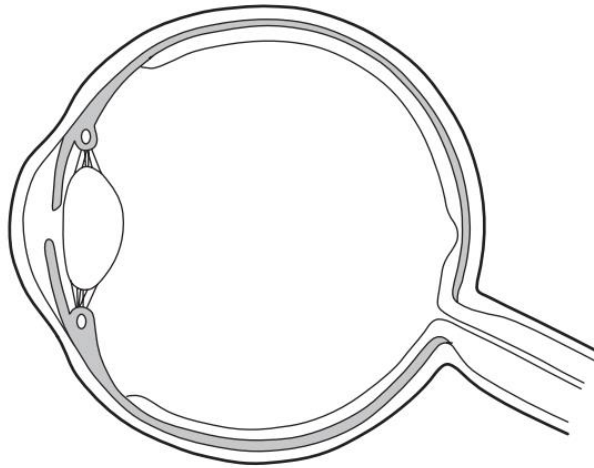
Large areas of tropical forests have been cleared to grow monocultures of palm oil plants.

Which effect will this have on the ecosystem?

- A The use of fossil fuels in the area will decrease.
- B The use of pesticides in the area will decrease.
- C The variety of species in the area will decrease.
- D The variety of species in the area will increase.

9.

The diagram shows a structure found in the human body.

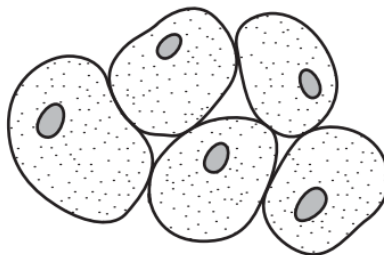


What is this structure an example of?

- A an organ
- B an organism
- C an organ system
- D a tissue

10.

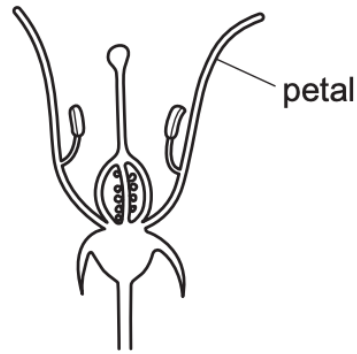
The diagram shows some liver cells as they appear under a microscope.



How many cell walls can be seen?

- A 0
- B 2
- C 5
- D 10

11. The diagram shows a section through a flower.



Using the key, identify this flower.

- 1 sepals present ..... go to 2  
 sepals not present ..... go to 3
- 2 stamens attached to petals ..... **A**  
 stamens not attached to petals ..... **B**
- 3 stigma above anthers ..... **C**  
 stigma below anthers ..... **D**

12.

The following can be used to write a word equation for photosynthesis.

- 1 carbon dioxide and water  
 2 light and chlorophyll  
 3 glucose and oxygen

Which shows a correct word equation for photosynthesis?

- A** 1 → 2 in the presence of 3  
**B** 1 → 3 in the presence of 2  
**C** 2 → 3 in the presence of 1  
**D** 3 → 1 in the presence of 2

13.

These actions may be important in controlling the spread of disease.

- 1 washing hands after going to the toilet
- 2 disposing of waste frequently
- 3 using separate cutting boards for meat and salad
- 4 disposing of raw sewage into a river

Which would help control the spread of disease?

- A** 1, 2, 3 and 4  
**B** 1, 2 and 3 only  
**C** 2 and 3 only  
**D** 4 only

14. The diagram shows someone blowing up a balloon.



How do the proportions of gases in the air inside the balloon compare with the air outside the balloon?

	carbon dioxide	oxygen	water vapour
<b>A</b>	less	more	more
<b>B</b>	less	more	less
<b>C</b>	more	less	more
<b>D</b>	more	less	less

