BOTSWANA EXAMINATIONS COUNCIL

JUNIOR CERTIFICATE EXAMINATION

(G1 3J)

SCIENCE

14/2

Paper 2

October/November 2014

Marks: 80

Time: 2 Hours

Candidate's Examination Number:	Centre						Candidate			

INSTRUCTIONS

1. Write your examination number in the space provided above.
2. Answer **ALL** questions.
3. All answers must be written in the spaces provided.
4. Show **ALL** the necessary working.
5. Calculators may be used in this paper.
6. A copy of the Periodic Table is printed on page 16.

FOR EXAMINER'S USE ONLY

Section	Marks Scored
A	
B	
Total Marks	

*This question paper contains **16** printed pages.*

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A (60 marks)

Use the information below to answer question 1.

Silicon is a non-metallic element. Some of the properties of silicon are similar to those of metals.

The following is a list of some of the properties of silicon.

- shiny and grey in colour
- hard but brittle
- melts at 1410 °C
- forms acidic oxide

1. **(a)** Which **two** of the properties of silicon are similar to those of metals?

.....

..... (2)

(b) **(i)** What is the physical state of silicon at room temperature?

..... (1)

(ii) Describe the arrangement and the movement of particles in a silicon element at room temperature.

Arrangement

..... (1)

Movement

..... (1)

(c) **(i)** In the space below, draw the atomic structure of silicon showing all electrons. Indicate the number of protons and that of neutrons in your drawing. Refer to the periodic table on page 16.

(3)

(ii) Which part of the atom contains protons?

..... (1)

For Examiner's Use

2. Oxygen can be obtained in the laboratory by the decomposition of hydrogen peroxide in the presence of a catalyst.

(a) (i) Complete the word equation below for the decomposition of hydrogen peroxide.

..... $\xrightarrow{\text{catalyst}}$ ..... + ... (2)

(ii) Name a suitable catalyst that is used in the reaction.

..... (1)

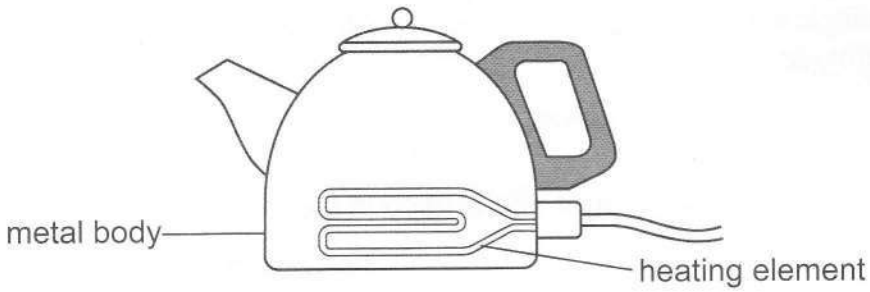
(b) Ozone (O_3) and Oxygen (O_2) are different forms of the **same** element in the same physical state.

What term is used to describe these **two** forms of the same element?

..... (1)

For Examiner's Use

The diagram below shows an electric kettle with the body made of metal. The kettle is filled with water. Use it to answer questions 3(a) to (c).



3. **(a)** Explain why the heating element is placed near the base of the kettle.

.....

.....

..... (2)

(b) The heating element of the kettle has a power rating of 2500 W.

(i) Explain this statement in terms of energy.

.....

..... (1)

(ii) The cost of 1 unit of electrical energy (1 kWh) is P0.60.
Calculate the cost of using the kettle for 15 hours.

Cost = ... (3)

(c) Suggest an improvement that can be made to the kettle to reduce heat loss.

.....

..... (1)

(d) State any **two** methods of heat transfer.

.....

