

DATE: 14-01-19

MARKS: 80

SUBJECT: PHYSICS

TIME: 2Hrs

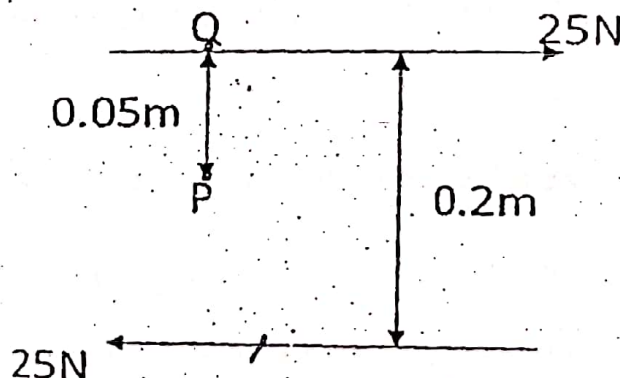
You will not be allowed to write during the first 15 minutes. This time is to be spent in reading the Question Paper. The time given at the head of this Paper is the time allowed for writing the answers.

## SECTION I (40 Marks)

Attempt all questions from this Section.

## Question 1

- (a) (i) Define moment of couple.  
 (ii) Name the motion produced by a couple acting on a rigid body. [2]
- (b) The given diagram shows two forces each of magnitude  $25\text{N}$  acting in opposite direction at a separation of  $0.2\text{m}$ . The distance between P and Q is  $0.05\text{m}$ .



Calculate the resultant moment of the two forces about the point

- (i) P and  
 (ii) Q

[2]

(24)

- (c) Classify the following into levers as class I, class II, or class III:
- (i) a plier,
  - (ii) a sugar tongs. [2]
- (d) State the energy changes in the following cases, while in use:
- (i) burning coal,
  - (ii) microphone. [2]
- (e) (i) Give the relation between M.A. and V.R. for an ideal machine  
(ii) Define the term efficiency of a machine. [2]

## QUESTION 2

- (a) The critical angle for glass-air is  $45^\circ$  for the light of yellow colour state whether it will be less than, equal to, or more than  $45^\circ$  for
- (i) red light,
  - (ii) blue light. [2]
- (b) Which colour of white light is scattered the most?  
Give reason [2]
- (c) A coin kept inside water ( $\mu_w = 4/3$ ) when viewed from air in vertical direction, appears to be raised by 2mm. Find the depth of the coin in water. [2]
- (d) (i) Name the subjective property of sound related to its frequency.  
(ii) The resistance of two lamps A and B connected to the same voltage is in the ratio 4:5. What will be the ratio of their electric power? [2]

(e) How is the frequency of a stretched string related to

(i) it's length,

(ii) it's tension?

[2]

### QUESTION 3

(a) A force is applied on a body of mass 20kg moving with a velocity 40m/s. The body attains a velocity of 50m/s in 2 s. Calculate the work done by the body. [2]

(b) Is it possible for a lens to act as a convergent lens in one medium and a divergent lens in another? Explain. [2]

(c) In a circuit three bulbs are connected in series.

(i) If one more bulb is connected in series, what will be the effect on the brightness of each bulb?

(ii) If one bulb fuses, what will be the effect on the other bulbs? [2]

(d) Give two characteristics of the secondary coil of a step up transformer. [2]

(e) Two cylindrical copper wires A and B of same length have area of cross section as  $2A$  and  $A/2$  respectively. Compare:

(i) their resistances,

(ii) their specific resistances. [2]

### QUESTION 4

(a) write the nuclear reaction for the following:

(i) nucleus  ${}_{88}^{226}\text{X}$  emits an  $\alpha$  particle and forms nucleus Y.

(ii) nucleus  ${}_{88}^{228}\text{P}$  emits a  $\beta$  particle and forms a nucleus Q. [2]

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(b) What do you mean by background radiation? Name one internal source of background radiation. [2]

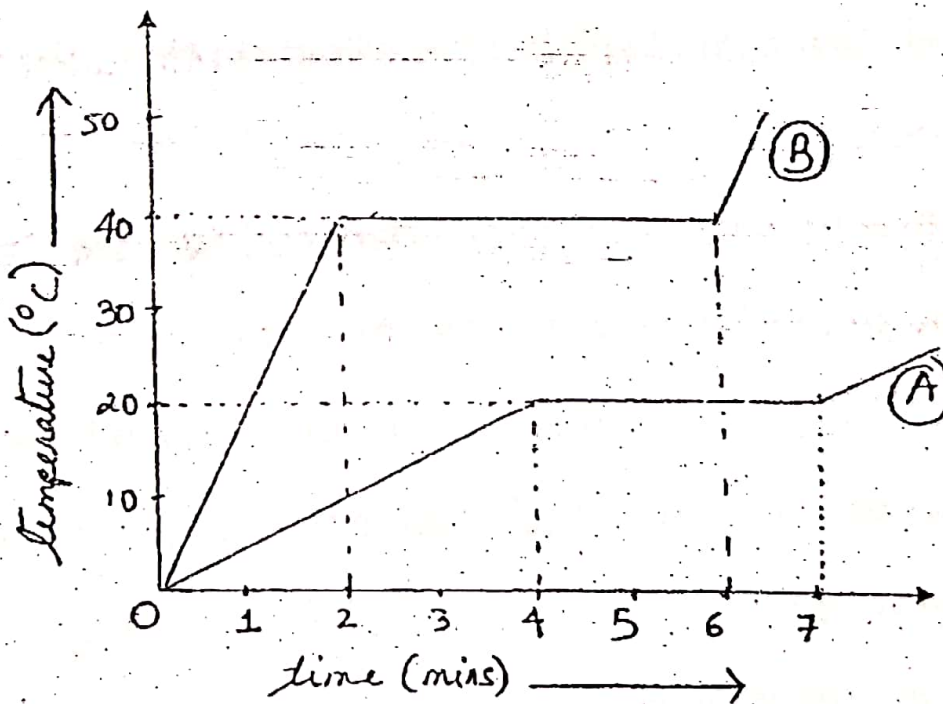
(c) Give two differences between isotopes and isobars. [2]

