535/2
PHYSICS THEORY
Paper 2
Aug. 2023
2 ½ hours

JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Education

MOCK EXAMINATIONS 2023

PHYSICS

(Paper 2)

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer any **five** *questions.*

Any additional question(s) answered will **not** *be marked*

Mathematical tables and silent non-programmable calculators maybe used.

These values of physical quantities may be useful to you.

Acceleration due gravity, g	=	10 m s^{-2}
Specific heat capacity of water	=	4200 J kg^{-1} K^{-1}
Specific heat capacity of ice	=	2100 J kg^{-1} K^{-1}.
Specific latent heat of vaporization of water	=	2,260,000 J kg^{-1}
Specific latent heat of fusion of water	=	340,000 J kg^{-1}
Speed of sound in air	=	330 m s^{-1}
Density of water	=	1000 kg m^{-3}

© 2023 Jinja Joint Examinations Board **Turn Over**

CamScanner

1. (a) (i) State **Hooke's law** of elasticity. *(01 mark)*

(ii) Describe an experiment to verify Hooke's law of elasticity.

(05 marks)

(b) An elastic cylindrical rubber of length 20 cm and cross-sectional area 0.0000025 m^2 is clamped on a retort stand with a pointer attached to its free end by the help of an inelastic string, besides a metre rule.
The initial position of the pointer is 56.3 cm. When a 400 g mass is attached to the rubber, the new position of the pointer becomes 59.5 cm.

Calculate the:

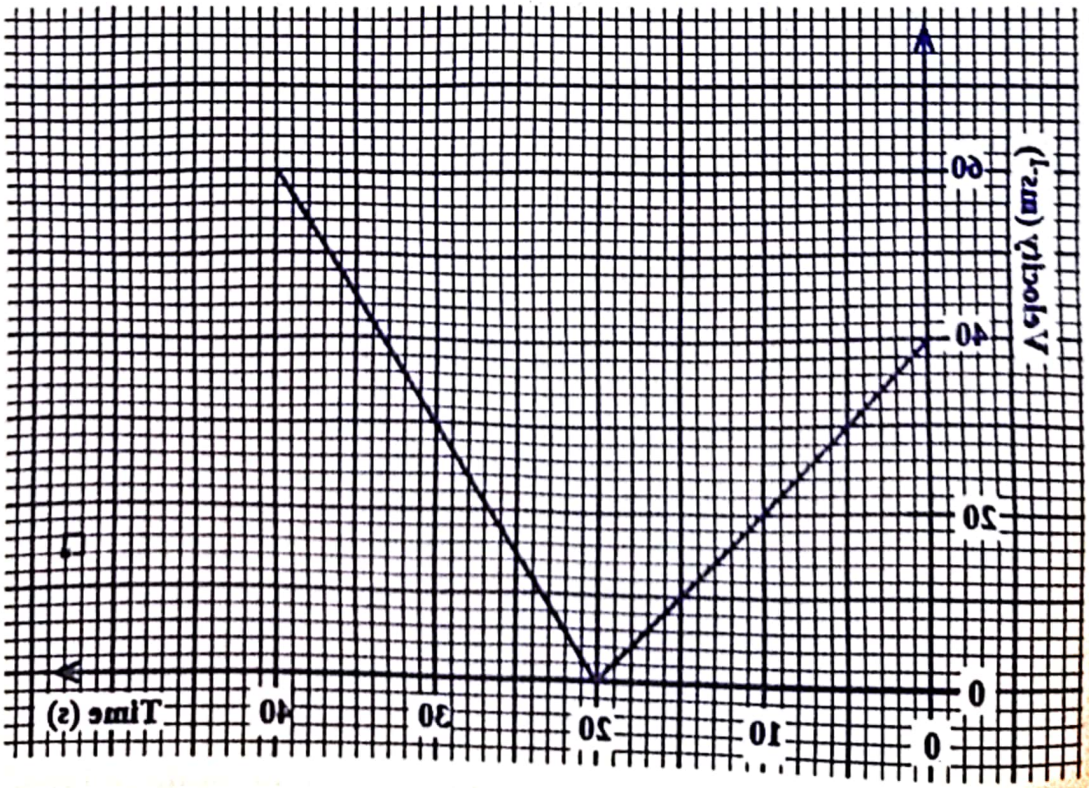
(i) tensile stress in the rubber. *(04 marks)*
(ii) tensile strain in the rubber. *(02 marks)*

(c) (i) Define the term **diffusion.** *(01 mark)*
(ii) State any **two** factors that affect the rate of diffusion in gases. (01 mark)

(d) Explain the effect of cooling on matter. *(02 marks)*

2. (a) How different is **non-uniform velocity** from **uniform velocity**? *(02 marks)*

(b) The diagram below shows a velocity-time graph for the motion of a motorcyclist along a straight road.