..... (2)

For Examiner's Use

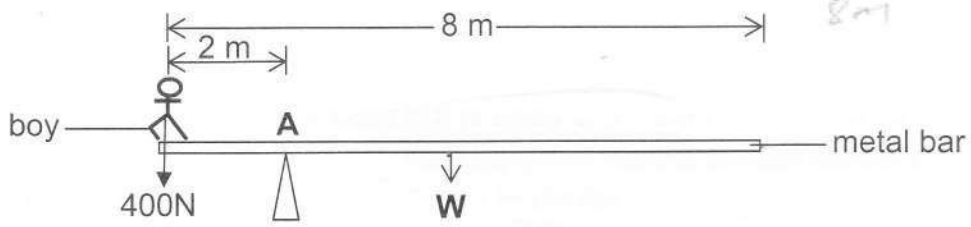
4. (a) State the principle of moments.

.....

..... (2)

Use the diagram and the information below to answer questions 4 (b) to (d).

A boy is standing on a metal bar of length 8 m as shown in the diagram below. The metal bar is supported at point **A** and it is balanced horizontally. The boy is standing 2 metres from point **A**. The weight of the metal bar, **W**, acts at the centre of the metal bar.



(b) Which term describes the turning effect of a force at point **A**?

.....

..... (1)

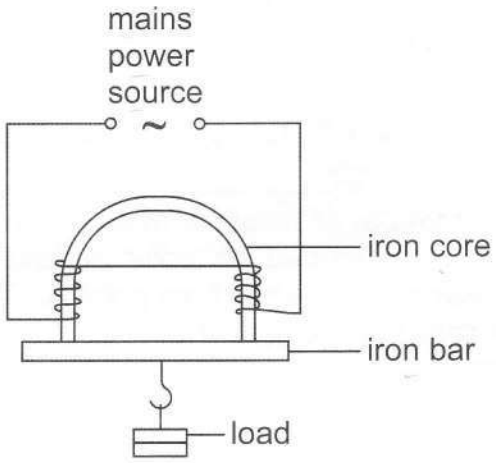
(c) Calculate the turning effect of a force about point **A** due to the boy.

Moment of force = ... (2)

(d) Calculate the weight of the metal bar.

Weight = ... N (2)

The diagram below shows a machine used to lift a load.
Use it to answer question 5.



5. **(a)** What method of magnetisation is used in the machine shown?

..... (1)

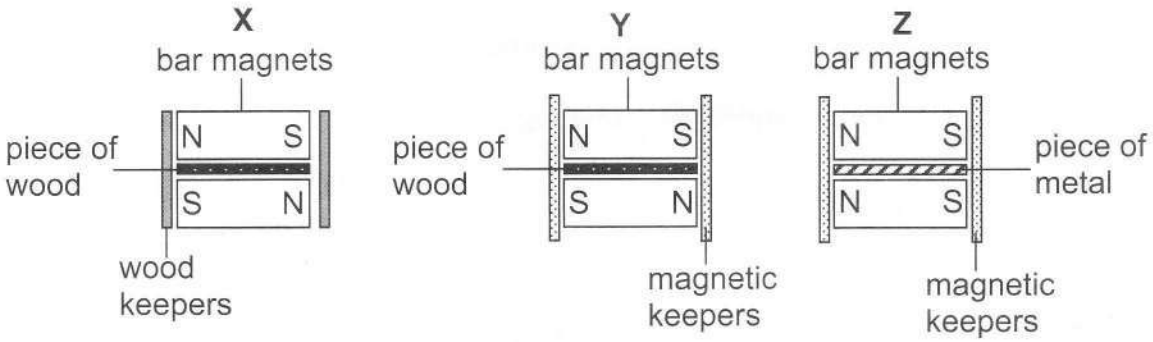
(b) The machine can lift a maximum load of 5000 N.

Suggest **two** ways in which the machine can be improved to make it lift a heavier load.

.....

..... (2)

(c) **(i)** Which of the diagrams below shows the correct way of storing magnets?



..... (1)

(ii) Give a reason for your answer to **(c) (i)** above.

.....

..... (1)

For Examiner's Use

(iii) Why is steel classified as a hard magnetic material?