**Chemistry Section (15 marks)**

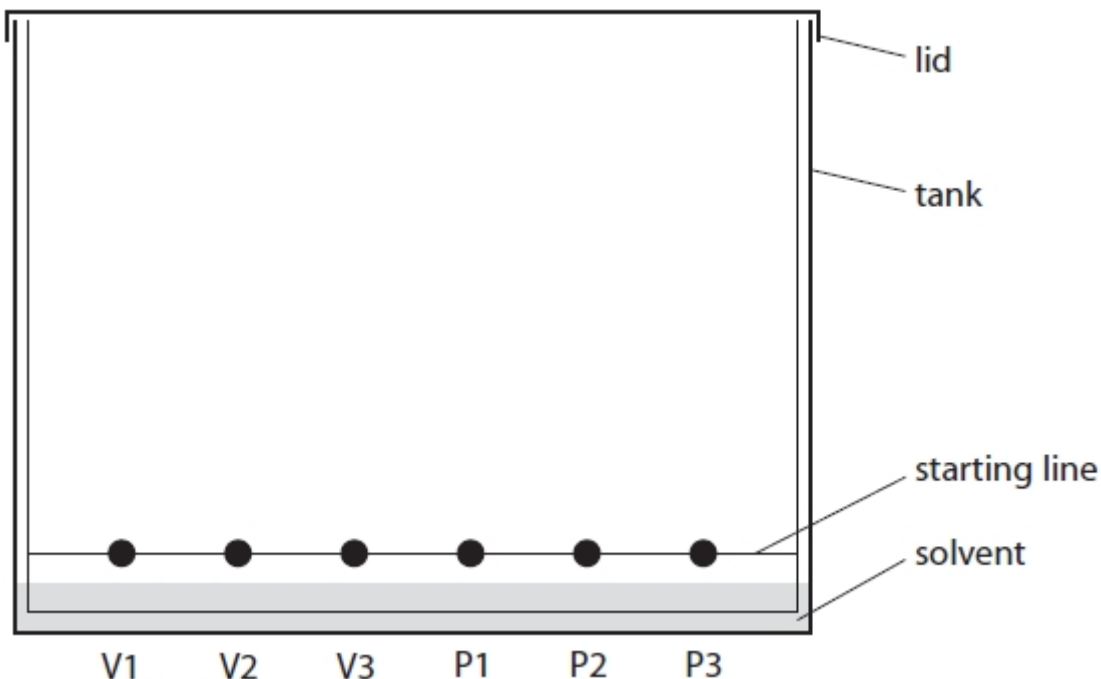
**Q1.**

A student investigates the pigments found in some vegetables and fruit.

She obtains some coloured vegetable and fruit extracts from carrots, tomatoes and sweet potatoes.

She places a spot of each extract on chromatography paper, along with spots of the three pigments beta-carotene, chlorophyll and lycopene.

Her teacher provides solvent containing volatile, flammable organic compounds for the experiment. The diagram shows the apparatus at the start of the experiment.



Key to vegetable and fruit extracts and pigments

V1 = carrots

V2 = tomatoes

V3 = sweet potatoes

P1 = beta-carotene

P2 = chlorophyll

P3 = lycopene

(a) (i) Explain why it is important for the solvent level to be below the spots.

(1)

.....  
 .....

(ii) State two potential problems that are prevented by fitting the tank with a lid.

(2)

1 .....

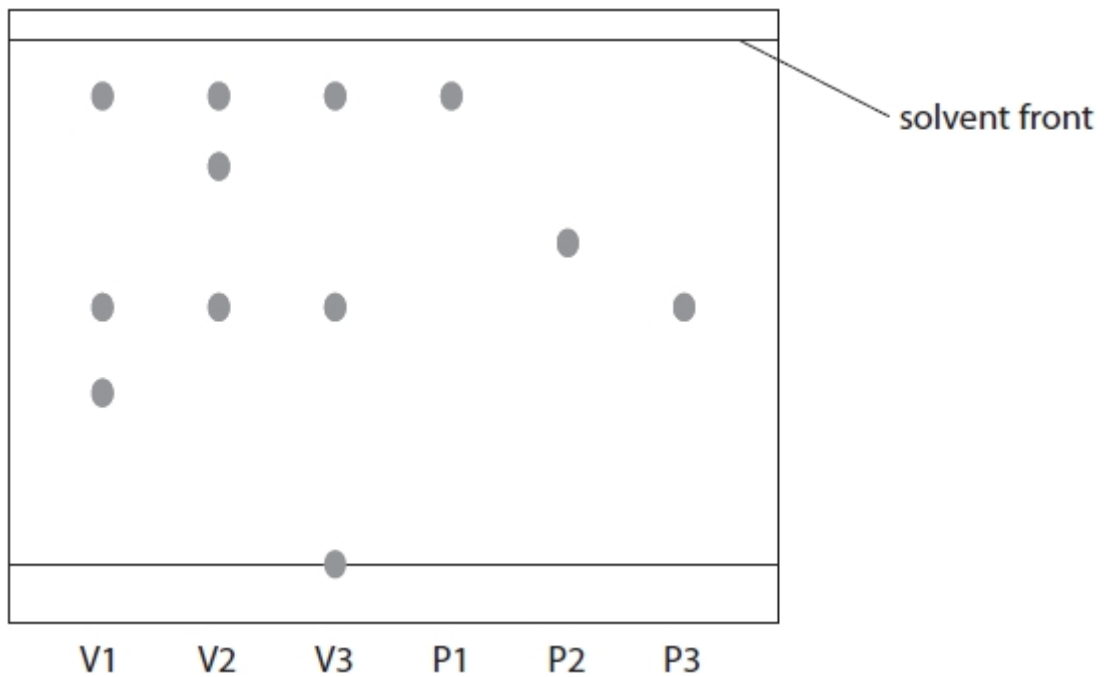
.....

