

MAR THOMA RESIDENTIAL SCHOOL, TIRUVALLA  
SECOND MODEL EXAMINATION-2019-'20

Marks-80  
Std-X

PHYSICS

Time-2 h

Answers 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 spend in reading the question paper.  
The time given at the head of this Paper is the time allowed for writing the answer.

Section I is compulsory. Attempt any four questions from Section II.  
The intended marks for questions or parts of questions are given in brackets ( ).  
This question paper consists of six printed pages.

SECTION I (40 Marks)

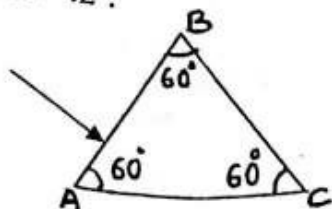
Attempt all questions from this section. All Questions carry 10 marks each.

Question-1

- a) i) Which type of lever has a mechanical advantage always less than one?  
ii) Give reason with one example. (2)
- b) A single fixed pulley is used to lift a load of 400N by applying an effort of 480N.  
i) What is the mechanical advantage?  
ii) Calculate the efficiency of the pulley. (2)
- c) i) State work- energy theorem.  
ii) How fast should a man weighing 600N run so that his kinetic energy is 750J?  
(  $g = 10\text{m/s}^2$  ) (2)
- d. Differentiate between uniform circular motion and uniform linear motion (2 points). (2)
- e. A rain drop reaches the earth with a constant velocity.  
i) Name the kind of equilibrium.  
ii) State one condition for the above mentioned equilibrium. (2)

Question-2

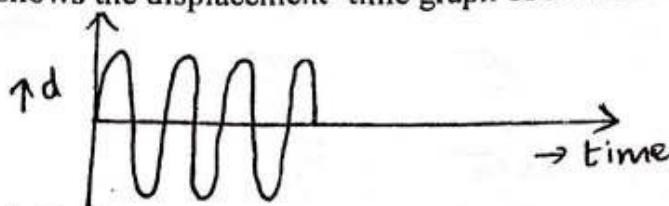
- a) i) State one condition for total internal reflection to occur.  
ii) How does critical angle depend on the wavelength of light? (2)
- b) A ray of light is incident normally on the face AB of an equilateral glass prism.  
Complete the ray diagram showing the emergence into air after passing through the prism.  
Take critical angle for glass =  $42^\circ$ .



- c) i) How does the intensity of scattered light depend on the wavelength of incident light? (2)  
 ii) State the condition when the above dependence holds.
- d) i) What do you mean by the statement specific heat capacity of copper is  $0.4 \text{ Jg}^{-1} \text{ K}^{-1}$ ? (2)  
 ii) Two blocks P and Q of different metals having their mass in the ratio 4:3 are given same amount of heat. Their temperature rises by the same amount. Compare their specific heat capacities.
- e) i) An iron ball requires 500J heat energy to raise its temperature by  $10^{\circ}\text{C}$ . Calculate the heat capacity of the iron ball. (2)  
 ii) If the mass of the ball is 1.1kg, find the specific heat capacity of iron.

### Question-3

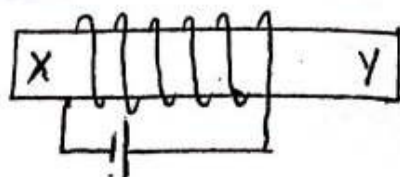
- a) i) What is the other name given to nuclear fission? (2)  
 ii) Why is very high temperature required for nuclear fusion? (2)
- b) A certain nucleus P has a mass number 15 and atomic number 7. The nucleus P loses  
 i) one alpha particle ii) one beta particle. Express each change by a reaction. (2)
- c) The diagram shows the displacement- time graph of a vibrating body.



- i) Name the kind of vibration. (2)  
 ii) Give one example of such vibration. (2)
- d) i) Name the material of fuse. (2)  
 ii) State its characteristics. (2)
- e) If 5 bulbs each of 60W and 2 tube lights each of 40W are used simultaneously, find the current drawn from the main of 220V. (2)

### Question-4

- a) The diagram below shows a coil wound around a soft iron bar XY.  
 i) State the polarity of the ends X and Y as the switch is pressed.  
 ii) Suggest one way of increasing the strength of the electromagnet so formed.



