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Answer to this paper must be written on the paper provided separately.  
You will not be allowed to write during the first 15 minutes  
This time is to be spent in reading the question paper.  
The time given at the head of this paper is the time allowed for writing the answers.

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This paper is divided into two sections.  
**All** questions in **section I** are compulsory.  
Answer any **four** in **section II**

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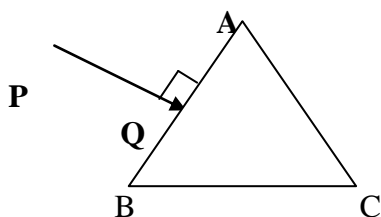
**Section I (40 marks)**

**Question 1**

- a. A body is acted upon by two forces each of magnitude  $F$ , but in opposite directions. State the effect of forces if : (i) both forces act at the same point of the body  
(ii) The two forces act at two different points of the body at a separation  $r$ . [2]
- b. Differentiate between watt and watt hour [2]
- c. A ball is placed on a compressed spring. What form of energy does the spring possess? What happens when you release the spring? [2]
- d. What is the velocity ratio of a single fixed pulley? How does friction in the pulley bearing affect it? [2]
- e. An electric heater of power 3 kW is used for 10 h. How much energy does it consume? Express your answer in joules. [2]

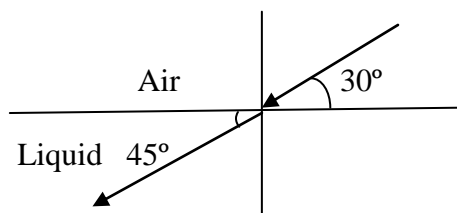
**Question 2**

- a. Two bodies have masses in the ratio 5:1 and kinetic energies in the 125: 9. Calculate the ratio of their velocities. [2]
- b. Copy the diagram given below of an equilateral triangle prism and complete the path of the light ray till it emerges out of the prism. The critical angle of glass is  $42^\circ$ . [2]



- c. The apparent depth of a liquid in a vessel is 15 cm, and the shift is 5 cm. Find the refractive index of the liquid [2]

- d. Answer the questions from the following diagram [2]



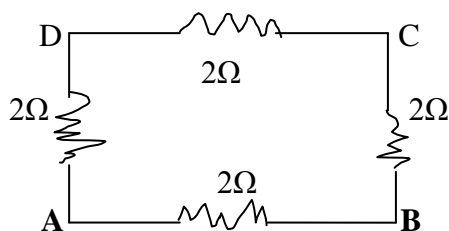
- (i) Write the values of angle of incidence and angle of refraction
  - (ii) Find refractive index and name the law used to find refractive index.
- e. Define the term focus of a convex lens. Is it real or virtual? [2]

### Question 3

- a. A wave has a wavelength  $10^{-3}$  nm. Name the wave. State its one use. [2]
- b. Define damped vibrations. Give one example. [2]
- c. A RADAR sends a signal to an aeroplane at a distance 300 km away, with a speed of  $3 \times 10^8$  m/s. After how much time is the signal received back after reflecting from the aeroplane? [2]
- d. A metal piece of mass 50 g at  $27^\circ\text{C}$  requires 2400 J of heat energy in order to raise its temperature to  $327^\circ\text{C}$ . Calculate the specific heat capacity of the metal. [2]
- e. Why do the farmers fill their fields with water on a cold winter night? [2]

### Question 4

- a. Calculate the equivalent resistance between the points A and B. [2]



- b. Draw a diagram to connect  $3\Omega$  and  $6\Omega$  resistors in parallel. Hence calculate equivalent resistance [2]
- c. Define the term specific resistance and state its S.I unit. [2]
- d. It is dangerous to connect the switch in the neutral wire. Explain. [2]
- e. 'Radioactivity is a nuclear phenomenon'. Why? [2]

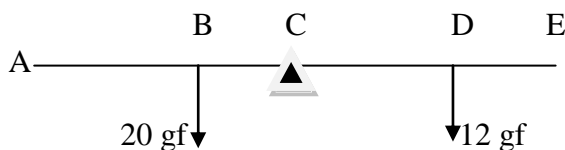
## Section II ( Answer any four)

### Question 5

- a. A half metre rod is pivoted at the centre with two weights of 20 gf and 12 gf suspended at a perpendicular distance of 6 cm and 10 cm from the pivot respectively as shown in the figure.

[3]

- Which of the two forces acting on the rigid rod causes clockwise moment?
- Is the rod in equilibrium?
- The direction of 20 gf force is reversed. What is the magnitude of the resultant moment of the forces on the rod?



