ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/2

PAPER 2 Theory

NOVEMBER 2018 SESSION 2 hours

Candidates answer on the question paper

Additional materials: Calculator (Optional)

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top.
Write your centre and candidate number in the boxes on the top right corner of every page of this paper.
Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.
Write your answers in the spaces provided on the question paper.

Section A
Answer **all** questions.

Section B
Answer any two questions.

Section C
Answer any **two** questions.

Section D
Answer any **two** questions.

INFORMATION FOR CANDIDATES

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

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Section A

Answer all questions in this section in the spaces provided.

1. **Fig.1.1** shows a palisade cell.

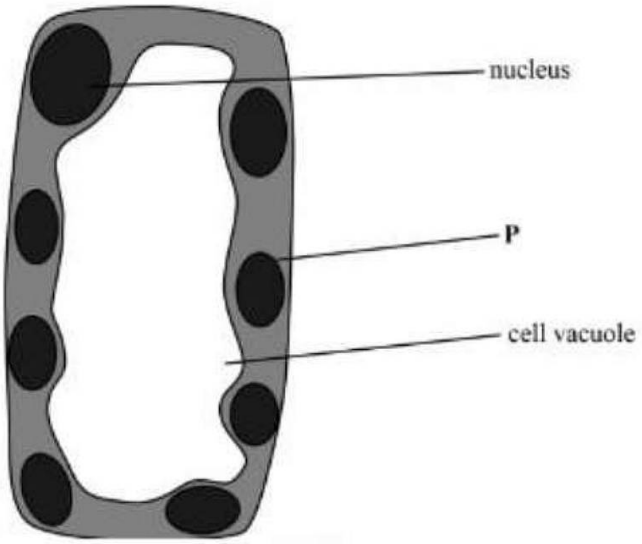


Fig. 1.1

(a) **(i)** Identify structure **P**.

_____ [1]

(ii) Explain how the palisade cell is adapted for its function.

_____

_____

_____

_____

_____

[4]

(b) State any **two** nutrient deficiency diseases in humans.

_____

_____

_____

[2]

2. **(a)** Name any **two** types of teeth and give **one** function for each.

[4]

(b) **(i)** Explain the importance of chemical digestion.

[2]

(ii) State the enzyme that converts starch to maltose in the mouth.

[1]

3. **Fig.3.1** shows the electrolytic cell used for the electrolysis of molten lead bromide.

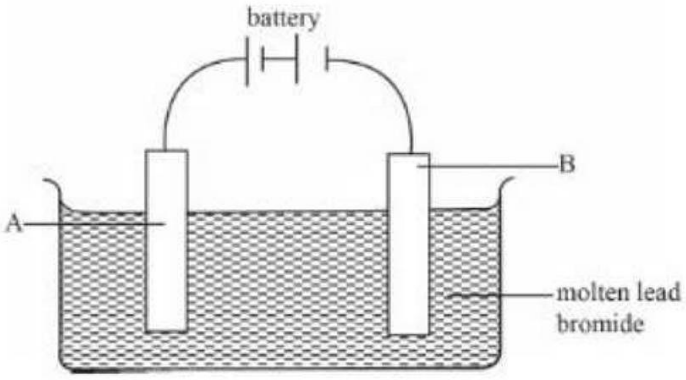


Fig.3.1

(a) Define the term *electrolysis*.

[2]

(b) **(i)** State the name given to electrode **A**.

[1]

(ii) Name the product formed at electrode **B**.

[1]

(iii) Write an equation for the reaction which occurs at **B**.

[2]

4. **Fig.4.1** shows a method used to completely neutralise sodium hydroxide solution, $NaOH_{(aq)}$.

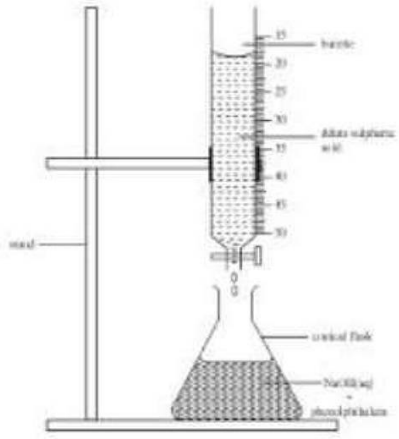


Fig.4.1

(a) Name the method shown in **Fig.4.1**

[1]

(b) Explain why the phenolphthalein indicator is added.