- b) i) Give two characteristics of high tension wires. (2)  
 ii) A switch is not touched with wet hands while putting it **ON** or **OFF**. Give reason. (2)

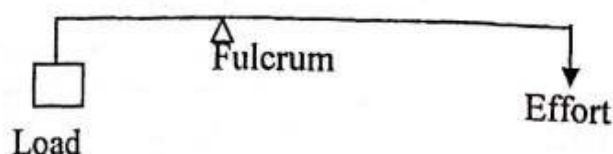
- c) An object is placed at a distance of 20cm in front of a concave lens of focal length 20cm. Find
- the position of the image
  - the magnification of the image.
- d) A virtual image of an object is formed in front of the object by a lens. Draw a ray diagram to show this. (2)
- e) i) How does the specific resistance of a semi-conductor change with the increase in the temperature? (2)
- A wire of resistance  $4\Omega$  and length 10cm is stretched to length 40cm. Assuming that it has a uniform cross section, what will be its new resistance? (2)

### SECTION II (40 Marks)

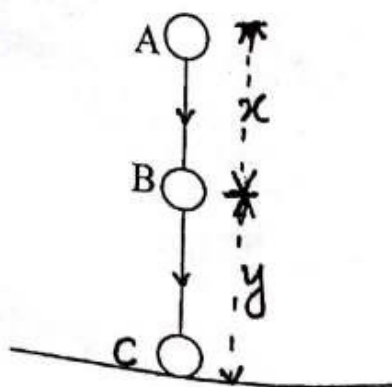
(Attempt any four questions)

#### Question-5

- a) The diagram below shows a lever in use.



- To which class of lever does it belong?
  - Give one example of the class of lever mentioned above.
  - How will the mechanical advantage change if the load is shifted towards the fulcrum without changing its dimension? (3)
- b) A uniform metre rule of mass 105g is balanced on a fulcrum at mark 58cm by suspending an unknown mass 'm' at the mark 70cm. (3)
- Find the value of  $m$ .
  - In which direction the rule will tilt if the mass  $m$  is moved to the mark 62cm?
  - How can it be balanced by another mass of 50g?
- c) i) Show that the sum of kinetic energy and potential energy is always conserved in the case of a freely falling body under gravity (with air resistance neglected) from a height by finding it when 1) the body is at the point A 2) the body has fallen a distance 'x' and 3) the body has reached the ground. (3)



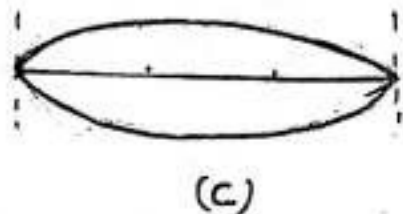
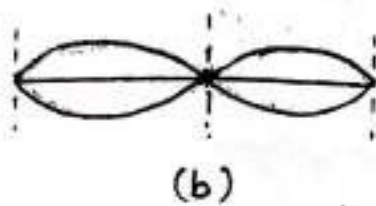
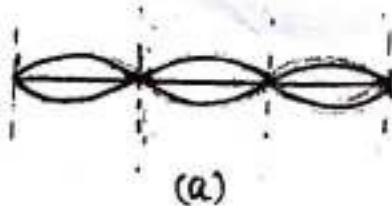
- ii) A simple pendulum while oscillating rises to a maximum vertical height of 5cm from its rest position when it reaches to its extreme position on one side if the mass of the bob of the simple pendulum is 500g and  $g=10\text{m/s}^2$ . Find the velocity of the bob at its mean position. (4)

#### Question-6

- a) A crack in a glass often shines like a mirror.  
i) Name and define the phenomenon responsible for it.  
ii) Give one advantage of using total reflecting prism as a reflector in place of a plane mirror. (3)
- b) i) Name the radiation used as signals during the war.  
ii) Give one source of the radiation mentioned in part (i) above.  
iii) Give another use of the above mentioned radiation. (3)
- c) Gamma, ultraviolet, radio wave, micro wave, x-ray are some of the electromagnetic radiation  
i) Arrange them in the decreasing order of frequency.  
ii) Which one is having the least penetrating property?  
iii) Which one is the most energetic radiation.  
iv) Which one is detected by their chemical activity on dyes. (4)