..... (1)

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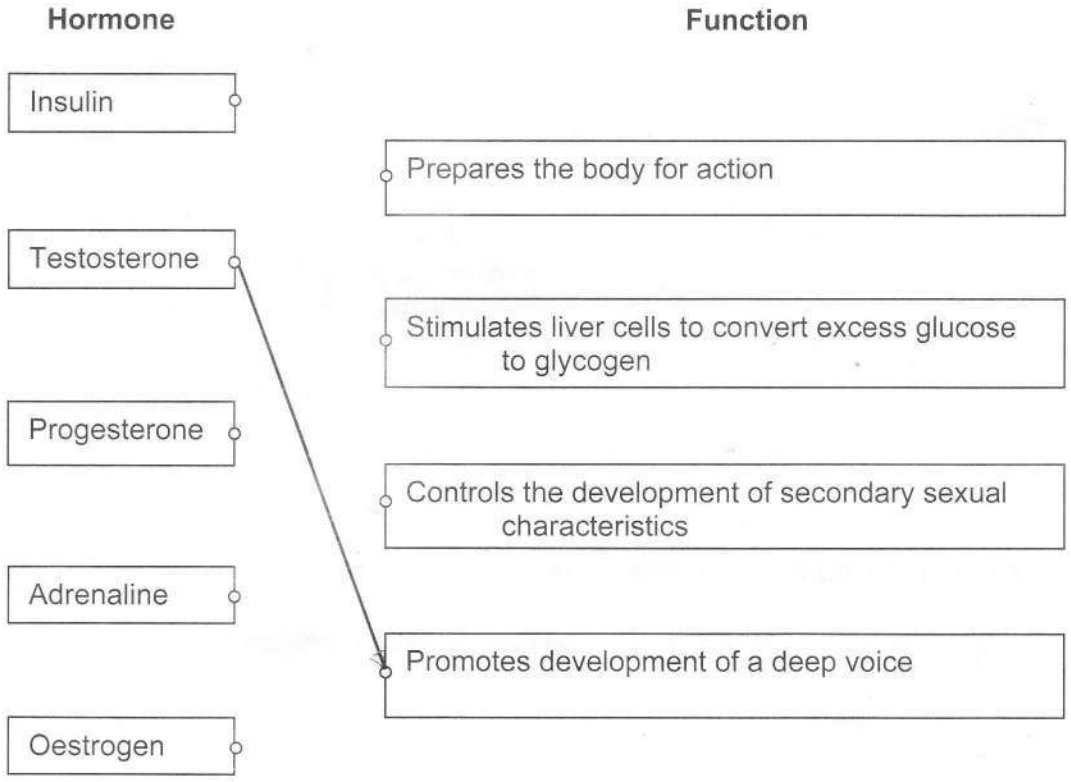
6. Below is a list of hormones and the functions of some of them.
Draw a line to connect a hormone with its function. One has already been done for you.



(3)

For Examiner's Use

Use the information below to answer question 7.

In an ecosystem, an ecologist found a *mophane* tree to be having 10 000 leaves which are food for 1000 *mophane* worms. On the same tree, there were 2 owls which were depending on 100 weaver birds for their food. The weaver birds feed on *mophane* worms.

7. **(a)** Name the habitat in this ecosystem.

..... (1)

(b) Draw a labelled pyramid of numbers for the ecosystem described above.

(3)

(c) All *mophane* worms were harvested from the tree.

