

535/2

Physics

Paper 2

July/August. 2022

2¼ hours

BUGANDA EXAMINATIONS COUNCIL MOCKS

Uganda Certificate of Education

PHYSICS

Paper 2

2 hours 15 minutes

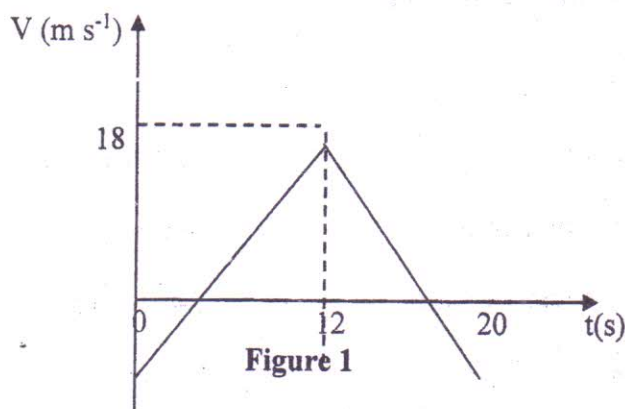
INSTRUCTIONS TO CANDIDATES:

- ✓ Answer any **five** questions.
- ✓ Any additional question(s) answered will **not** be marked.
- ✓ Mathematical tables and silent non-programmable calculators may be used.

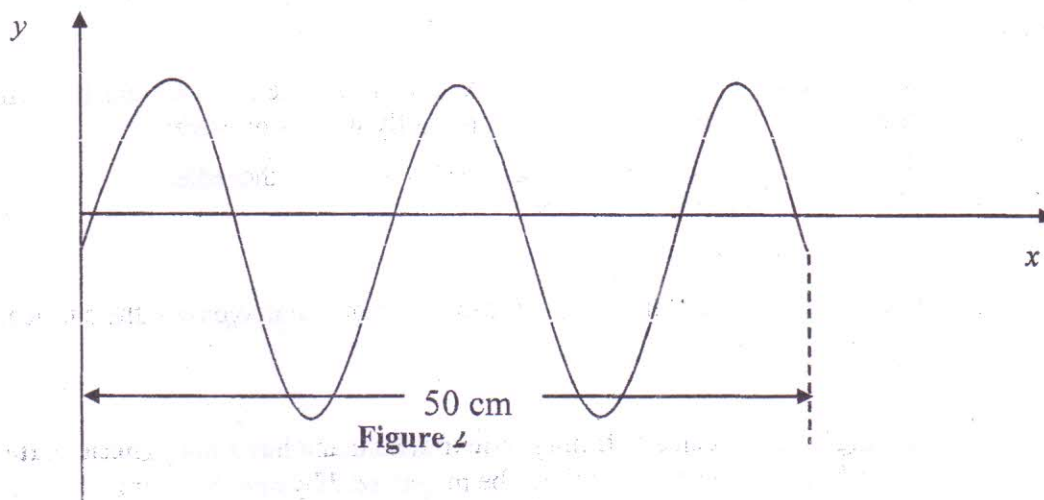
These values of physical quantities may be useful to you.

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|---|---|---|
| ✓ Acceleration due to gravity | = | 10 m s^{-2} |
| ✓ Specific heat capacity of water | = | $4200 \text{ J kg}^{-1} \text{ K}^{-1}$ |
| ✓ Specific heat capacity of copper | = | $400 \text{ J kg}^{-1} \text{ K}^{-1}$ |
| ✓ Specific latent heat of fusion of water | = | 340000 J kg^{-1} |
| ✓ Speed of sound in air | = | 320 m s^{-1} |
| ✓ Velocity of electromagnetic waves | = | $3.0 \times 10^8 \text{ m s}^{-1}$ |

