Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS

PAPER 2 Theory

4023/2

NOVEMBER 2023 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 14 printed pages and 2 blank pages.

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Section A

*Answer **all** questions.*

1 (a) (i) If an object is thrown upwards, it will eventually fall to the ground. Give a reason for this.

_____

_____ [1]

(ii) Write any equation of motion that will assist to determine the final velocity of the object as it hits the ground.

_____

_____ [1]

(b) An astronaut standing on a planet surface throws a rock vertically upwards. The rock is thrown with a velocity of 6.5 m/s and reaches its maximum height in 3.9 s.

Determine the acceleration due to the gravity of the planet.

[3]

2 (a) Define *pressure*.

_____

_____ [1]

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(b) **Fig .2.1** shows apparatus used to find the pressure of gas A.

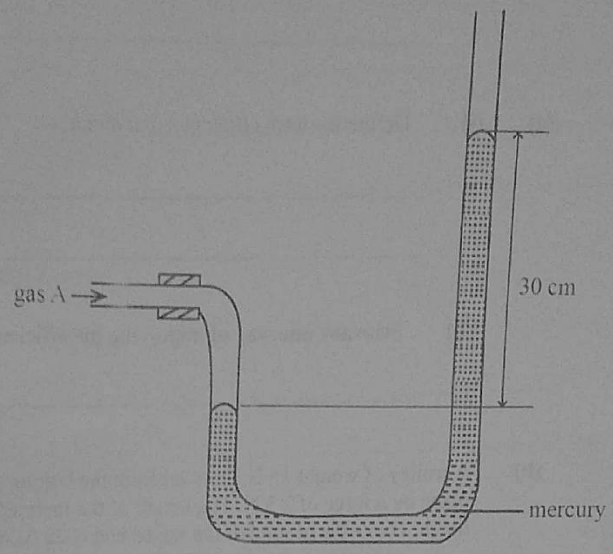


Fig.2.1

(i) Calculate the pressure of the gas, if the density of mercury is 13600 kg/m^3.
{g = 10 m/s^2 and atmospheric pressure is **$1.01x10^5$Pa}**

[3]



(ii) State **one** disadvantage of using mercury.

_____

_____ [1]

3 (a) (i) Define the term *efficiency of a machine.*

_____

_____ [1]

(ii) State any **one** way of improving the efficiency of a machine.

_____ [1]

(b) A trolley of weight 15 N is pulled from the bottom to the top of an inclined plane by a force of 2.5 N. The length of the inclined plane is 2.0 m and the height above the ground of the raised end is 25.0 cm.

Calculate the efficiency of the inclined plane.

[3]

4 (a) State **one** advantage of using multiple cylinders in an engine.

_____

_____ [1]

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(b) Describe the operations of a four stroke engine.

[4]

5 **(a)** Explain the terms

(i) *wavelength.*

[1]

(ii) *frequency.*

[1]

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(b) **Fig. 5.1** below shows a cathode ray oscilloscope trace of a sound wave produced by a loud speaker.

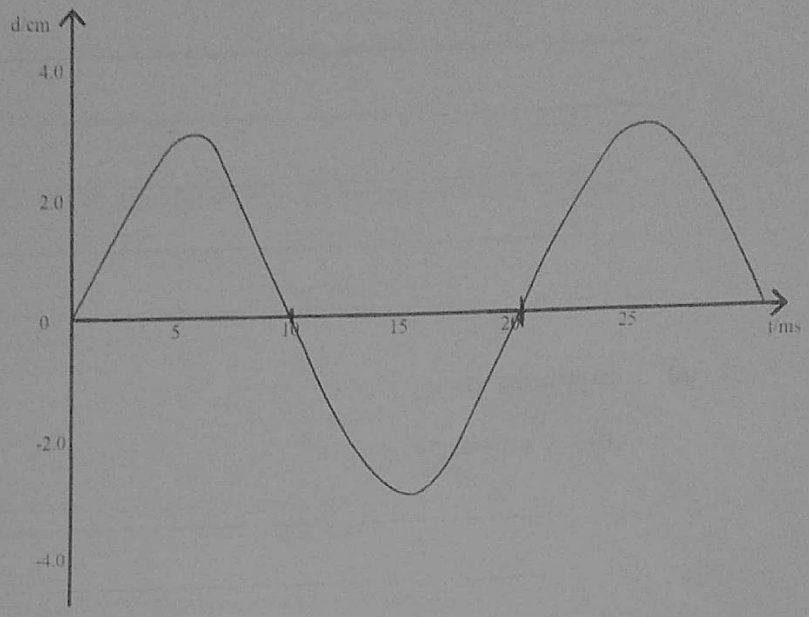


Fig 5.1

Determine from the graph the

(i) amplitude,

_____

_____ [1]

(ii) period.

_____

_____ [1]

(c) On **Fig.5.1**, draw a trace of the sound with a higher pitch. [1]

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6 (a) Define *potential difference* and state its *SI unit.*

_____

_____

_____ [2]

(b) **Fig. 6.1** shows two identical resistors connected to a source of 6.0 V.