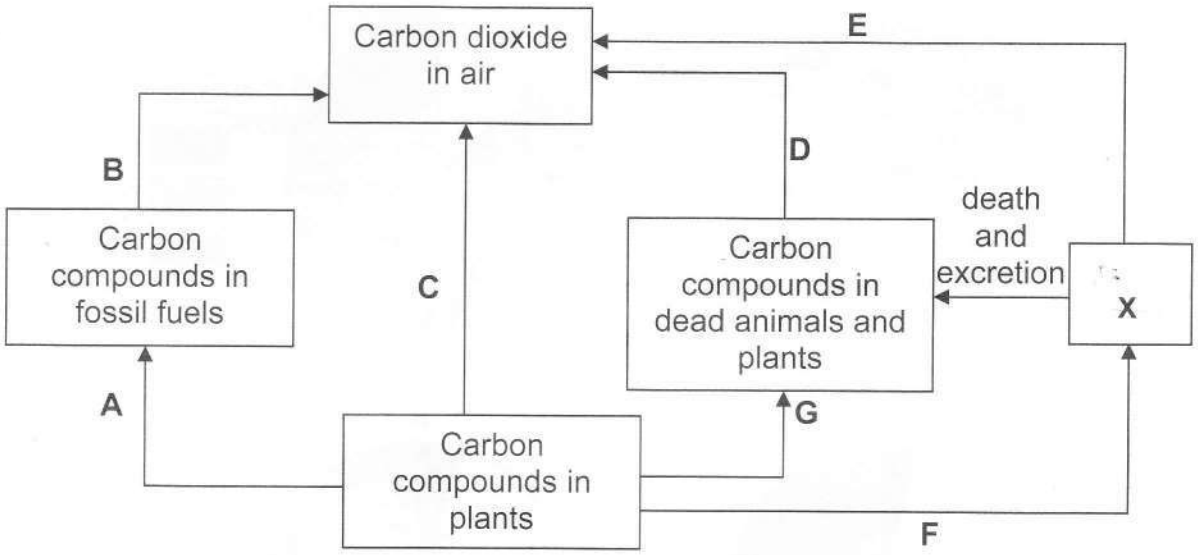
Suggest **two** ways in which the ecosystem will be affected.

.....

..... (2)

For Examiner's Use

The diagram below shows an incomplete carbon cycle. The letters A to G represent some of the processes that take place in the cycle. Use the diagram to answer question 8.



8. **(a)** What does the letter **X** represent?

..... (1)

(b) Which letter represents;

(i) respiration?

..... (1)

(ii) combustion?

..... (1)

(c) **(i)** On the diagram, draw an arrow to represent the process of photosynthesis and label it **P**. (1)

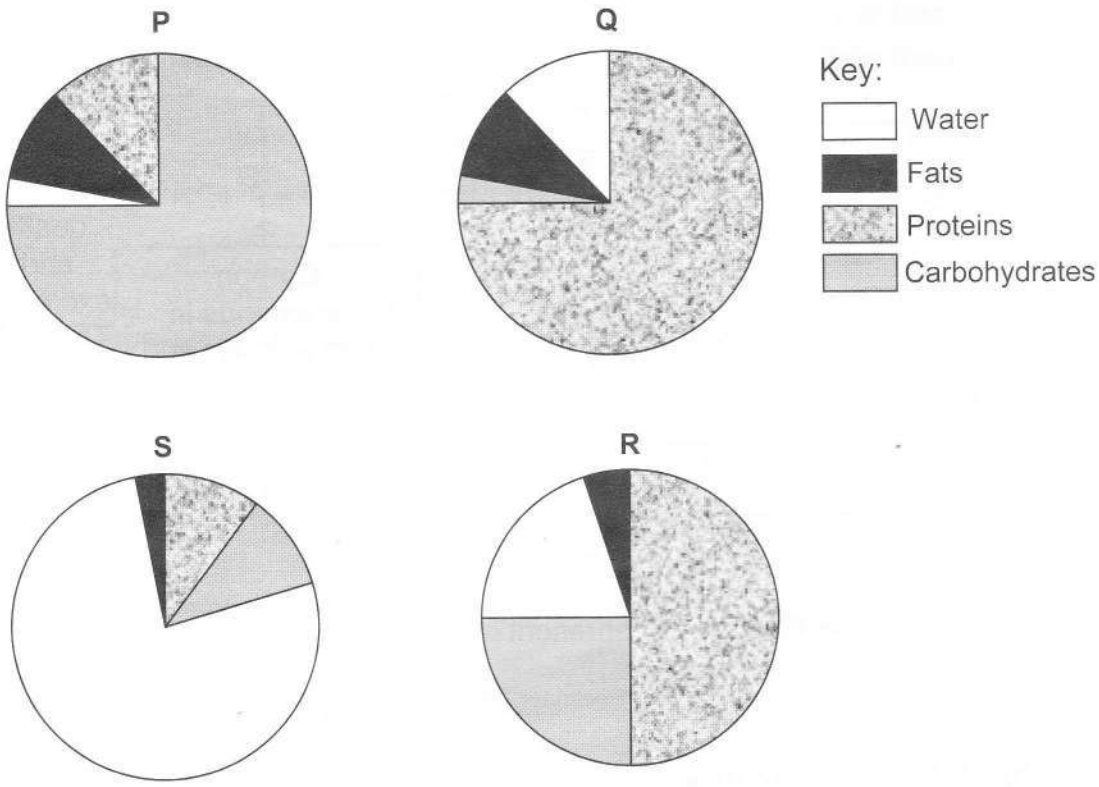
(ii) Write the word equation for photosynthesis.

