

535/2
PHYSICS
PAPER 2
July / Aug 2022
2¼ hours

BURST THE BRAIN NATIONAL MOCK



Uganda Certificate of Education PHYSICS Paper 2 2hours 15minutes

Instructions

- Attempt any **five** questions
- Mathematical tables, slide rules and silent non-programmable calculators may be used.
- These values of physical constants may be useful to you.

- Acceleration due to gravity	=	10ms^{-2}
- Speed of light in vacuum	=	$3 \times 10^8 \text{ms}^{-1}$
- Speed of sound in air	=	330ms^{-1}
- Specific heat capacity of water	=	$4200\text{Jkg}^{-1}\text{K}^{-1}$

1. a) Define the following terms:

i) **weight**

(1 mark)

ii) **a newton**

(1 mark)

b) A body of mass 20kg is tied to one end of a string and the other end B of the string is tied to the ceiling. The body is held in equilibrium making an angle 60° with the vertical by a horizontal force, F as shown in figure 1 below, W is the weight of the mass.

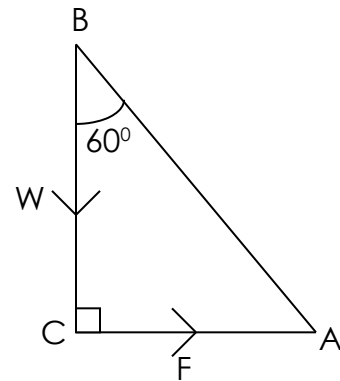
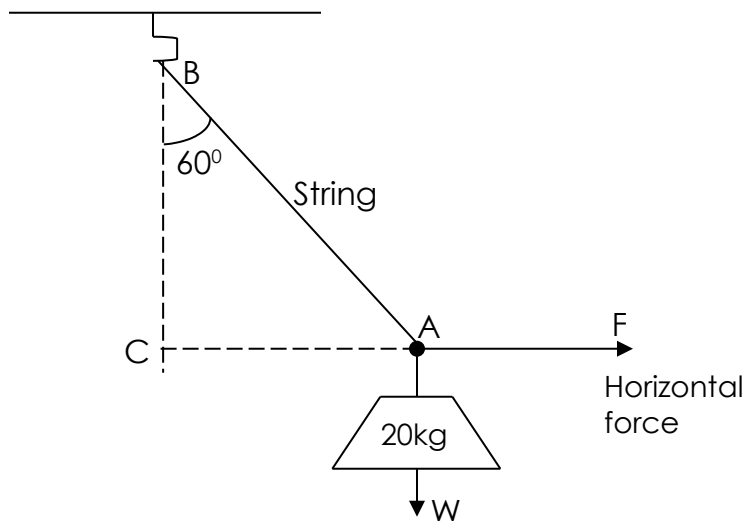


Fig. 1

- i) Mention the conditions for a body to be in mechanical equilibrium. (1 mark)
ii) Indicate the direction of the tension force in string AB. (1 mark)
iii) Calculate the value of F and the tension in the string. (4 marks)

c) i) Define **moment of a force**.

(1 mark)

ii) State the **principle of moments**.

(1 mark)

d) Describe an experiment you would carry out to verify the principle of moments. (5 mark)

e) Mention **one** practical application of the principle of moments. (1 mark)

2. a) What is meant by the following terms?

i) **temperature**,

(1 mark)

ii) **fixed temperature points**.

(1 mark)

b) Briefly describe an experiment to determine the **lower fixed point** of a thermometer. (4 marks)

c) Mention **two** advantages and **one** disadvantage of using mercury as a thermometric liquid (3 marks)

- d) The diagram in figure 2 below shows a flask fitted with a rubber bung and a length of glass tubing. The flask is filled with water such that the level of water comes up a short distance above the tube.

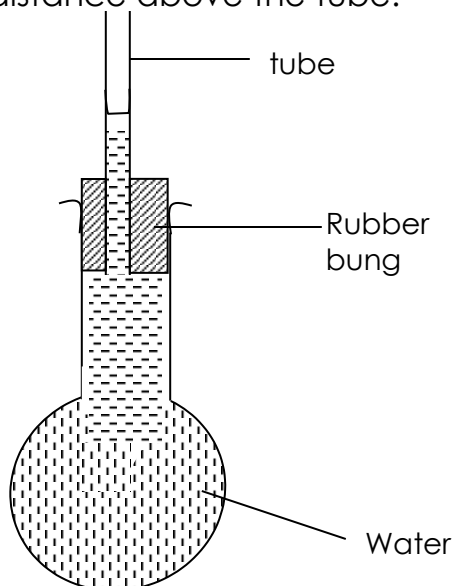


Fig. 2

- i) State what is observed when the flask is plunged into a can of hot water. (2 marks)
- ii) Explain your observation. (2 marks)
- e) The pressure inside a motor tyre is found to be 190kPa at a temperature of 12°C. Calculate the pressure in the tyre if the motor car stands in the sun so that the temperature rises to 32°C? (3 marks)
(Assume the volume of air inside remains constant)
3. a) State the **laws of reflection of light**. (2 marks)
- b) i) Explain the term **rectilinear propagation** of light.
- ii) Draw diagrams and use them to explain the formation of **partial** and **total eclipses** of the moon. (3 marks)
- c) A man has got a height of 180cm and the man's eyes are 12cm below the top of his head. Find the shortest length of mirror necessary to view the whole of his body. (3 marks)
- d) Define the terms:
- i) **principal focus**, (2 marks)
- ii) **focal length**, as used in curved mirrors. (1 mark)
- e) By means of accurate graphical construction, determine the position, size and nature of the image of an object 20mm tall, standing on the principal axis of a concave mirror of radius of curvature 400mm and 340mm from the mirror. (5 marks)