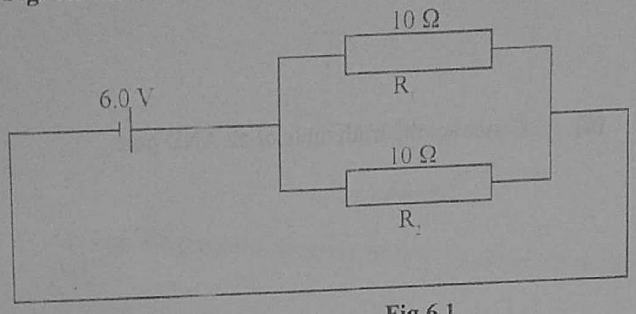


Fig.6.1

(i) Calculate the total resistance in the circuit.

[2]

(ii) Determine the voltage across R_1. [1]

7 **(a)** **(i)** Draw a symbol of an AND gate.

[1]

(ii) Construct the truth table of an AND gate.

[2]

(b) Give **two** examples where logic gates are used in industry.

_____

_____

_____ [2]

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8 (a) **Fig 8.1** shows a straight conductor AB connected to a cell.

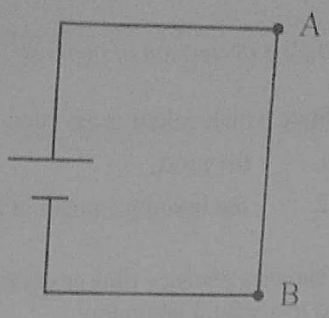


Fig.8.1

On **Fig. 8.1** show the direction of flow of current in the straight conductor **AB**. [1]

(b) Name a device that can be used to show the direction of the magnetic field around the straight conductor.

_____ [1]

(c) Draw on **Fig. 8.1** the magnetic field pattern around the straight conductor **AB**. [2]

(d) Deduce what happens to the magnetic field if the polarity of the cell is reversed.

_____

_____ [1]

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Section B

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

9 **(a)** **(i)** Define *dispersion of light.* [2]

(ii) State which colour is deviated

1. the most,
2. the least by a prism in the dispersion of white light. [2]

(b) **Fig 9.1** shows a distance time graph from an experiment to determine the speed of sound in a school laboratory.

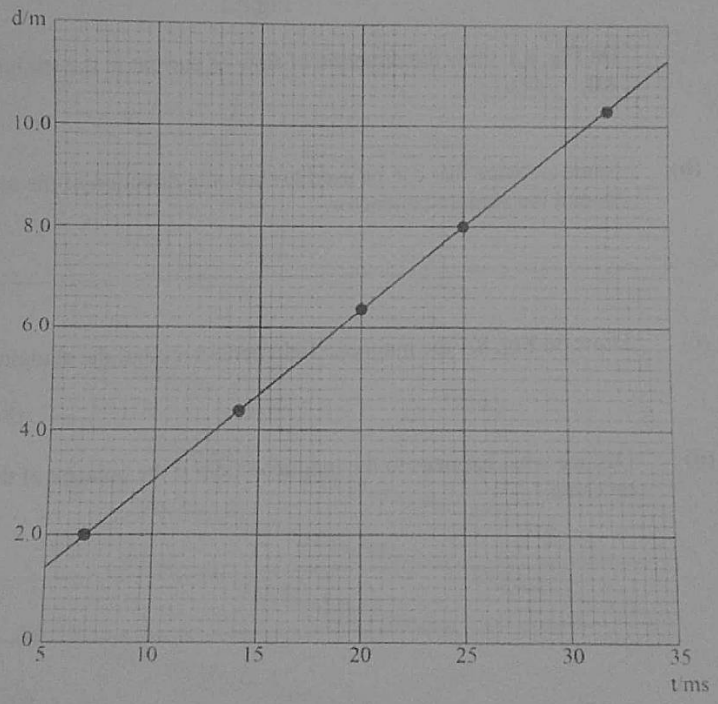


Fig.9.1

1. Use **Fig.9.1** to determine the speed of sound used in the experiment.
2. Explain why it is difficult to measure the speed of sound in a school laboratory using a stop watch. [4]

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(c) (i) Sate any **two** properties of magnets. [2]

(ii) Give **two** differences between magnetic properties of iron and steel. [2]

(iii) Suggest, with a reason, the material suitable for making an armature of an electric bell. [2]

(d) **Fig.9.2** shows a circuit consisting of a source of **4.5 V** and three resistors.