#### Question-7

- a) i) Define echo.  
ii) State one essential condition for an echo to be heard distinctly.  
iii) A radar is able to detect the reflected waves from an enemy's aeroplane after a time interval of 0.02millisecond. If the velocity of the wave is  $3 \times 10^8\text{m/s}$ , calculate the distance of the aeroplane from the radar. (3)
- b) The stem of a vibrating tuning fork is pressed against a table top.  
i) State the kind of vibration produced on the table top.  
ii) Under what condition does it lead to resonance?  
iii) State one difference between the kind of vibration mentioned in part( i) and resonance. (3)
- c) 1) Figure below shows three different modes of vibration of a string of length 'l'.

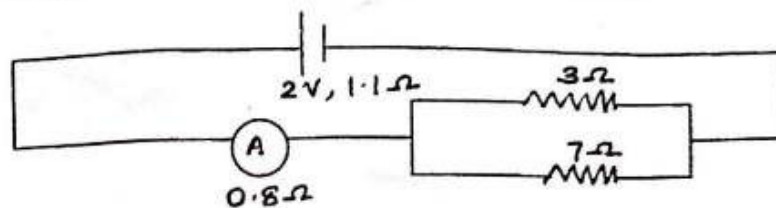


- i) What is the ratio of frequency between (a) and (c)?

- ii) What is the ratio of wavelength between (b) and (a)?  
 2) A wire of length 80cm under some tension produces sound of frequency 256Hz. What length of wire will produce sound of frequency 1024Hz under the same tension? (4)

### Question-8

- a) i) State Ohm's law. (3)  
 ii) Draw a circuit diagram to verify Ohm's law.  
 b. A cell of emf 2V and internal resistance  $1.1\Omega$  is connected to an ammeter of resistance  $0.8\Omega$  and two resistors of  $3\Omega$  and  $7\Omega$  as shown.



Calculate

- i) the reading of the ammeter.  
 ii) the potential difference across the terminals of the cell  
 iii) the potential difference across  $7\Omega$  resistor. (3)  
 c. i) Explain the meaning of the statement 'current rating of a fuse is 8A'.  
 ii) Two fuse wires are rated 6A and 15A. Which of the two is 1) longer, 2) thicker. (4)  
 iii) What is the colour code for the insulation on 1) earth wire, 2) live wire.

### Question-9

- a) i) State the principle of calorimetry.  
 ii) What is the other name given to it? (3)  
 iii) Name the law on which the principle is based.  
 b) The melting point of naphthalene is  $80^{\circ}\text{C}$  and the room temperature is  $30^{\circ}\text{C}$ . A sample of liquid naphthalene at  $100^{\circ}\text{C}$  is cooled down to the room temperature. Draw a temperature-time graph to represent this cooling. In the graph mark the region which corresponds to the freezing process. (3)  
 c) An electric heater of power 150W is immersed in 0.75kg of ice at  $0^{\circ}\text{C}$  in a lagged container of negligible heat capacity. The temperature remains constant for 27.5minutes and then rises to  $40^{\circ}\text{C}$  in further 14 minutes. Calculate (4)  
 i) the specific latent heat of ice and  
 ii) the specific heat capacity of water.

### Question-10

- a) i) What are radio isotopes?  
ii) Mention one safety precaution that have to be taken while establishing a nuclear power plant.  
iii) State one difference between radioactive decay and nuclear fission. (3)
- b) i) State one way of increasing the speed of rotation of an electric motor.  
ii) State the law which is used to determine the direction of force on a current carrying conductor placed in a magnetic field.  
iii) State the function of split rings in dc motor. (3)
- c. i) Draw a neat labelled diagram of an ac generator.  
ii) State one factor that determines the magnitude of induced emf.  
iii) State one way to increase the maximum value of induced emf. (4)