Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS 4023/2

PAPER 2 Theory

NOVEMBER 2021 SESSION 2 hours 15 minutes

Additional materials:
Electronic calculator
Answer paper

Time 2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and on any separate answer paper used.

Section A

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

Section B

Answer any **three** questions.
Write your answers on the separate answer paper provided.
At the end of the examination fasten the answer paper used securely to the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question.
Candidates are reminded that **all** quantitative answers should include appropriate units.

This question paper consists of 16 printed pages.

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Section A

*Answer **all** questions.*

1 **(a)** **Fig. 1.1** shows how the measurement of length can be used to find the thickness of a wire.

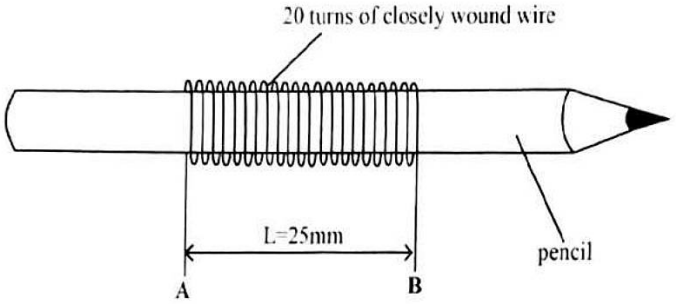


Fig. 1.1

Name the instrument used to measure length **AB.**

_____ [1]

(b) Calculate the thickness of the wire in **Fig. 1.1.**

[2]

(c) State the precaution to be taken when winding the wire over the pencil.

(d) **Name the most suitable instrument for measuring the diameter of the wire.**

_____ [1]

2 **(a)** Explain what is meant by *transverse wave*.

_____

_____ [1]

(b) State any **two** other similarities of electromagnetic waves.

_____

_____

_____

_____ [2]

(c) A radio wave has a speed of 3×10^8 m/s in air and its wavelength is 150 m. Calculate its frequency.

[2]

3 (a) (i) State a base quantity that is measured to determine the strength of a beam.

_____ [1]

(ii) Name a property of beams that is used to name them.

_____ [1]

(b) **Fig. 3.1** shows a beam made by piling layers of wood.

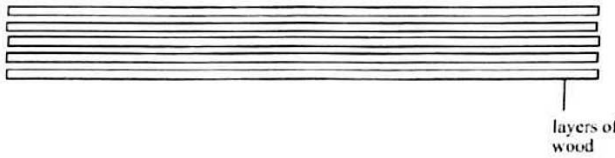


Fig. 3.1

(i) Explain why the beam is easily sheared by a horizontal force.

_____ [1]

(ii) Add on **Fig. 3.1** a beam that will make it resist shear. [1]

(iii) Explain why wood snaps when loaded.

_____ [1]

4 (a) State the value of the upper fixed point on a Celsius scale.

_____ [1]

(b) State any **two** physical properties which can be used for temperature measurement.

_____

_____ **[2]**

(c) State with a reason, a suitable thermometer for measuring the melting point of iron.

Type of
Thermometer _____

Reason _____ [2]

5 **(a)** **(i)** State the effect, on the resistance of a metallic conductor, of

doubling the length,

_____

doubling the cross-sectional area,

_____

increasing the temperature.

_____ [3]

(ii) A copper cable of length 50 m and uniform cross-sectional area 1.26×10^{-5} m^2 is used during transmission of electricity.

Calculate the resistance of the cable given that the resistivity for copper is $1.68 \times 10^{-8} \Omega$m.

[2]

6 **(a)** **Fig. 6.1** shows a conductor carrying a current into the paper.

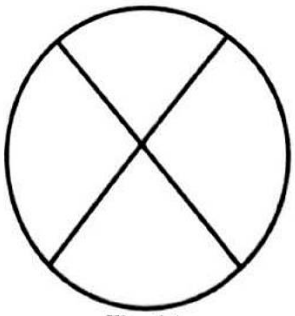


Fig. 6.1

On Fig. **6.1** draw the magnetic field around the wire. [2]

(b) **Fig. 6.2** shows two hollow cylindrical tubes placed next to each other with insulated copper wires passing through the hollow tubes.