.....

..... (3)

For Examiner's Use

The pie charts below represent the proportions of different nutrients found in food substances P, Q, R and S. Use them to answer questions 9 (a) to (c).



9. **(a)** State with a reason, which of the food substances **P**, **Q**, **R** or **S** is the **best** source of energy.

Food substance ..... (1)

Reason ..... (1)

(b) **(i)** At an ante-natal clinic, an unborn baby was suspected to be underweight. Which of the food substances **P**, **Q**, **R** or **S** would be **best** recommended to the mother?

..... (1)

(ii) Explain your answer to **(b) (i)** above.

..... (1)

(c) State with a reason, which of the food substances **P**, **Q**, **R** or **S** would **most** likely lead to heart related diseases if eaten for a prolonged period.

Food substance ..... (1)

Reason .....

..... (1)

For Examiner's Use

(d) State the end product in the digestion of carbohydrates.

..... (1)

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10. The following is a list of some features of the Earth's spheres.
From the list circle the features of hydrosphere.

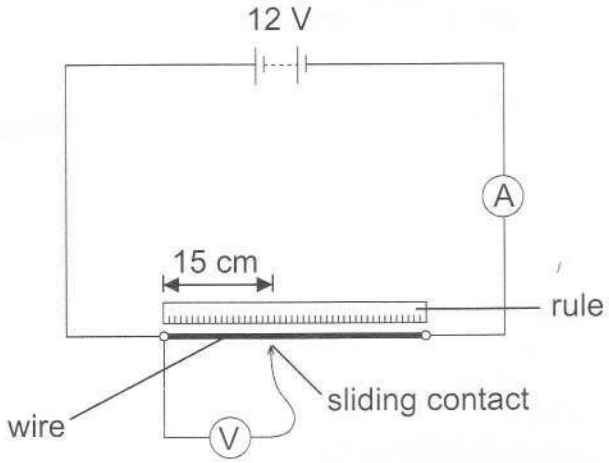
plants **rivers** **insects** **rain** **rocks**

(2)

SECTION B (20 marks)

Use the information and the diagram below to answer questions 11 (a) to (c).

The diagram shows a set-up that was used in an experiment to investigate the relationship between the length of a wire and its resistance. The voltmeter was used to measure the potential difference across different lengths of the wire. The sliding contact was initially placed at the 15 cm mark from the end of the wire.



The experiment was repeated by placing the sliding contact at different lengths of the wire. Some of the results of the experiment are recorded in the table below.