2 .....

.....

(b) The diagram shows the chromatogram at the end of the experiment.





Key to vegetable and fruit extracts and pigments

V1 = carrots                      V2 = tomatoes                      V3 = sweet potatoes

P1 = beta-carotene              P2 = chlorophyll              P3 = lycopene

Which three of the statements A, B, C, D and E are supported by the chromatogram?

Place a cross in three boxes to indicate your choice.

(3)

- A Chlorophyll is **not** present in carrots, sweet potatoes or tomatoes.
- B Beta-carotene is present in carrots but **not** present in tomatoes.
- C Both beta-carotene and lycopene are present in sweet potatoes.
- D Lycopene is present in tomatoes but **not** present in carrots.
- E Both carrots and tomatoes contain a pigment **other than** beta-carotene, chlorophyll and lycopene.

(c) One of the pigments present in the vegetable extracts is not shown in the chromatogram. It appears as a very faint spot 1.3 cm above the starting line.

Calculate its  $R_f$  value using the expression

$$R_f = \frac{\text{distance travelled by pigment}}{\text{distance travelled by solvent}}$$

(2)

$R_f = \dots\dots\dots$

(d) Suggest a reason why there is a spot on the starting line in the chromatogram for sweet potatoes.

(1)

.....  
 .....

(Total for question = 9 marks)

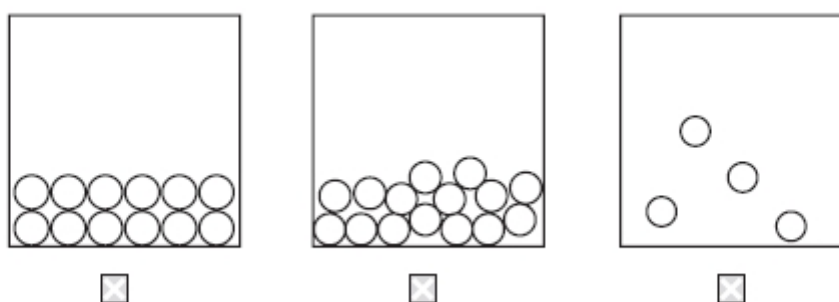
Q2.

This question is about the elements hydrogen and oxygen.

(a) The circles in the diagrams represent molecules of hydrogen.

Place a cross  in the box under the diagram that represents hydrogen gas.

(1)



(b) The diagram below shows two different atoms of hydrogen.



(i) The particle furthest from the centre of each atom is

(1)

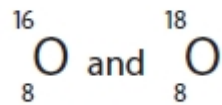
- A an electron  
 B a neutron  
 C a nucleus  
 D a proton

(ii) The particle present in atom Y but not in atom X is

(1)

- A an electron  
 B a neutron  
 C a nucleus  
 D a proton

(c) Different atoms of oxygen can be represented as



Select words or phrases from the box to complete the sentence about these atoms of oxygen.  
You may use each word or phrase once, more than once or not at all.

atomic numbers	isotopes	mass numbers	numbers of electrons
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(3)

These atoms of oxygen are called .....

because their ..... are the same

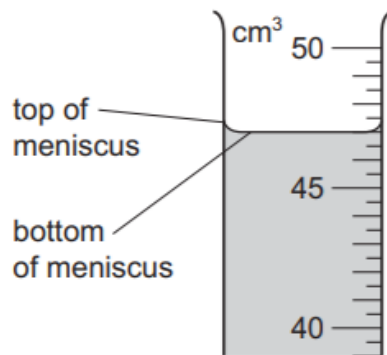
but their ..... are different.