(i) Describe the motion of the motorcyclist. *(02 marks)*
(ii) Calculate the distance covered in 34 seconds. *(04 marks)*

2

(i) State the **law of inertia.** *(01 mark)*
(ii) Explain the recoiling of a gun using the law of inertia. *(03marks)*

(c) (i) Define the term **acceleration due to gravity.** *(01 mark)*

(ii) A body of mass 2kg is projected vertically upwards with a speed of 30 ms^{-1}. Calculate the maximum height reached by the body. (03 marks)

3. (a) (i) Define the term **electromotive force** of a cell. *(01 mark)*

(ii) State any **two** defects that can reduce the electromotive force of a simple cell, hence state how each defect is minimized. *(03 marks)*

(iii) Describe an experiment to determine the e.m.f, E and internal resistance, r of a cell, using an ammeter and a voltmeter. *(04 marks)*

(b) Figure 1 shows a network of resistors of resistances 1.5Ω, 3.0Ω and 3.0Ω connected across a cell of e.m.f 4.5V and negligible internal resistance.

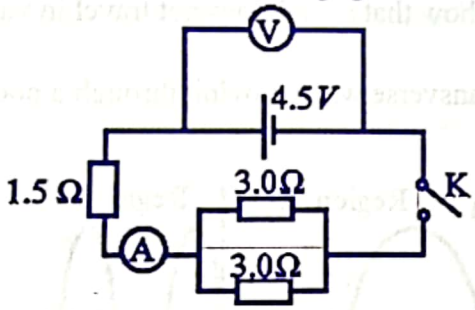


Figure 1

Determine the reading of the:

(i) voltmeter when switch, K is open. *(01 mark)*
(ii) ammeter when switch, K is closed. *(05 mark)*

(c) You are provided with; a rheostat, an ammeter, a voltmeter, connecting wires and two cells. Draw a circuit diagram to show how the apparatus are arranged such that the ammeter reads the current through the rheostat and the voltmeter reads the p.d across the rheostat. *(02 marks)*

© 2023 Jinja Joint Examinations Board

CamScanner

4. (a) (i) State the **laws of reflection** of light. *(02 marks)*

(ii) State any **two** natural phenomena that occur due to total internal reflection. *(02 marks)*

(b) (i) What is **dispersion of light**? *(01 mark)*

(ii) Draw a simple ray diagram to show how dispersion of light occurs in a glass prism. *(02 marks)*

(iii) State any **two** daily life applications of total reflecting prisms. *01 mark)*

(c) An object of size 4cm is placed at 45 cm from the optical center of a convex lens of radius of curvature of 30 cm. By scale drawing, determine the:

(i) image size. *(04 marks)*

(ii) magnification of the image. *(02 marks)*

(d) Differentiate between a human eye and a lens camera. *(02 marks)*

5 (a) (i) What is **sound**? *(01 mark)*

(ii) Briefly, explain **two** factors that affect the speed of sound in air. *(02 marks)*

(iii) Describe an experiment to show that sound does not travel in vacuum. *(05 marks)*

(b) Figure **2** shows a transverse wave moving through a pool of water.