[2]

(c) Complete and balance the chemical equation for the reaction between sodium hydroxide and sulphuric acid.

$$2NaOH \quad + \quad H_2SO_4 \quad \rightarrow$$

[3]

(d) Calculate the molecular mass of NaOH.

[1]

5. **(a)** State Ohm's law and give any **one** limitation to the law.

Ohm's law _____

_____

Limitation _____

_____

[2]

(b) **Fig.5.1** shows an electric circuit with three resistors, $\mathbf{R}_1$ which is 2 Ω, $\mathbf{R}_2$ which is 2Ω and $\mathbf{R}_3$ which is 6 Ω.

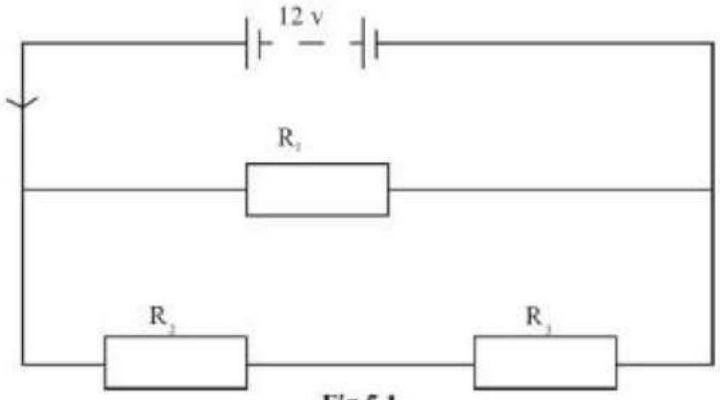


Fig.5.1

(i) State the way in which $\mathbf{R}_1$ is connected in relation to $\mathbf{R}_2$ and $\mathbf{R}_3$.

[1]

(ii) Calculate the total current, I, in the circuit.

[3]

6. (a) **Fig.6.1** shows a water pump.

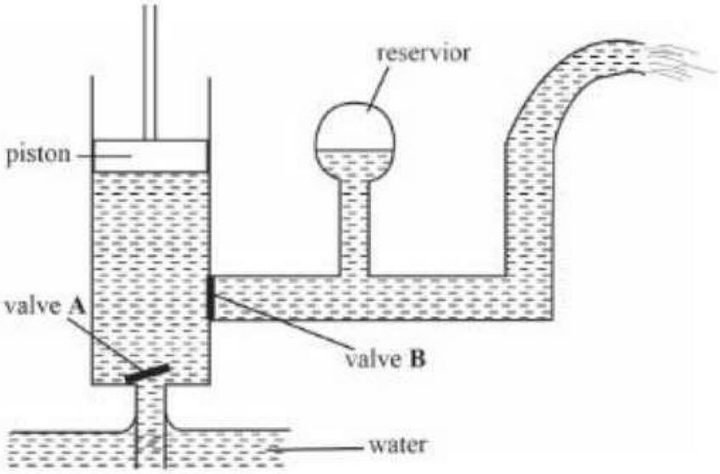


Fig.6.1

(i) Name the type of the water pump shown in **Fig.6.1**.

[1]

(ii) Outline what happens during the upward stroke.

[3]

(b) **Fig.6.2** is a pie chart showing people using a particular source of energy.

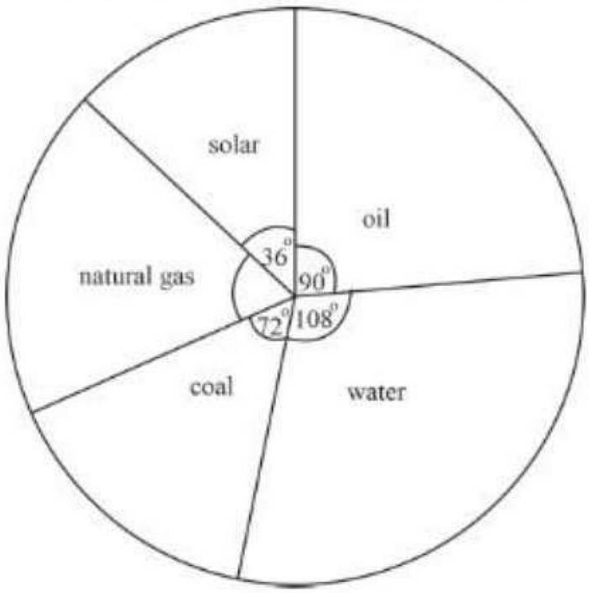


Fig.6.2

(i) Identify the energy source which is most widely used.

