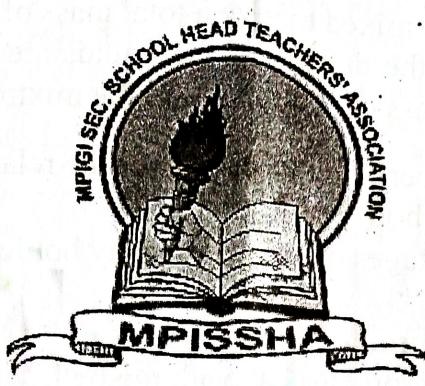


535/2  
PHYSICS THEORY  
Paper 2  
July / Aug. 2023  
2 1/2 hours



## MPISSHA JOINT MOCK EXAMINATIONS 2023

### 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 maybe used.*

*These values of physical quantities may be useful to you.*

$$\text{Acceleration due gravity, } g = 10 \text{ m s}^{-2}$$

$$\text{Specific heat capacity of water} = 4200 \text{ J kg}^{-1} \text{ K}^{-1}$$

$$\text{Specific heat capacity of ice} = 2100 \text{ J kg}^{-1} \text{ K}^{-1}$$

$$\text{Specific latent heat of vaporization of water} = 2,260,000 \text{ J kg}^{-1}$$

$$\text{Specific latent heat of fusion of water} = 340,000 \text{ J kg}^{-1}$$

$$\text{Speed of sound in air} = 330 \text{ m s}^{-1}$$

$$\text{Density of water} = 1000 \text{ kg m}^{-3}$$

1. (a) (i) Define the terms **density** and **relative density**. (02 marks)
- (ii) Two liquids are mixed to give a total mass of 240g and a total volume of  $250\text{cm}^3$ . If the density of the liquids are  $0.80\text{gcm}^{-3}$  and  $1.20\text{ gcm}^{-3}$ , calculate the mass of each liquid in the mixture. (05 marks)
- (b) (i) Describe an experiment to determine the relative density of a liquid using a density bottle. (03 marks)
- (ii) State the advantages of using a density bottle. (01 mark)
- (c) (i) What is a **hydrometer**? (01 mark)
- (ii) Why does a hydrometer have a large bulb? (01 mark)
- (iii) State **three** uses of special hydrometers. (03 marks)
2. (a) Write down the **three** equations of uniformly accelerated motion. (03 marks)
- (b) A body changed its velocity from  $5\text{ms}^{-1}$  to  $26\text{ms}^{-1}$  in 7 seconds.
- (i) Calculate its acceleration. (02 marks)
- (ii) If the body continues moving, find its velocity after 12 seconds. (01 mark)
- (c) (i) State the **law of conservation of linear momentum**. (01 mark)
- (ii) A bullet of mass 100g is fired with a velocity of  $700\text{ms}^{-1}$  from a gun of mass 5kg. Calculate the recoil velocity of the gun. (05marks)
- (d) Describe the working of the jet engine. (04marks)
3. (a) (i) What is **light**? (01mark)
- (ii) Distinguish between **luminous** and **non-luminous** bodies giving **two** example of each. (03marks)
- (b) Draw a well labeled diagram to show the formation of a solar eclipse indicating clearly the different regions on it. (04marks)
- (c) An object 5cm high forms an image 2.5cm high in a convex mirror. If the object is 20cm from the mirror and the image is 10cm from the mirror, draw a scale diagram to illustrate the formation of the image and use it to determine the focal length of the mirror. (06marks)
- (d) State the conditions for total internal reflection to take place. (02marks)
4. (a) (i) Define **heat capacity** and state its **S I unit**. (02 marks)
- (ii) What is the quantity of heat required to raise the temperature of a body whose heat capacity is  $120 \text{ JK}^{-1}$  from  $26^\circ\text{C}$  to  $70^\circ\text{C}$  (02marks)
- (b) Describe an experiment to determine specific heat capacity of a solid using an electrical method. (07marks)

- (c) An electric kettle of mass 500 g and specific heat capacity  $900 \text{ J kg}^{-1} \text{ K}^{-1}$ , contains water of mass 1800 g at a temperature of  $27^\circ\text{C}$ . If the kettle has a power rating of  $25 \text{ kW}$ , calculate the time taken to heat the water to its boiling point of  $100^\circ\text{C}$ . (05marks)
5. (a) Define the following terms:
- (i) Electromotive force, and (02marks)
  - (ii) Resistance of a conductor.
- (b) (i) State ohm's law. (01mark)
- (ii) Describe an experiment to verify it. (05marks)
- (c)