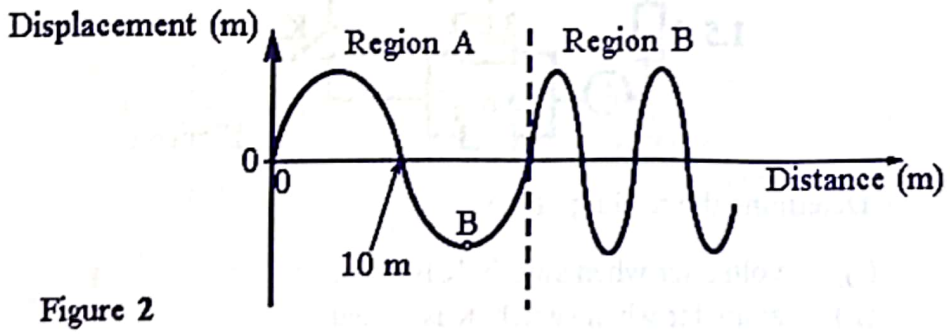


Figure 2

(i) What is the name given to point B? *(01 mark)*

(ii) Which of the two regions is deepest? *(01 mark)*

(iii) What is the wave velocity in region A if the wave frequency is 40 Hz. *(04 marks)*

(c) Explain why an open ended pipe is preferred to a closed ended pipe as a musical instrument. *(02 marks)*

© 2023 Jinja Joint Examinations Board

CamScanner

6. (a) (i) What is meant by the term **thermometry**? (*01 mark*)

(ii) Give any **two** properties of a material which change with temperature.

(*02 marks*)

(b) Give the reason for the following in the manufacture of liquid in glass thermometer:

(i) the space above the liquid is evacuated. (*01 mark*)

(ii) the tube is made finer and uniform. (*02marks*)

(c) Use the kinetic theory to explain the following observations:

(i) Ice melts faster when salt is sprinkled on it. (*02 marks*)

(ii) Liquids expand more than equal volumes of solids when heated through the same temperature. (*03 marks*)

(d) (i) Briefly, explain any **two** sources of errors that may lead to inaccurate results when determining specific heat capacity of a solid by the method of mixtures. (*02 marks*)

(ii) A block of metal of mass 1.5 kg which is insulated is heated from $30^{o}C$ to $50^{o}C$ in 8minutes and 20 seconds by an electric heater coil rated $54W$. Find its specific heat capacity. (*03 marks*)

7. (a) Define **Ferro-magnetic materials**, hence give **two** examples. (*02 marks*)

(b) With the aid of a diagram, describe how:

(i) a steel bar can be made a magnet by single touch method. (*03 marks*)

(ii) a scrap metal lifter works. (*03 marks*)

(c) (i) Give **two** ways in which the sensitivity of a galvanometer can be increased.

(*02 marks*)

(ii) A 0-10 mA meter has a full-scale deflection when the potential difference across it is 100 mV. How would you adapt the meter to read 0- 1A?

(*03 marks*)

© 2023 Jinja Joint Examinations Board

CamScanner

(d) Figure 3 shows an arrangement in which a piece of soft iron is inserted in two solenoids placed at a short distance between them.

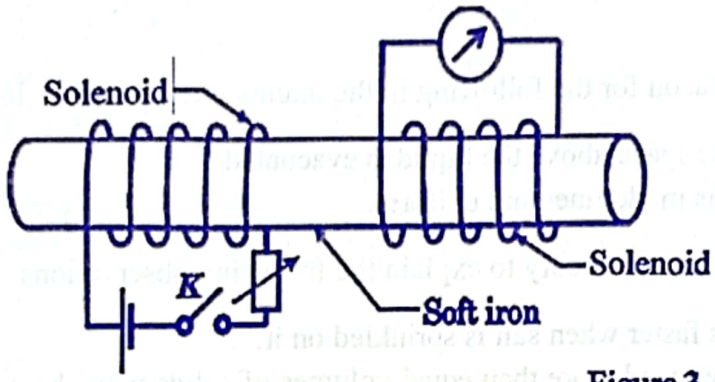


Figure 3

Explain what happens when switch, K is closed. (*03 marks*)

8 . (a) (i) Distinguish between **thermionic emission** and **photoelectric emission**. (*02 marks*)

(ii) With the aid of a labelled diagram, describe how a cathode ray tube works. (*04 marks*)

(b) State **two** dangers encountered and **two** safety precautions taken when handling X-rays (*04 marks*)

(c) (i) What is **half-life?** (*01 mark*)

(ii) A radioactive element of mass 12 g has a half-life of 7 years. Find the time taken for the element to decay to 0.75 g. (*03 marks*)

(d) Explain how alpha particles are differentiated from gamma radiations when passed through an ionization chamber. (*02 marks*)

© 2023 Jinja Joint Examinations Board **End**

CamScanner