**(Total for question = 6 marks)**

## Physics Section (15 marks)

Q1.

A student uses a measuring cylinder to measure the volume of some water. The diagram shows part of the measuring cylinder. The top and bottom of the meniscus are labelled.

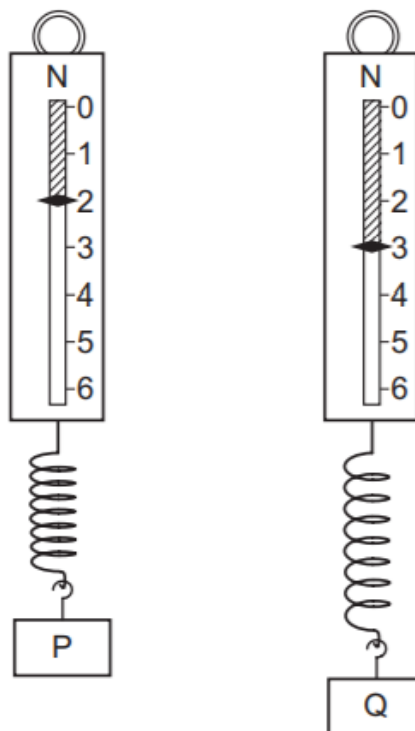


What is the volume of the water?

- A** 47.0  $\text{cm}^3$       **B** 47.5  $\text{cm}^3$       **C** 49.0  $\text{cm}^3$       **D** 49.5  $\text{cm}^3$

Q2.

Two metal blocks P and Q have identical dimensions. They hang on identical spring balances.



What can be deduced about P and Q?

- A** They have different volumes and different weights.  
**B** They have different volumes, but equal masses.  
**C** They have equal volumes and equal weights.  
**D** They have equal volumes, but different masses.

**Q3.**

A person measures the length, width, height and mass of a metal block with rectangular sides.

Which of these measurements must be used in order to calculate the density of the metal?

- A mass only
- B height and mass only
- C length, width and height only
- D length, width, height and mass

**Q4.**

A helicopter takes off from the ground and rises vertically. It then hovers at a constant height above the ground.

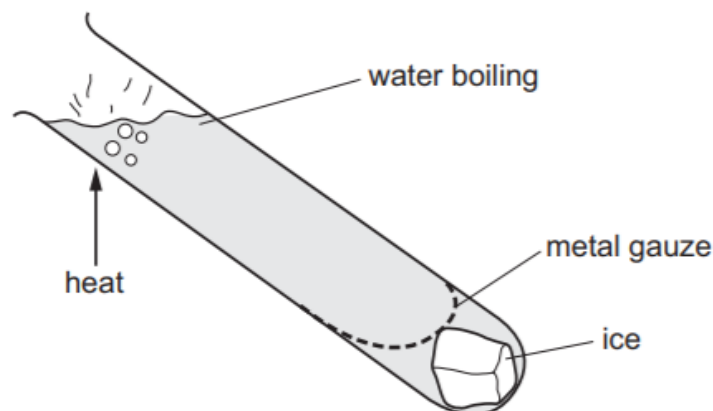
Which sequence of energy changes takes place during the gain in height?

- A chemical → gravitational potential → kinetic
- B chemical → kinetic → gravitational potential
- C gravitational potential → chemical → kinetic
- D kinetic → chemical → gravitational potential

**Q5.**

Ice is trapped by a metal gauze at the bottom of a tube containing water.

The water is heated strongly at the top, but the ice only melts very slowly.



Why does the ice melt so slowly?

- A Heat energy always travels upwards.
- B Hot water is more dense than cold water.
- C Metal gauze does not allow heat to pass through.
- D Water is a poor conductor of heat.

**Q6.**

A man stands by a railway track.



A train travelling at  $40 \text{ m/s}$  takes  $2.0 \text{ s}$  to pass the man.

What is the length of the train?