(d) Calculate the amount of heat released when 5g of water at  $20^{\circ}\text{C}$  is changed into ice at  $0^{\circ}\text{C}$

Given: Specific heat capacity of water is  $4.2 \text{ Jg}^{-1}\text{C}^{-1}$

Specific latent heat of fusion of ice is  $336 \text{ Jg}^{-1}$  [2]

(e) Two solid bodies A and B <sup>each</sup> of mass  $m$  are heated at a uniform rate under identical conditions. Their change in temperature are reflected graphically in the given figure.



From the given graph:

(i) Compare the melting points of solid A and solid B,

(ii) What is the ratio of their latent heats?

[2]

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## SECTION II (40 marks )

Attempt any four questions from this section

### QUESTION 5

- (a) Determine the nature of work done in the following cases:
- (i) When a body is displaced along a horizontal surface, work done by its weight.
  - (ii) A ball falling freely under the action of gravity.
  - (iii) When two similar charges approach each other, they repel each other. [3]
- (b) By using a block and tackle system, a man can raise a load of 700N by applying an effort of 200N. Find
- (i) the mechanical advantage of this system
  - (ii) the useful power output if he raises the load through 20m in 1.5 minutes. [3]
- (c) (i) A fulcrum divides a crowbar in the ratio 3:1. What weight will be lifted if an effort of 100N is applied at the end of its longer arm.
- (ii) Is it possible to have an accelerated motion with a constant Speed? Explain. [4]

### QUESTION 6

- (a) What is meant by Total Internal Reflection? With the help of a diagram show how a suitable glass prism is used to turn a ray of light through  $180^\circ$  [3]

(b) An erect, ~~virtual~~ and diminished image is formed, when an object is placed between the optical centre and principal focus of a lens.

(i) Name the lens.

(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics. [3]

(c) An object is placed in front of a convex lens of focal length 20cm to obtain a real and four times magnified image. Find

(i) position of the object,

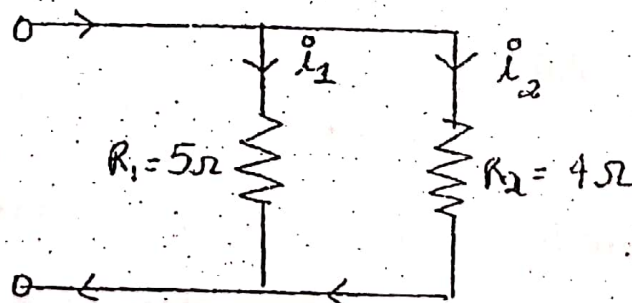
(ii) power of the lens. [4]

### QUESTION 7

(a) (i) How will you investigate the existence of radiations beyond the red and the violet end of the spectrum?

(ii) Which colour of white light has the highest speed in vacuum? [3]

(b) In the given circuit diagram, the heat produced in a  $5\Omega$  resistor due to a current flowing in it is 40 joule per second.



Calculate:

(i) The ratio of the currents flowing through  $4\Omega$  and  $5\Omega$ .

(ii) The heat produced in  $4\Omega$  resistor per second. [3]

(c) (i) Why is it more economical to transmit electrical energy at high voltage and low current ?

(ii) What is an electric fuse? How is a fuse connected in an electric circuit? [4]

### QUESTION 8

(a) An observer standing between two cliffs, produces sound. Two successive echoes are heard after 5s and 7s. Calculate the distance between the cliffs (velocity of sound in air is 340m/s) [3]

(b) State the principle of a d.c. motor. With the help of a neat labelled diagram show its essential parts. [3]

(c) (i) An electric kettle is rated at 220V, 1100W. Find the cost of running the kettle for two hours at rupees 5.40 per unit.

(ii) State two conditions necessary for an echo to be heard distinctly. [4]

### QUESTION 9

(a) What material is the calorimeter made up of? Give two reasons for using the material stated by you. [3]

(b) 40g of ice at  $0^{\circ}\text{C}$  is used to bring down the temperature of certain mass of water at  $60^{\circ}\text{C}$  to  $10^{\circ}\text{C}$ . Find the mass of water used. [ Given specific heat capacity of water is  $4200\text{ J kg}^{-1}\text{K}^{-1}$  and specific latent heat of fusion of ice is  $336000\text{ J kg}^{-1}$  ] [3]

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(c) (i) A certain amount of heat  $Q$  will warm 1g of material X by  $3^{\circ}\text{C}$  and 1g of material Y by  $4^{\circ}\text{C}$ , which material has greater specific heat? Why?

(ii) Ice cream appears colder to the mouth than water at  $0^{\circ}\text{C}$ . Give reason. [4]

### QUESTION 10

(a) What is the principle of a nuclear reactor? State the function of a moderator in a nuclear reactor. Name one substance used as a moderator. [3]

(b) A radioactive substance emits three types of radiations.

Name the radiation:

(i) which has the lowest ionizing power,

(ii) which has the lowest penetrating power,

(iii) that produces X-rays when they are stopped by metals such as tungsten. [3]

(c) (i) Give one difference and one similarity between nuclear fusion and nuclear fission.

(ii) Write down Einstein's mass – energy equivalence relation, explaining the meaning of each symbol used in it. [4]