ACEITEKA JOINT MOCK EXAMINATIONS 2023
UGANDA CERTIFICATE OF EDUCATION
PHYSICS

Paper 2

2 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

Attempt any **five** questions.

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

Mathematical tables and silent non–programmable electronic calculators may be used.

These physical quantities may be useful to you.

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

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1. (a) (i) Define pressure. (01 marks)
      (ii) State two factors that affect pressure of liquids. (02 marks)
      (iii) Explain how the above factors affect pressure in liquids. (02 marks)

   (b) A cylindrical tank of radius 1.4m and height 5m is half - filled with water. Calculate
      (i) the Force exerted by the water at the base of the tank. (02 marks)
      (ii) the pressure exerted by the water at the base of the tank. (02 marks)

   (c) State the principle of conservation of linear momentum. (01 mark)

   (d) A trolley P of mass 150 g moving with velocity of 20 ms^{-1} collides with another stationary trolley Q of mass 100 g. If P and Q move together after collision, Calculate the
      (i) velocity with which P and Q will move after collision. (3 marks)
      (ii) loss of kinetic energy of trolley P . (3 marks)

2. (a) (i) Define intermolecular forces. (01 mark)
      (ii) Describe an experiment to show the existence of surface tension in liquids. (04 marks)
      (iii) Use kinetic theory to explain the existence of surface tension in liquids. (03 marks)

   (b) (i) A steel ball is placed centrally on the surface of a viscous oil in a tall jar. Describe the motion of the ball. (02 marks)
      (ii) Sketch a velocity – time graph for the motion of the ball. (02 marks)

   (c) A ball bearing has a volume of 1.0 x 10^{-6} cm^3 and a mass of 7.5g. the ball bearing falls through oil contained in a long glass tube. If the density of oil is 1500kgm^{-3}, calculate the maximum viscous force on the ball bearing. (04 marks)

3. (a) State the laws of refraction. (02 mark)

(b) (i) State the conditions for occurrence of total internal reflection of light rays (02 marks)

(ii) Explain **two** advantages of the prism periscopes over the mirror periscopes (03 marks)

(c) A monochromatic light is incident at a glancing angle of 25° on a rectangular glass block as shown in Figure 1.
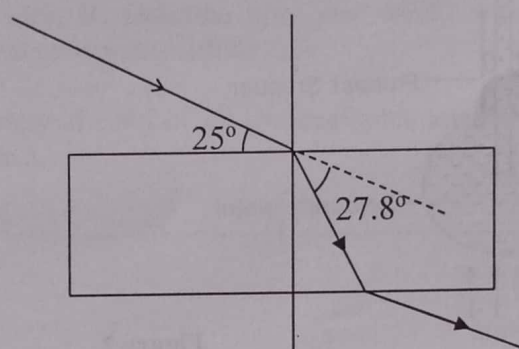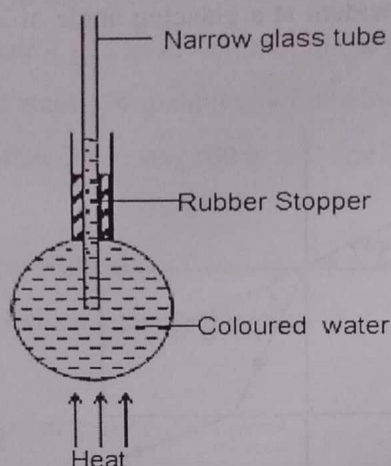

Figure 1

Find the refractive index of the glass. (04 marks)

(d) Describe an experiment to determine the refractive index of water in a glass beaker. (05 marks)

4. (a) (i) Define an echo? (01 mark)

(ii) Ultrasound is used for detecting other sea vessels and to measure the depth of the sea. Explain briefly how it is used for the two purposes. (04 marks)

(b) Describe an experiment to show that sound require a material medium for its transmission. (06 marks)

(c) A progressive wave travels a distance of 31.5m in 20 seconds. If the distance travelled is equivalent to the distance between 10 consecutive crests, Calculate;

(i) the wave length of the wave. (02 mark)

(ii) the period of the wave. (02 mark)

(d) What is reverberation? (01 mark)

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5. (a) (i) Distinguish between **Convection** and **radiation**. (02 marks)

   (ii) Explain why an iron bar feels cold when touched on a cold day. (02 marks)

   (b) The diagram in figure 2 shows a flask fitted with a rubber stopper and a length of glass tubing. The flask is filled with coloured water such that the level of water comes up a short distance above the tube.

Figure 2

   (i) State what is observed when the bottom of the flask is heated. (01 marks)

   (ii) Explain your observation. (03 marks)

   (c) 4kg of water at 20°C is placed in a refrigerator. After 2 hours, 13 minutes and 20 seconds, all the water had changed to ice at 0°C. Find the rate at which heat is removed from the water. (04 marks)

   (d) (i) What is meant by evaporation? (01 mark)
       (ii) Explain why evaporation causes cooling. (03 marks)

6. (a) (i) What is an electromagnet? (01 mark)
       (ii) State two ways of increasing the strength of an electromagnet. (02 marks)

   (b) Sketch the magnetic field pattern around
       (i) a straight wire carrying current (02 marks)
       (ii) a solenoid carrying current (02 marks)

   (c) With the aid of a labelled diagram, describe the action of a moving coil loud speaker. (05 marks)

(d) A step up transformer is designed to operate from a 240V supply with delivery energy at 250V. If the transformer is 80% efficient, determine the current into the primary coil when the output terminals are connected to 250V, 75W lamp.

(04 marks

7. (a) What is a primary cell? (01 mark)

   (b) (i) With the aid of a diagram, describe the action of a simple cell. (04 marks)
       (ii) State any two advantages of a Knife cell. (02 mark)

   (c) You are provided with a dry cell, a voltmeter, an ammeter, and a resistor of known resistance, R. Describe how you would use these equipments to determine the internal resistance, r of the cell. (03 marks)

   (d) A battery of e.m.f of 2V and negligible internal resistance, is connected as shown in Figure 3.
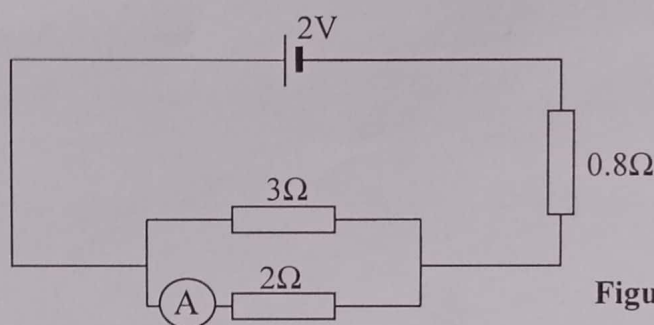

Figure 3

Calculate
(i) the effective resistance (02 marks)
(ii) the reading of the ammeter. (04 marks)

8. (a) Define the following terms
   (i) Isotopes (01 mark)
   (ii) Mass number (01 mark)

   (b) The count rate recorded by a Geiger-Muller tube of a radioactive source was as follows:

Count rate(min^{-1})	800	500	350	200	80	25
Time (min)	0	1.0	1.8	3.0	5.0	7.5

(i) Plot a graph of count rate against time. (05 marks)
(ii) Determine the half-life of the radioactive element. (02 marks)
(iii) Give **one** industrial application of radioactivity. (01 mark)

(c) (i)   Distinguish between photo electric emission and thermionic emission
                                                                    (02 marks)
     (ii) Use kinetic theory to explain the occurrence of thermionic emission.
                                                                    (02 marks)
     (iii) State **two** applications of photo electric effect.   (02 marks)

END