

535/2  
PHYSICS  
Paper 2  
July /Aug. 2023  
2¼ hours



UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

PHYSICS

Paper 2

2 hours 15 minutes

**INSTRUCTIONS TO CANDIDATES:**

*Answer FIVE questions.*

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

*Mathematical tables, and silent non – programmable calculators may be used*

*Where necessary use the following constants;*

Acceleration due to gravity, $g$	=	$10\text{ms}^{-2}$
Specific heat capacity of copper	=	$400\text{Jkg}^{-1}\text{K}^{-1}$
Specific heat capacity of water	=	$4200\text{Jkg}^{-1}\text{K}^{-1}$
Specific latent heat of fusion of water	=	$340,000\text{Jkg}^{-1}$
Speed of sound in air	=	$330\text{ms}^{-1}$
Density of water	=	$1000\text{kgm}^{-3}/1\text{gcm}^{-3}$
Speed of light in vacuum	=	$3.0 \times 10^8\text{ms}^{-1}$

- ✓ 1. (a) What is meant by the following terms:
- (i) Plumbline (01 mark)
  - (ii) Moment of a force (01 mark)
- (b) (i) State two conditions for a body to be in mechanical equilibrium. (02 marks)
- (ii) A uniform metre rule of mass 95g is balanced on a knife edge when a 5 g mass is hung at 10cm mark from one end. How far is the knife edge from the centre of the metre rule? (04 marks)
- (c) (i) Explain what happens to a metre rule balanced on finger tip when the centre of gravity is not exactly above the tip. (03 marks)
- (ii) With the aid of a labeled diagram, explain how the principle of moments is applied to the beam balance with two scale pans when measuring unknown mass. (5 marks)
2. (a) (i) Why do a thick glass crack when hot liquid is poured in it? (04 marks)
- (ii) A glass flask is fitted with a rubber bung and a length of glass tubing. The set up is placed in a vertical position with the end of the tube below the surfaces of water in a vessel as shown in figure 1 below. Explain what is observed when the flask is warmed. (04 marks)

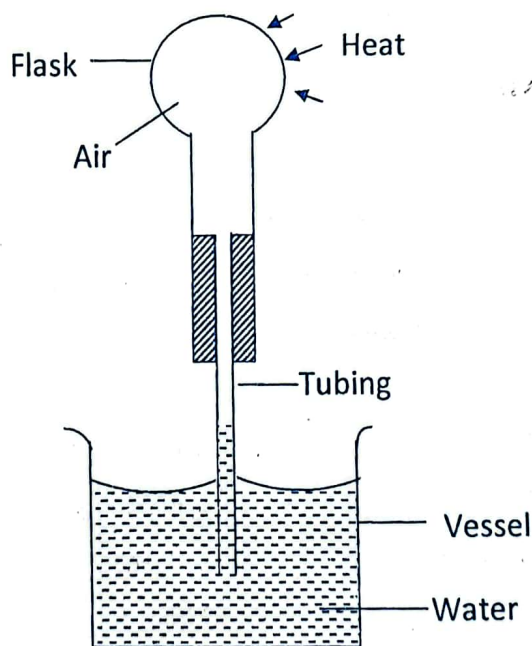


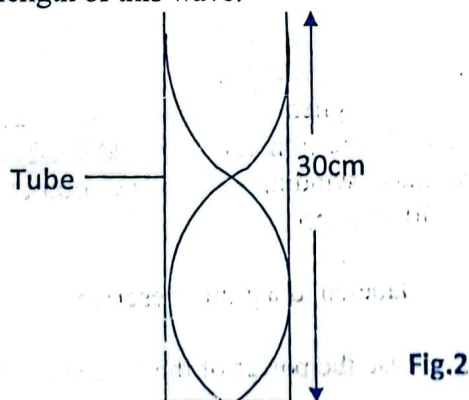
Fig. 1

- (b) (i) Explain what happens when a bimetallic strip is heated. (03 marks)
- (ii) Give two uses of bimetallic strips. (02 marks)
- (c) Air is trapped by a light frictionless piston in a cylinder of a uniform cross-sectional area. Air column of length 30.0cm at a pressure of 110 Pa is compressed by moving down a piston through a distance of 8.0cm. What is the new pressure in the cylinder if the temperature of air is kept constant? (03 marks)

- ✓ 3. (a) (i) Distinguish between energy and power. (02 marks)  
 (ii) Describe the action of a four stroke engine. (06 marks)  
 (b) A truck of total mass 15 tonnes moving at  $1\text{ms}^{-1}$  collides with a stationary truck of mass 10 tonnes. If the trucks are automatically connected so that they move off together. Find;  
 (i) Their common velocity after collision. (03 marks)  
 (ii) The kinetic energy lost during collision. (03 marks)  
 (c) Give two sources of renewable energy. (02 marks)