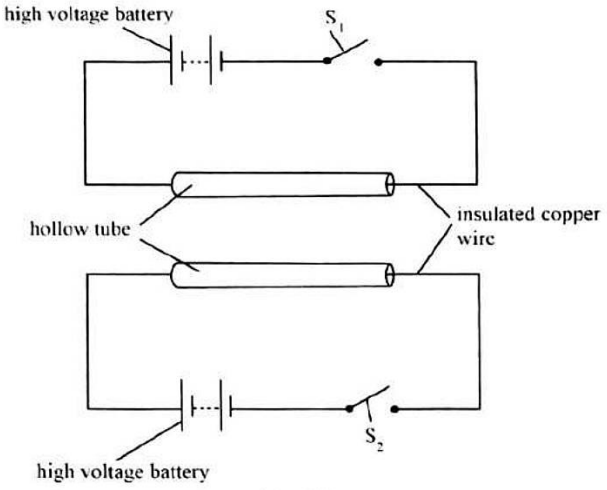


Fig. 6.2

(i) State what is observed when switches S_1 and S_2 are closed.

_____

_____ [1]

(ii) Explain your observations in **b (i)**.

_____

_____

_____

_____ **[2]**

7 **(a)** **(i)** State the function of a capacitor.

_____ **[1]**

(ii) **Fig. 7.1** shows an RC circuit.

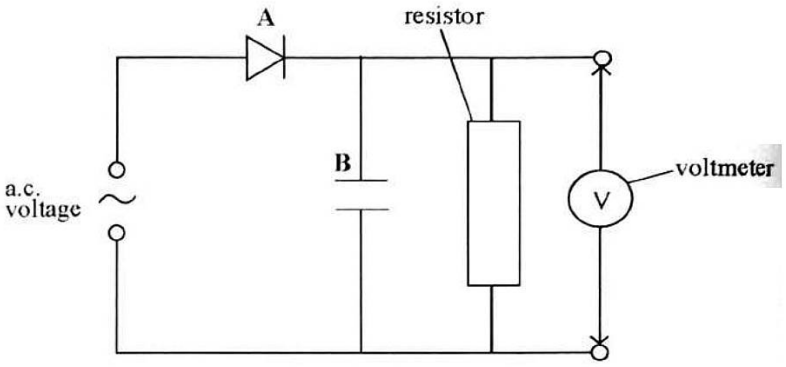


Fig. 7.1

Name the components

A, _____

B. _____ **[2]**

(b) Sketch a voltage-time graph of the output voltage across the resistor in **Fig. 7.1** for two cycles.

[2]

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

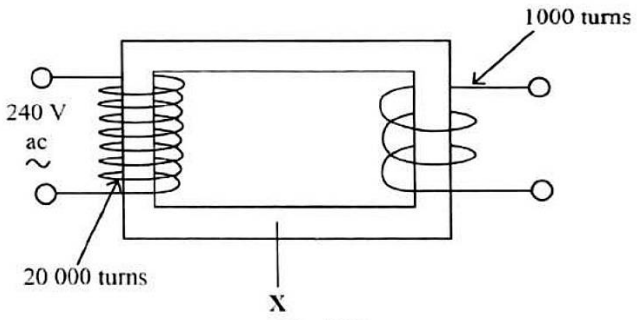


Fig. 8.1

(i) Identify part X.

_____ [1]

(ii) State, giving a reason, the type of transformer in **Fig. 8.1**.

_____

_____

_____

_____ [2]

(b) Calculate the output voltage of the transformer in **Fig. 8.1**.

[2]

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Section B

*Answer **any three** questions from this section.*

9 **(a)** **Fig. 9.1** shows the moon orbiting the earth.