- A** 20 m            **B** 38 m            **C** 40 m            **D** 80 m

**Q7.**

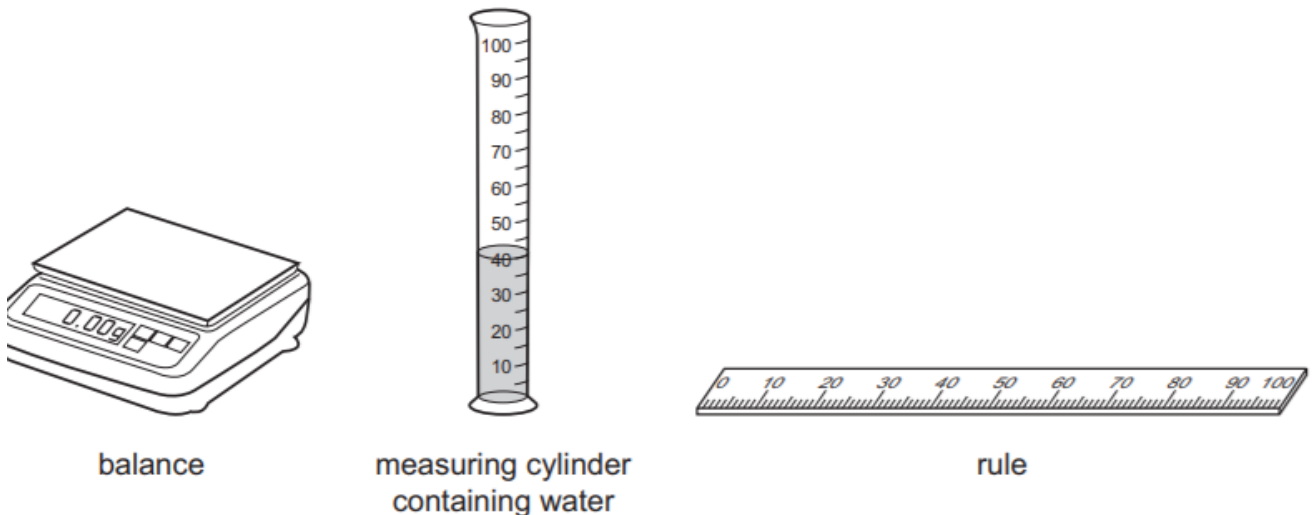
Which particles move in a metal to cause an electric current?

- A** electrons  
**B** neutrons  
**C** nucleons  
**D** protons

**Q8.**

A student is asked to find the volume of a small irregularly-shaped piece of rock.

He has the following apparatus available.



balance

measuring cylinder  
containing water

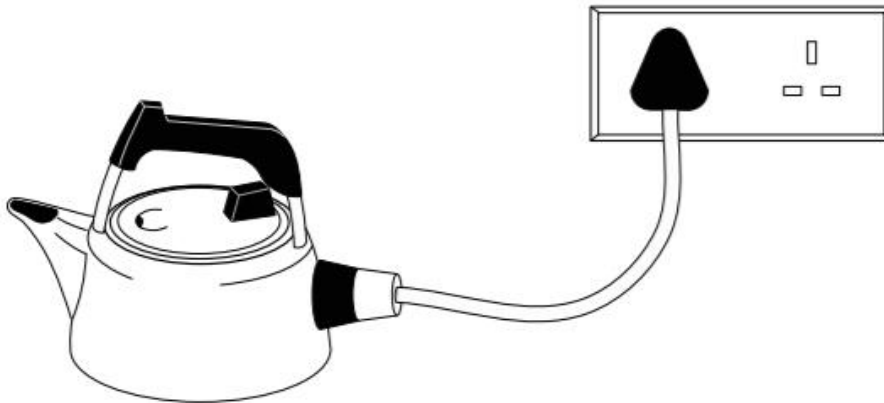
rule

Which apparatus must the student use to find the volume of the small piece of rock?

- A** balance and rule  
**B** rule only  
**C** balance and measuring cylinder  
**D** measuring cylinder only

**Q9.**

(a) Electrical heating is used in different ways, for example in an electric kettle.



Give **two** other examples of devices which use electrical heating.

- 1 .....
- 2 ..... **(2)**

(b) Electricity can be dangerous. Safety features such as fuses are often used.

Give **two** other examples of electrical safety features.

- 1 .....
- 2 ..... **(2)**

(c) Explain why it is dangerous to touch an electric socket when your hands are wet.

- .....
- .....
- ..... **(2)**

(d) A small object is stuck in an electric socket. Explain why it is dangerous to use a metal screwdriver to remove it.

- .....
- .....
- ..... **(2)**

**TOTAL FOR THE PAPER = 45 MARKS**