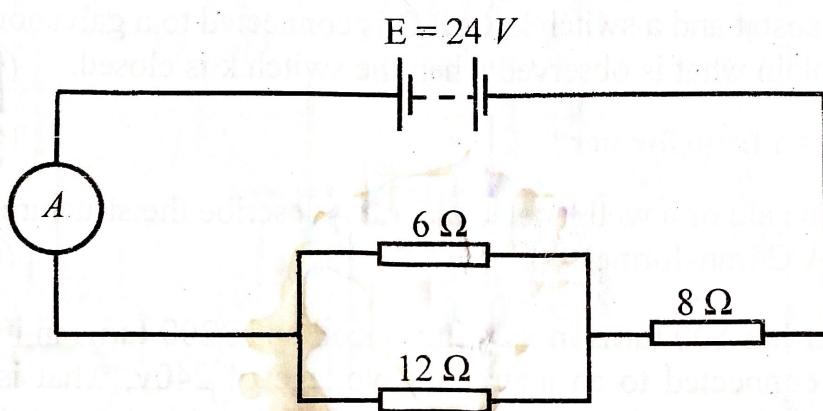


Fig. 1

A battery of e.m.f,  $24V$  and negligible internal resistance is connected to resistors of  $6\Omega$ ,  $8\Omega$  and  $12\Omega$  as shown. Calculate:

- (i) The reading of the ammeter, (03marks)
  - (ii) The power dissipated in the  $12\Omega$  resistor. (02marks)
- (d) Explain the physical factors that affect the resistance of a conductor. (03marks)
6. (a) What do you understand by the terms:
- (i) Self-induction. (01mark)
  - (ii) Mutual induction. (01mark)

(b)

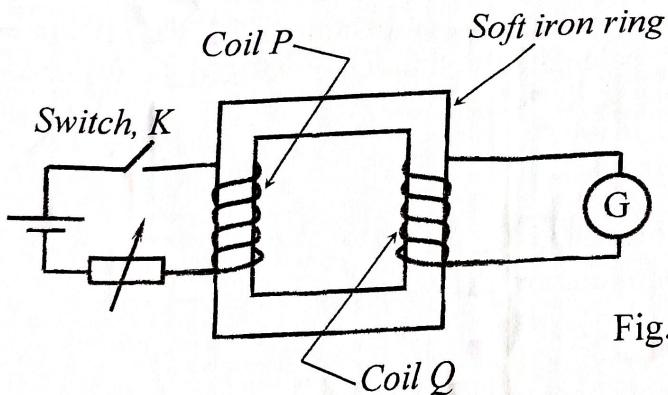


Fig. 2

Figure 2 shows two coils P and Q wound on an iron ring. Coil P is connected to battery, rheostat and a switch k. Coil Q is connected to a galvanometer G. State and explain what is observed when the switch k is closed. (05marks)

- (c) (i) What is a **transformer**? (01mark)
- (ii) With the aid of a well labeled diagram, describe the structure and action of an A.C transformer. (05marks)
- (d) A transformer has 800 turns in its primary coil and 3200 turns in its secondary coil. If it is connected to an alternating voltage of 240v, what is the output voltage? (03marks)
7. (a) State and explain what happens when;
- (i) A negatively charged rod is brought near the cap of an un charged gold leaf electroscope. (03marks)
- (ii) A positively charged rod is brought near the cap of a positively charged gold leaf electroscope. (03marks)
- (b) (i) State **four** applications of electrostatics. (02marks)
- (ii) Explain the cause of thunder. (03marks)
- (c) Describe the structure and action of a lightning arrester. (05marks)
8. (a) What are **X-rays**? (01mark)
- (b) State the effect on **X-rays** produced if;
- (i) The filament current is increased. (01mark)
- (ii) The anode is made more positive. (01mark)
- (c) State any **four** properties of **X-rays**. (04marks)
- (d) (i) What is a **radioactive nuclide**? (01mark)
- (ii) Write down three radiations that can be produced by a radioactive. (03marks)

- (e) (i) A nuclide  $^{214}_{82}X$  decays to form nuclide  $M$  by emission of a beta particle and a gamma ray. Write down the balanced equation of the decay and state the atomic number and mass number of  $M$ . *(02marks)*
- (ii) A certain mass of radioactive material contains  $3.0 \times 10^{20}$  radioactive atoms. If the half-life of the material is 500 years, how many atoms will have decayed after 1500 years. *(03 marks)*