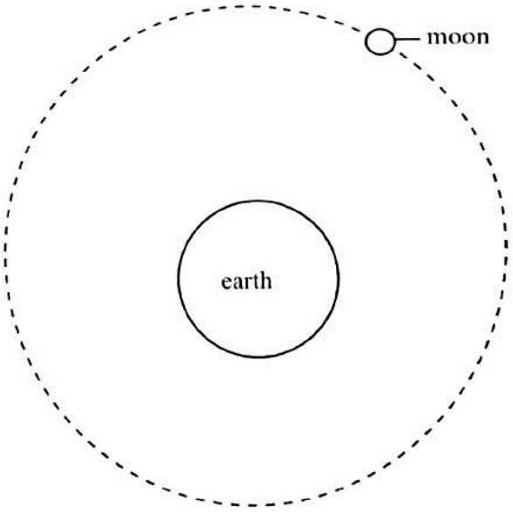


Fig. 9.1

(i) On **Fig. 9.1** draw an arrow that shows the direction of the force that keeps the moon in orbit.

(ii) State the name of the force in **a (i).**

(iii) Explain why the force in **a (i)** does not do any work.

(iv) Predict what will happen to the moon, if the force was to do work.

[6]

(b) **Fig. 9.2** shows an electric motor rated 6 500 W used to operate a lift of mass 500 kg that rises 11 m in 15 seconds.

[g = 10 ms^{-2}].

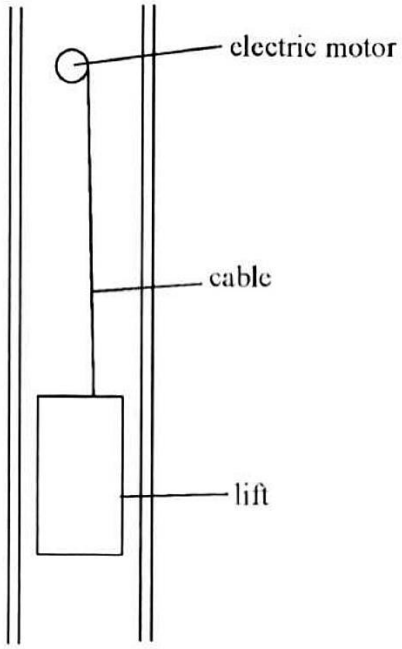


Fig. 9.2

(i) Calculate the tension in the cable.

(ii) Determine the power out of the electric motor.

(iii) Calculate the efficiency of the electric motor.

(iv) Justify the efficiency found in **b (iii)**.

[6]

(c) **(i)** Name **two** processes that gives out nuclear energy.

(ii) State any **two** uses of nuclear energy.

(iii) Suggest **two** dangers associated with nuclear energy.

(iv) Explain, giving **two** reasons, why most countries in the world are failing to make use of nuclear energy.

[8]

10 **(a)** **(i)** State any **two** reasons why aeroplane bodies are made of aluminium alloy.

(ii) Table **10.1** shows information about beams **A, B** and **C** produced whic sags after being loaded.

Table 10.1

Beam	A	B	C
Sag	0.5 cm	2.0 cm	3.0 cm

From **table 10.1,** suggest with a reason, the strongest beam.

(iii) State **two** factors that should be kept constant for the comparison of the beams to be fair.

[6

(b) Wind is blowing towards a wind turbine at $8\ ms^{-1}$. The mass of air passing through the area covered by wind turbine blades is $5000\ kgs^{-1}$.

(i) State the useful energy conversions during operation of a wind turbine.

(ii) Determine the kinetic energy of the air flowing in one second.

(iii) If the turbine is 15% efficient, calculate the electrical energy output.

(iv) State the reason why the turbine is not 100% efficient.

(v) Suggest an environmental hazard passed by wind turbines.

[6

(c) (i) State any **two** factors which determine the type of bridge to be constructed across a river.

(ii) Suggest why suspension bridges have a limited life span.

(iii) **Fig.10.1** show an incomplete suspension bridge.