4. a) i) Define the term **refraction**. (1 mark)
 ii) State the **laws of refraction**. (2 marks)
- b) Describe with the aid of a ray diagram how thick plane mirrors form multiple images. (3 marks)
- c) What is meant by the following terms?
 i) **dispersion**, (1 mark)
 ii) **pure spectrum**. (1 mark)
- d) Where must an object be placed so that the image formed by a converging lens will be: (4 marks)
 i) the same size as the object,
 ii) erect and magnified,
 iii) inverted and magnified,
 iv) at infinity?
- e) The diagram in figure 3 below shows a section of the electromagnetic spectrum.

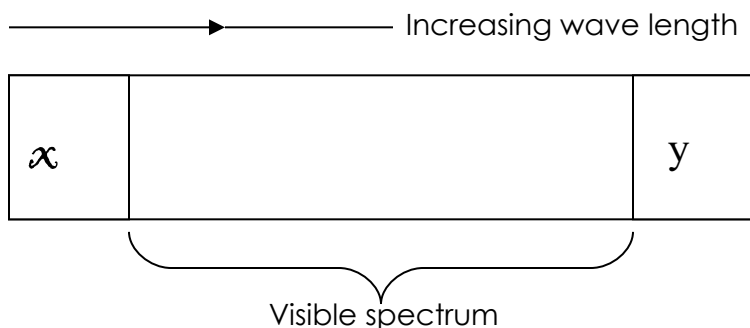
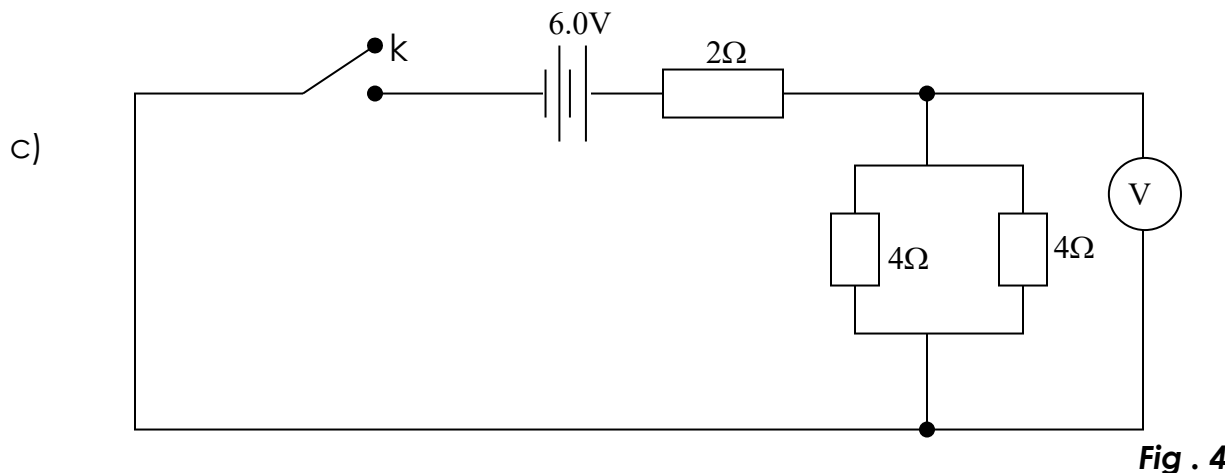


Fig. 3

- i) Identify the borders x and y of the visible spectrum. (2 marks)
 ii) Suggest **one use** and **one effect** of the band x. (2 marks)
5. a) i) Draw a well labeled diagram of a lead acid accumulator. (2 marks)
 ii) List **four** precautions necessary to prolong the life of an accumulator (2 marks)
 iii) State two advantages of a **Nife cell** over a lead acid cell. (2 marks)
- b) Define a **volt**. (1 mark)