- b. State the energy changes in the following cases:

- Microphone
- Burning coal
- A solar cell

[3]

- c.(i) Draw a labelled diagram of a block and tackle system of 3 pulleys. In the diagram, mark the directions of all the forces acting on it.

[2]

- (ii) It lifts a load of 150 N by an effort of 60 N. Calculate the mechanical advantage. Is this an ideal machine?

[2]

### Question 6

- a. A light ray passes from water to (i) air and (ii) glass. In each case, state how does the speed of light change.

Define refraction

[3]

- b. (i) What is total internal reflection?

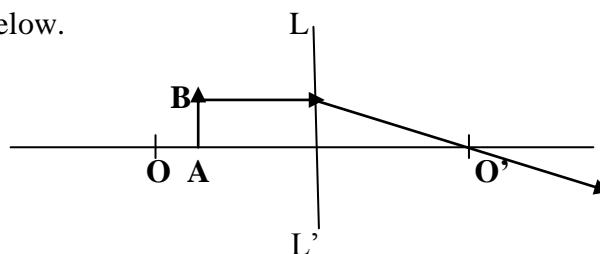
[1]

- (ii) State 2 conditions necessary for the total internal reflection to occur.

[2]

- c. Study the diagram below.

[4]



- Name the lens LL'
- What are the points O and O' called?
- Complete the diagram to form the image of the object AB

### Question 7

- a. Where should an object be placed in front of a concave lens of focal length 30cm to obtain an image 15cm in front of the lens? Find its magnification. [3]
- b. A pendulum has a frequency of 4 vibrations per second. An observer starts the pendulum and fires a gun simultaneously. He hears the echo from the cliff after 6 vibrations of the pendulum. If the velocity of sound in air is 340m/s, find the distance between the cliff and the observer. [3]
- c. (i) How do you tune your radio set to a particular station? Name the phenomenon involved in doing so. [2]  
(ii) Define pitch. State one factor on which pitch depend. [2]

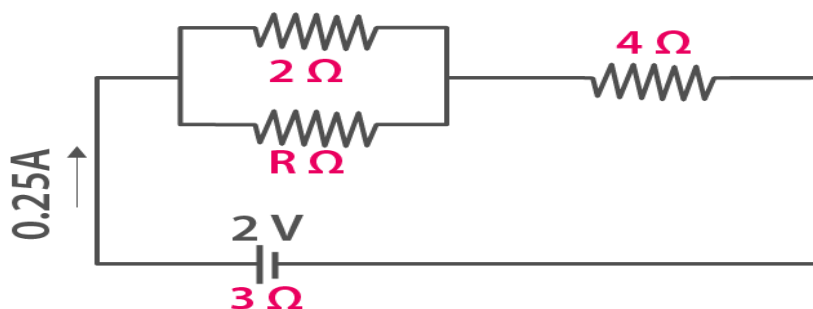
### Question 8

- a. Complete the table [3]

Wire	Colour ( new convention)
Neutral	
Live	
Earth	

- b. An electric bulb is rated '100 W, 250 V'. What information does this convey? [3]
- c. The circuit diagram in figure shows three resistors 2 ohm, 4 ohm and R ohm connected to a battery of e.m.f. 2 V and internal resistance 3 ohm. If main current of 0.25 A flows through the circuit, find:

- (i) the p.d. across the 4 ohm resistor
- (ii) the p.d. across the internal resistance of the cell,
- (iii) the p.d. across the R ohm or 2 ohm resistor, and
- (iv) the value of R.



### Question 9

- a. 1 kg of water is contained in a 1.25kW kettle. Calculate the time taken for the temperature of water to rise from 25°C to its boiling point 100°C. [3]  
( Specific heat of water = 4200 J kg<sup>-1</sup> K<sup>-1</sup>)
- b. Draw a labelled diagram of a calorimeter. [2]  
State principle of heat exchange [1]
- c. (i) Define specific latent heat of fusion of ice. State its S.I unit. [2]  
(ii) Ice cream appears colder to the mouth than water at 0°C. Give reason [2]

### Question 10

- a. An element  ${}_X^Y\text{P}$  disintegrates by  $2\alpha$  emission and the new element suffer two further disintegrations both by  $\beta$  emission, to form an element Q. [3]  
Write the reaction.
- b. A radioactive source emits 3 types of radiations. [3]  
(i) Name the radiation of zero mass  
(ii) Name the radiation which has lowest ionizing power.  
(iii) Name the radiation with least penetrating power
- c. (i) State 2 safety precautions while using nuclear energy. [2]  
(ii) What are isobars? Give one example [2]