- 1(a) State the **principle of moments**. (01 mark)
- (b) Describe an experiment to determine the mass of a uniform metre rule. (05 marks)
- (c) The handle of a door is nearer its outside edge than the hinge.
- (i) Explain the above observation. (03 marks)
- (ii) If the handle is 0.80 m from the hinge and a force of 56 N is applied to open the door, calculate the moment of force. (02 marks)
- (d) A lever system of velocity ratio 40 overcomes a load of 4500 N when an effort of 125 N is applied.
- (i) Define **velocity ratio**. (01 mark)
- (ii) What is the mechanical advantage of the system? (02 marks)
- (ii) Determine the efficiency of the lever. (02 marks)
- 2(a) State the **laws of reflection** of light. (02 marks)
- (b)(i) With the aid of a labeled ray diagram, describe the action of a pin – hole camera. (03 marks)
- (ii) An object of height 2.0 m at a distance of 8.0 m from the pin – hole is photographed using the pin – hole camera. If the screen is at a distance of 20cm from the pin – hole, determine the height of the image formed. (03 marks)
- (c) With the aid of a ray diagram, describe briefly how you can use a convex lens as a magnifying glass.. (04 marks)
- (d) A convex lens has a focal length of 12cm and a real object, 25cm tall is placed 20cm away from it. By means of an accurate ray diagram, find where the image would be and measure its length. (04 marks)
- 3(a) State the **law of conservation of linear momentum**. (01 mark)
- (b) A wildlife ranger fires a bullet of mass 0.2 kg at a speed of 300 m s^{-1} to a poacher of mass 49.8 kg hanging on a tree branch. If the bullet remains in his flesh, find;
- (i) the common velocity of the system just after collision. (02 marks)
- (ii) the vertical height through which the poacher rises before falling to the ground. (03 marks)
- (c) Figure 1 shows a velocity – time graph of a car.



- (i) Find the distance covered by the car. (03 marks)
- (ii) Describe the motion of the car. (04 marks)
- (d) Explain the advantage of a seat belt to a passenger in a car. (03 marks)
- 4(a) Distinguish between a **longitudinal wave** and a **transverse wave**. (02 marks)
- (b) The diagram in Figure 2 shows a section of a progressive wave after 3.5 seconds.



Calculate:

- (i) the wavelength. (02 marks)
- (ii) the period of the wave. (02 marks)
- (c) Straight wave fronts are moving towards a straight barrier with a narrow gap.
 - (i) Draw a labelled diagram to show the behaviour of the wave fronts. (02marks)
 - (ii) What property is shown by the waves? (01mark)
- (d) Describe the resonance tube method for determining the speed of sound in air. (05marks)
- (e) A radio station transmits a radio signal at 24 MHz. Determine the wavelength of the signal. (02 marks)
- 5(a) (i) The **specific heat capacity** of copper is $400 \text{ J kg}^{-1} \text{ K}^{-1}$. What does this statement mean? (01 mark)
- (ii) Describe an experiment to determine the specific heat capacity of a solid metal using the method of mixtures. (06 marks)
- (b) An immersion heater rated 2.5 kW is placed in a liquid of mass 2 kg. When the heater is switched on for 5 minutes, the temperature of the liquid rises from 20°C to 70°C . Determine the specific heat capacity of the liquid (03 marks)
- (c) A cylinder with a movable piston contains 0.1 m^3 of air at a temperature of 27°C . Calculate the volume of the gas if it is cooled to -73°C at constant pressure. (03 marks)
- (d) Explain the effect of temperature on pressure using the kinetic theory of gases. (03 marks)
- 6(a) (i) State the **law of electrostatics**. (01 mark)

- (ii) Briefly describe how you can verify the law in (a) (i) above. (03 marks)
- (b) (i) Explain briefly how you can charge an insulated conductor positively by induction. (03 marks)
- (ii) Explain how you would test for the charge on the insulated conductor in (b) (i) above. (03 marks)
- (c) A positively charged rod is brought and held near the tip of a needle attached to the cap of a gold – leaf electroscope. Explain briefly what is observed;
- (i) when the positively charged rod is held near the needle. (02 marks)
- (ii) when the rod is removed. (02 marks)
- (d) Draw a simple diagram to show the distribution of charge over the surface of a pear – shaped conductor. (02 marks)
- 7(a) Distinguish between a **soft magnetic material** and a **hard magnetic material**. (02marks)
- (b)(i) Describe how a piece of steel can be magnetized by using the single stroke method. (05 marks)
- (ii) Give **two** uses of bar magnets. (02 marks)
- (c) With the aid of a labelled diagram, describe how an a.c transformer works. (04marks)
- (d) A galvanometer has a resistance of $20\ \Omega$ and gives a full scale reading for a current of 0.20 . What is the voltage across the galvanometer coil? (03 marks)
- 8(a) (i) What are **cathode rays**? (01 mark)
- (ii) Give **three** differences between cathode rays and X – rays. (03 marks)
- (b) (i) Draw a well labeled diagram of a cathode ray oscilloscope. (03 marks)
- (ii) Outline the steps involved in the production of cathode rays. (04 marks)
- (c) (i) Define the term **radioactivity**. (01 mark)
- (ii) A radioactive substance ${}^{23}_{8}\text{X}$ decays by emitting an alpha particle and then two beta particles. Find the mass number and atomic number of the daughter nuclide. (02 marks)
- (d) A radioactive material has a half life of 4 hours. If after 24 hours 0.5g of its original mass remains, calculate the initial mass of the material. (02 marks)

END