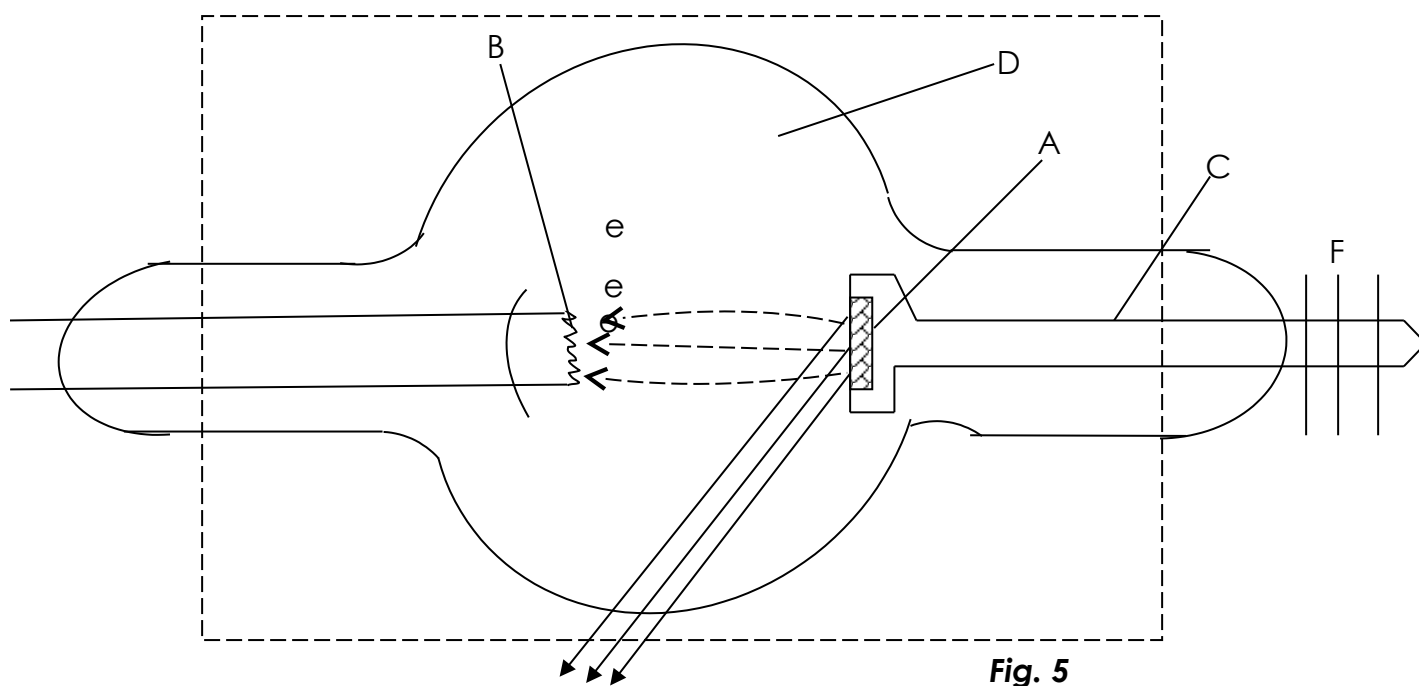


The figure 4 above shows a battery of e.m.f 6.0V and negligible internal resistance.

- i) Calculate the effective resistance of a circuit. (2 marks)
 - ii) Calculate the voltmeter reading when switch k is closed. (4 marks)
- d) i) State the **law of electrostatics**. (1 mark)
- ii) Explain what happens when two insulators of different materials are rubbed together. (2 marks)
6. a) Describe briefly the structure and action of an **a.c transformer**. (5 marks)
- b) i) Explain the advantage of transmitting electrical power at high voltage. (3 marks)
- ii) Find the power wasted as internal energy in the cables when 20kW of power is transmitted through the cable, given that its resistance is 1.0Ω and the voltage is 400V. (4 marks)
- c) What is meant by the following terms?
- i) **magnetic meridian**, (1 mark)
 - ii) **neutral point**. (1 mark)
- d) Draw a diagram of the magnetic field due to a bar magnet placed horizontally with its axis in the magnetic meridian and its north pole pointing south. (2 marks)
7. a) Define **an echo** and explain the term **reverberation**. (2 marks)
- b) i) Describe an experiment to measure the speed of sound in air using echo method. (5 marks)
- ii) State any sources of errors in the experiment above. (1 mark)
- c) Describe with the aid of diagrams what happens when plane waves are incident on the gap between two obstacles as in a ripple tank if:
- i) the gap is wide (2 marks)
 - ii) the gap is narrow (2 marks)

- d) In a sonometer, the tension in the stretched string is kept constant while the string vibrates at a frequency of 160Hz when the free length is 40cm. Calculate the length of the string if the frequency changes to 300Hz. (2 marks)
- e) Explain the importance of reverberation in a concert hall. (2 marks)
8. a) What are **x-rays**? (1 mark)

b)



The diagram in figure 5 above shows an extract from a modern x-ray tube.

- Name the parts labeled A, B, C, D, E and F. (3 marks)
 - Describe how x-rays are produced. (4marks)
 - Mention the function of the part labeled D. (1 mark)
 - State **one** use of x-rays and one danger of X-rays. (2 marks)
- c) Define the term **radioactivity**. (1 mark)
- The activity of a radioactive substance reduces from 2000 counts per second to 125 counts per second in 40 seconds. What is the half life of the source. (3 marks)
 - What percentage of the original sample will have disintegrated after 40 seconds? (1 mark)

END