Length (cm)	Voltage (V)	Resistance Ω
0	0	0
15.0	2.0	2
30.0	4.0	4
45.0	6.0	
60.0	8.0	8
90.0	12.0	12

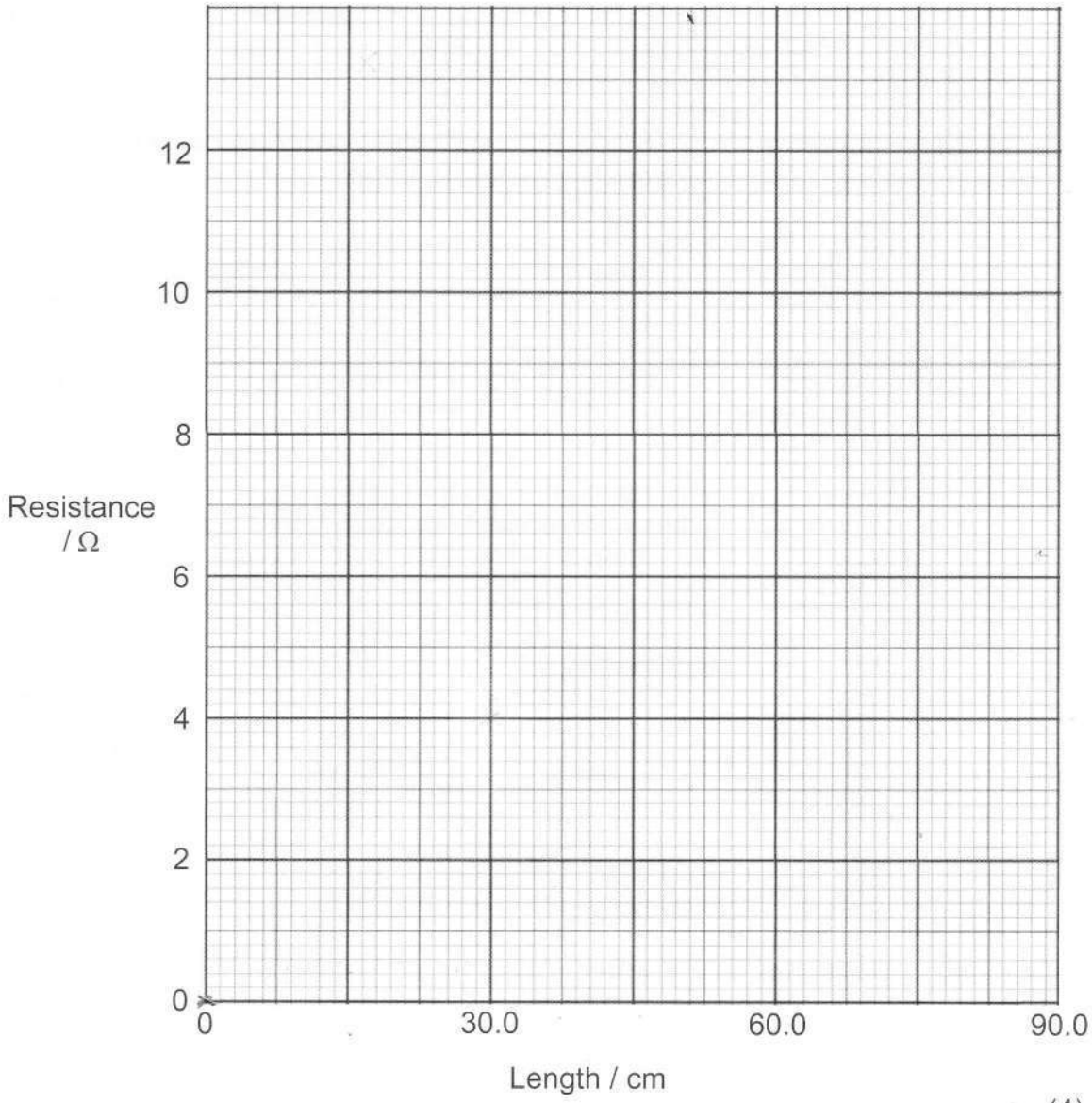
11. (a) The current in the circuit was 1.0 A.

The resistance of the wire is calculated using the relationship $R = \frac{V}{I}$.

Complete the table by calculating the resistance of the wire when the sliding contact was placed at the 45.0 cm mark. (1)

For Examiner's Use

(b) **(i)** On the grid below, plot a graph of resistance against length of the wire.