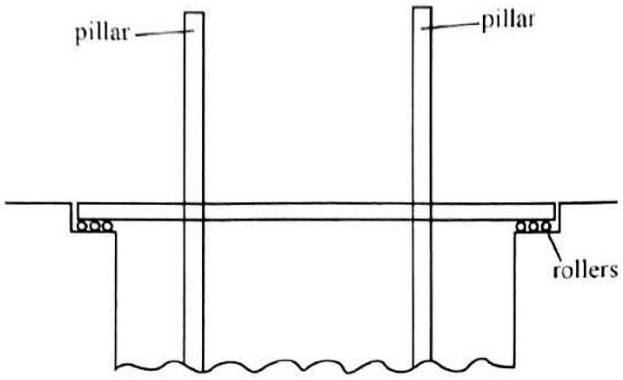


Fig. 10.1

On **Fig. 10.1** make additions that will complete and strengthen the bridge.

Using arrows, show the type of forces acting on pillars when the bridge is loaded.

(iv) State the function of rollers.

[8]

11 (a) **Fig. 11.1** shows a component on a car engine.

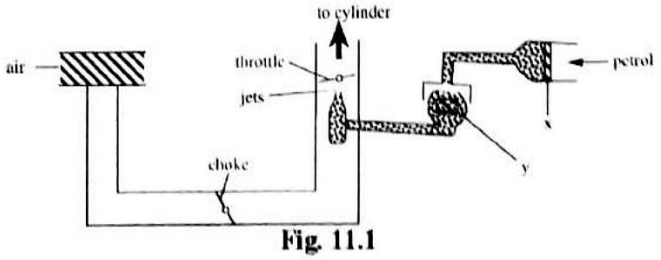


Fig. 11.1

(i) Identify the component in **Fig. 11.1**.

(ii) State the functions of parts labelled X and Y.

(iii) Name a substance used in blending petrol in Zimbabwe.

(iv) Suggest any **two** reasons why countries are shifting from fossil fuels to solar energy.

[6]

(b) (i) State what causes boiling point of water to vary with altitude.

(ii) Explain why sea water has a higher boiling point than pure water.

(iii) Describe how sound is produced when water boils.

[6]

(c) (i) Define *heat capacity*.

(ii) State **two** factors that determine the heat capacity of a substance.

(iii) An aluminium cup of mass 0.2 kg contains 0.4 kg of water at 90 °C. Calculate the total amount of heat lost when the water and cup are cooled to 15 °C.
[specific heat capacity of water = 4 200 J/kg °C]
[specific heat capacity of aluminium = 900 J/kg °C]

(iv) Explain why different materials have different heat capacities. [8]

12 (a) (i) Arrange x-rays, radio waves and micro waves in order of increasing frequency.

(ii) State one use of
1. X-rays,
2. micro-waves,
3. infra-red,
4. ultraviolet. [6]

(b) **(i)** Name any **two** household devices that make use of thermostats in temperature control.

(ii) **Fig. 12.1** shows a fire alarm circuit.

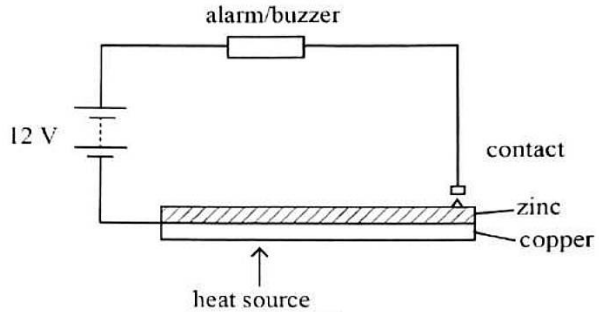


Fig. 12.1

Describe how the circuit in **Fig. 12.1** works.

(iii) Explain what would happen if railway lines had no gaps along them.

[6]

(c) **(i)** Give any **two** differences between *boiling* and *evaporation.*

(ii) State Boyle's law.

(iii) A gas occupies 100 cm^3 at a pressure of 20 kPa and a temperature of 25°C.
Calculate the volume of gas when pressure of 20 kPa and temperature are changed to 15 kPa and 15°C respectively.

(iv) Explain why island heat faster than the sea.

[8]