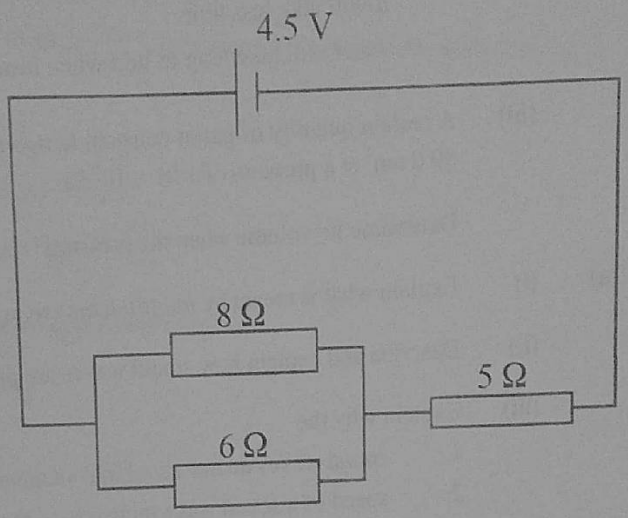


Fig.9.2

Calculate the

(d) (i) potential difference across the 5.0 Ω resistor, [2]

(ii) combined resistance of the 8.0 Ω and 6.0 Ω resistors, [2]

(iii) current through the 6.0 Ω resistor. [2]

10 (a) (i) State **two** applications of thermal expansion and contraction. [2]

(ii) With the aid of a diagram, explain how a thermostat in an electric iron works. [4]

(b) (i) State any **three** physical properties which vary with temperature. [3]

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(ii) Suggest, with a reason, a suitable thermometer for measuring temperature

1. in a blast furnace,
2. in a deep freezer. [4]

(c) (i) Define *Boyle's law*. [1]

(ii) Suggest and give an explanation for the following:

1. it takes two hours to cook meat but if sodium carbonate is added it will take less time.
2. water will take long to boil when heated in an open pot. [4]

(iii) A certain quantity of gas at constant temperature has a volume of 30.0 cm^3 at a pressure of 1.01 x 10^5 Pa.

Determine its volume when the pressure is 2.01 x 10^5Pa. [2]

11 (a) (i) Explain what is meant by *longitudinal waves*. [1]

(ii) Describe and explain how sound waves are produced. [3]

(iii) Explain why the

1. sound waves do not travel in a vacuum,
2. speed of a sound wave increases as the wave moves from air to a liquid. [4]

(b) (i) When a stick is partially immersed in water, it appears bent to an observer viewing it from a point above the water surface.

Explain this physical phenomenon. [2]

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12 (a) $^{235}_{92}U$ is an isotope of Uranium. [3]

(i) Describe the *structure of an atom.*

(ii) 1. Name the quantity which is the same for the nuclei of all isotopes of Uranium.

2. In each $^{235}_{92}U$, how many protons and neutrons are there? [3]

(b) Explain the terms

(i) *nuclear fission,* and [1]

(ii) *nuclear fusion.* [1]

(c) The equation shows beta decay of iodine.

$$^{131}_{53}I \rightarrow {}^{A}_{Z}X + {}^{0}_{-1}e$$ [2]

(i) Determine A and Z.

(ii) Give **two** differences between alpha particles and gamma radiation. [2]

(d) Radioactive materials pose danger to the environment if not properly stored and handled.

(i) Describe how radioactive materials are

1. handled,

2. stored. [4]

(ii) Give **one** effect of radioactive emission on the environment. [1]

(e) Describe three uses of radio isotopes. [3]

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(ii) **Fig. 11.1** shows an observer O, looking at a fish in a pond.

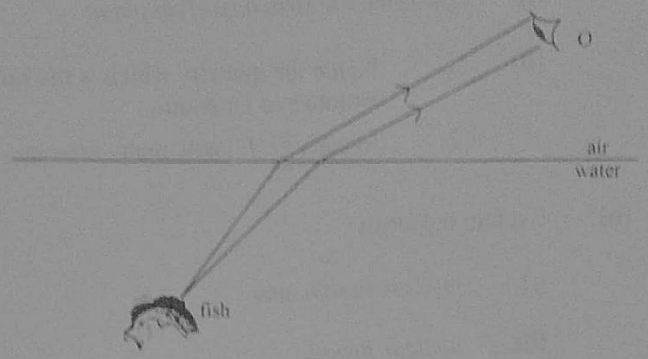


Fig 11.1

1. Copy and complete **Fig11.1**, showing the position of the fish as viewed by the observer.
2. Indicate by labelling, the real and apparent depths of the fish. [4]

(c) (i) State *Ohm's law* and its limitations. [2]

(ii) **Fig 11.2** shows I-V characteristics of a filament lamp.

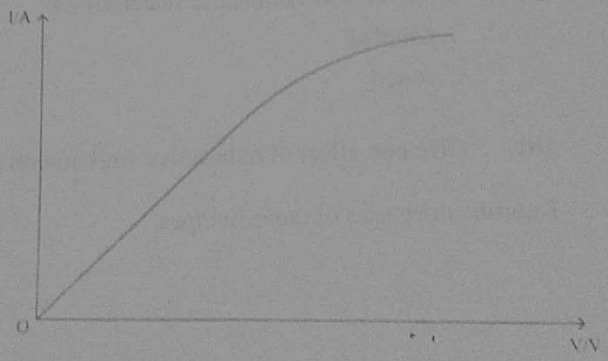


Fig 11.2

Describe and explain the variation of resistance for this filament lamp. [2]

(iii) State any **two** sources of e.m.f. [2]