(4)

(ii) Using your graph, find the resistance when the sliding contact is placed at the 75.0 cm mark. Show your working.

..... (2)

(c) **(i)** What conclusion can be drawn from the investigation?

.....

..... (1)

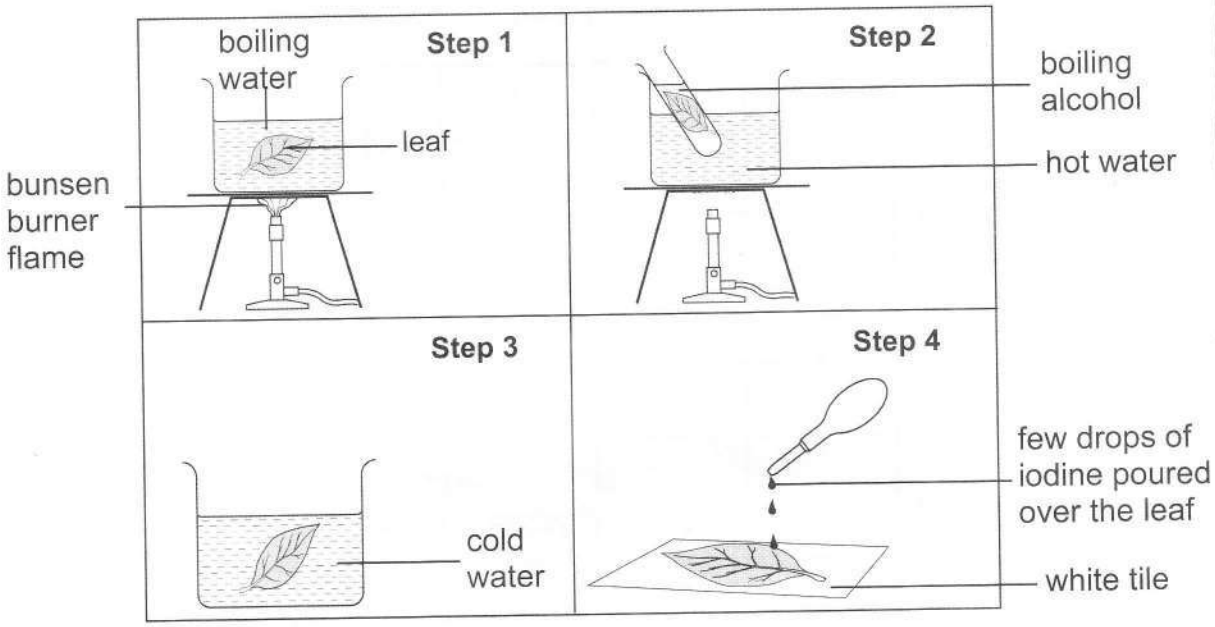
(ii) State **one** factor which affects the resistance of a wire apart from its length.

..... (1)

(d) Which instrument is used to measure current?

..... (1)

The diagram below shows steps followed when carrying out a certain test on a green leaf. Use it to answer question 12 (a).



12. (a) Give reasons for carrying out the following steps;

(i) Boiling the leaf in water in step 1.

..... (1)

(ii) Boiling the leaf in alcohol in step 2.

..... (1)

(iii) Switching off the Bunsen burner in step 2.

..... (1)

(iv) State the results for a positive test in step 4.

..... (1)

(v) Explain the results obtained in **(iv)**.

..... (1)

For Examiner's Use

Use the information below to answer question 12 (b).

A student had to separate a mixture of sodium chloride and sand. The student added water to the mixture and stirred. Sodium chloride dissolved in water.

(b) (i) Use words from the list below to complete the following sentences.

insoluble **soluble** **solute** **solution** **solvent**

Sodium chloride dissolved in water to form a colourless .....

The sand did not dissolve because it is ..... in water.

Sodium chloride is a ..... in this experiment. (3)

(ii) Name **two** apparatus that could be used to separate sand from the mixture of water, sodium chloride and sand.

.....

..... (2)