[1]

(ii) Calculate the percentage of people using natural gas.

[2]

Section B

*Answer any **two** questions. Write your answers in the spaces provided on the question paper.*

7. **(a)** Define the term *pollination*.

[2]

(b) Explain the importance of coloured petals, sticky pollen grains and enclosed anthers of an insect pollinated flower.

[4]

(c) **(i)** State any **two** conditions necessary for germination.

[2]

(ii) State any **two** advantages of reproducing plants using seeds over vegetative propagation.

[2]

8. (a) **Fig. 8.1** shows a sperm.



Fig. 8.1

(i) Explain how the structure of the sperm is related to its function.

[4]

(ii) Suggest why sperms need to be produced in large numbers compared to female gametes.

[1]

(b) (i) State any **two** phases of the human menstrual cycle.

[2]

(ii) State the part of the female reproductive system where implantation of the fertilised ovum takes place.

[1]

(iii) Name any **two** substances which move from the mother to the foetus through the placenta.

[2]

9. (a) **Fig.9.1** shows a food web in an ecosystem.

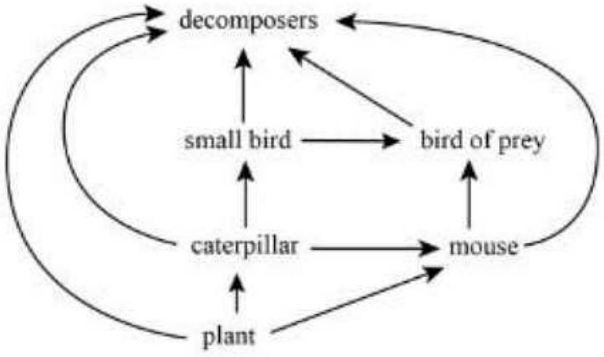


Fig.9.1

(i) State what is represented by arrows between organisms.

[1]

(ii) State the organism that feeds on all other organisms in the web.

[1]

(iii) State, with reasons, an organism in the web which could exist in small numbers.

[3]

(b) Explain how a food web is a better representation of what happens in an ecosystem than a food chain.

[1]

(c) State any **two** activities of man that can be harmful to an ecosystem.

[2]

(d) Give any **two** factors that reduce the rate of transpiration.

[2]

Section C

Answer any **two** questions. Write your answers in the spaces provided on the question paper.

10. **(a)** **(i)** Define the term *hydrocarbon*.

[1]

(ii) Name any **one** homologous series under hydrocarbons.

[1]

(iii) From the homologous series named in **(ii)**, name the hydrocarbon with three carbon atoms.

[1]

(iv) Draw the displayed formula of the hydrocarbon named in **(iii)**.

[1]

(b) Biogas is a renewable fuel obtained from organic wastes.

(i) Describe how biogas is produced.

[3]

(ii) State the **three** conditions needed for optimum production of biogas.

[3]

11. Nitrogen and hydrogen gases were compressed in the reaction chamber at a temperature of 450 °C–500 °C to produce ammonia.

(a) Describe what would happen to the yield of ammonia if the temperature of the reaction chamber was raised to 800 °C.

[2]

(b) State **two** optimum conditions for the Haber process other than temperature.

_____

_____

[2]

(c) Explain why ammonia and other gases are recycled into the reaction chamber.

_____

[1]

(d) State any **two** industrial uses of ammonia.

_____

_____

[2]

(e) Calculate the number of moles in 56 dm^3 of ammonia.

[3]

12. (a) **Fig.12.1** shows how the volume of gas **X** varied with time as a 2 cm piece of magnesium ribbon reacted with dilute hydrochloric acid (HC*l*).