- ✓ 4. (a) (i) Define the term power of a lens. (01 mark)  
 (ii) Describe an experiment to determine the focal length of a converging lens using an illuminated object and plane mirror. (04 marks)  
 (b) A small object is placed 6cm away from a diverging lens of focal length 10cm. By means of a drawn scale diagram, find:  
 (i) the nature of the image.  
 (ii) the position of the image. (05 marks)  
 (c) Give three similarities between a lens camera and a human eye. (03 marks)  
 (d) During the production of a pure spectrum:  
 (i) Why is an illuminated slit placed at the principal focus of the converging lens? (01 mark)  
 (ii) What is the significance of the prism? (02 marks)

- ✓ 5. (a) (i) Give four properties of electromagnetic waves. (02 marks)  
 (ii) Explain why ultra sonics are used in echo sounders. (03 marks)  
 (b) Briefly explain how surgical instruments can be cleaned using ultra sound. (03 marks)  
 (c) (i) By including the term frequency, distinguish between music and noise. (02 marks)  
 (ii) Describe an experiment to show that sound waves require a material medium for their transmission. (04 marks)  
 (d) Figure 2. Shows a stationary wave formed in a closed tube of length 30cm. Find the wave length of this wave. (02 marks)



- ✓ 6. (a) (i) State two defects of a simple cell. (02 marks)  
 (ii) Describe the action of a simple cell. (05 marks)  
 (b) Briefly explain the production of geothermal electricity. (03 marks)



- (c) Why is it dangerous to connect a piece of copper wire across the terminals of a 2V lead acid cell which has an internal resistance of  $0.01\Omega$ ? (03 marks)
- (d) Draw the electric circuit symbols for;
- standard resistor
  - switch
  - cell
- (03 marks)
7. (a) (i) State two uses of tracers. (02 marks)
- (ii) A radioactive source is brought near the cap of a positively charged electroscope as shown in figure 3 below. The leaf divergence reduces. Explain the cause for this observation. (04 marks)

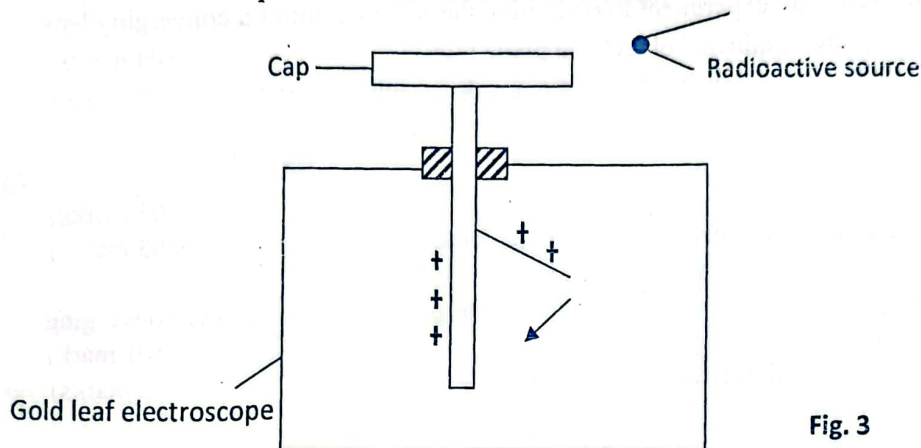


Fig. 3

- (b) Carbon,  $^{14}_6\text{C}$  undergoes a beta decay and turns into element N. Write a balanced nuclear equation for the decay. (02 marks)
- (c) What changes occur in atomic number and mass number of a radioactive atom if the nucleus emits.
- alpha particle (02 marks)
  - gamma rays (02 marks)
- (d) Briefly explain the production of cathode rays in a cathode ray tube. (04 marks)
8. (a) (i) Define the term neutral point. (01 mark)
- (ii) Explain the term demagnetization using the domain theory. (03 marks)
- (b) (i) Draw the magnetic flux due to a solenoid. (02 marks)
- (ii) A step up transformer is designed to operate from a 20 V supply and delivers energy at 250 V. If the transformer is 90% efficient, determine the current in its primary winding when the output terminals are connected to a 250 V, 100 W lamp. (04 marks)
- (c) (i) With the aid of a well labeled diagram, describe the operation of a bicycle dynamo. (04 marks)
- (ii) State two factors that increase the power of the dynamo. (02 marks)

END