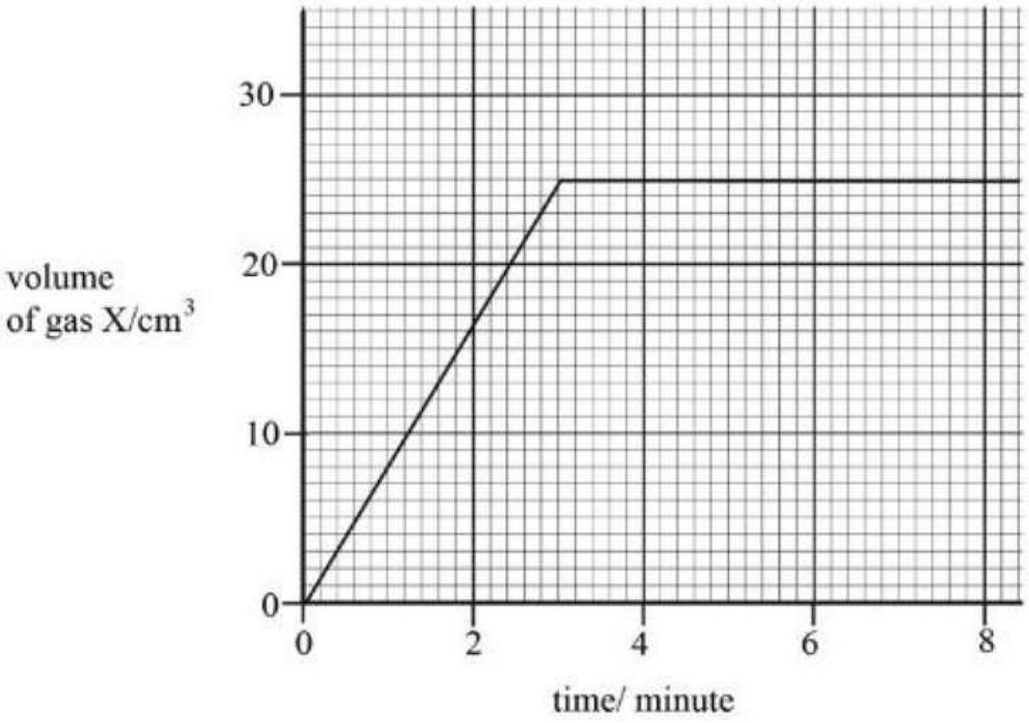


Fig.12.1

(i) Name gas **X**.

_____

[1]

(ii) From the graph, deduce the maximum volume of gas **X** produced at the end of the reaction.

_____

[1]

(iii) Determine the time taken for the reaction to get to completion.

_____

[1]

(iv) Describe the effect of using magnesium powder instead of the magnesium ribbon to the rate of the reaction.

_____

_____

[2]

(v) State any **two** factors, other than surface area that would increase the rate of reaction.

[2]

(b) **(i)** State an industrial process that produces nitrogen.

[1]

(ii) State any **two** uses of nitrogen.

[2]

Section D

*Answer any **two** questions. Write your answers in the spaces provided on the question paper.*

13. **(a)** A diesel engine undergoes a four stroke cycle during its operation.

(i) Describe what happens during the intake stroke of the diesel engine.

[3]

(ii) Explain why the diesel engine does **not** have spark plugs.

[2]

(f) A hand feels hot when placed above an electric heater which is switched on.

(i) Describe how the heat reaches the hand.

[3]

(ii) Calculate the energy drawn by the electric heater if it is connected to 240 V mains supply and draws a current of 6 A for 1 minute.

[2]

14. **(a)** A direct current (d.c) motor is a device which converts electrical energy to kinetic energy.

(i) Describe how motion is produced in a d.c motor.

[3]

(ii) State any **two** factors that would affect the motion of the d.c motor.

[2]

(iii) State what would happen if the d.c power supply is replaced by alternating current (a.c).

[1]

(b) State any **three** precautions taken against lightning.

[3]

(c) Name a device which can be used to determine whether or not a glass rod is charged.

[1]

15. (a) **Fig.15.1** shows a 3-pin plug.

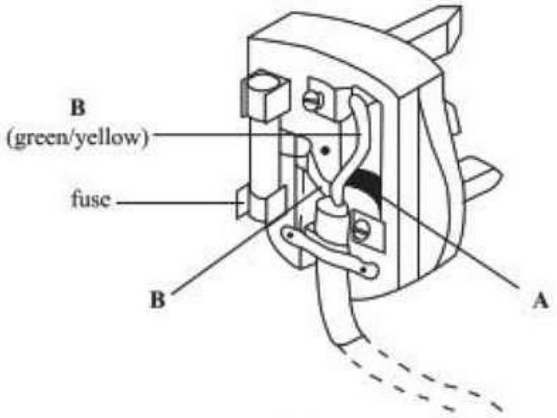


Fig.15.1

(i) State which of the labelled wires is the live wire.

[1]

(ii) State the colours of wires **A** and **C**.

A _____

C _____

[2]

(iii) State any **one** advantage and any **one** disadvantage of using photo voltaic cells as a source of electricity.

advantage

disadvantage

[2]

(iv) Explain how photo voltaic cells are used as a source of electrical power for appliances which use both alternating current and direct current.

[4]

(b) State any **one** use of electricity in the home.

[1]