

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

Marks-80
Time-2 h

Std-X

*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 ().*

SECTION I (40 Marks)

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

Question-1

- a) State the condition when on applying a force, the body has
i) translational motion ii) rotational motion. (2)
- b) How is the work done by a force measured when
i) Force is in the direction of displacement
ii) Force is at an angle to the direction of displacement. (2)
- c) A light mass and a heavy mass have equal momentum.
i) Which will have more kinetic energy?
ii) Give reason for the answer in part (i) above. (2)
- d) How is the mechanical advantage related to the velocity ratio for
i) a practical machine ii) an ideal machine (2)
- e) A crowbar 2m long is pivoted about a point 10cm from its tip.
i) Calculate the mechanical advantage of the crow bar.
ii) What is the least force which must be applied at the other end to displace a load of 100kgf? (2)

Question-2

- a) If an object is placed in front of a thick mirror and is viewed obliquely, a number of images are seen.
i) Which image is the brightest one?
ii) Give reason for the answer. (2)
- b) i) Draw a graph to show the variation of angle of deviation with the angle of incidence.
ii) Write a relation for the angle of deviation for a ray of light passing through an equilateral prism in terms of angle of incidence (i), angle of emergence(e) and

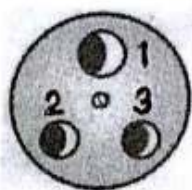
- angle of prism(A).
- c) Draw a diagram to show the appearance of a stick partially immersed in water. (2)
- d) A convex lens forms an image 16cm long of an object 4cm long kept at a distance of 6cm from the lens. (2)
- i) Find the position of the image and
ii) the focal length of lens.
- e) i) Give one property of ultraviolet radiation which differ from visible light. (2)
- ii) The danger signal is red. Why? (2)

Question-3

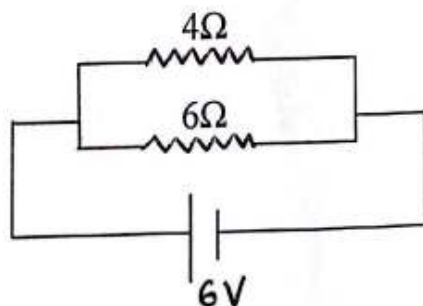
- a) i) When does the nucleus of an atom tend to become radioactive?
ii) What is meant by nuclear waste?
- b) Complete the following nuclear change.
- $$X \xrightarrow{\alpha} X_1 \xrightarrow{\gamma} X_2 \xrightarrow{\beta} X_3 \xrightarrow{\alpha} {}_{82}^{206}X_4$$
- c) A sound produced on the surface of a lake takes 4.5s to reach a boat man. How much time will it take to reach a diver inside water at the same distance, if the speed of sound in water is 4.5 times the speed of sound in air? (2)
- d) Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard.
i) Name the phenomenon taking place.
ii) Suggest one way by which the rattling sound could be stopped. (2)
- e) Why is the base of a cooking pan made thick? (2)

Question-4

- a) The diagram below shows a three pin socket marked as 1,2 and 3.



- i) Identify and write live (L), neutral (N) and earth(E) against the correct number. (2)
- ii) To which part of the appliance is the terminal 1 connected. (2)
- b) Draw a circuit diagram using the dual control switches to light a staircase electric light. (2)
- c) Two resistors of 4Ω and 6Ω are connected in parallel. The combination is connected across a 6V battery of negligible resistance.



- Find,
- i) the total current through the battery.
 - ii) the current through each resistor. (2)
- d) i) A substance has zero resistance below 1K. What is such a substance called? (2)
- ii) Two wires A and B are made of copper. The wire A is long and thin, while the wire B is short and thick. Which will have more specific resistance? (2)
- e) i) Draw an I-V graph for an Ohmic resistor. (2)
- ii) How can the resistance be calculated from the graph. (2)

SECTION II (40 Marks)

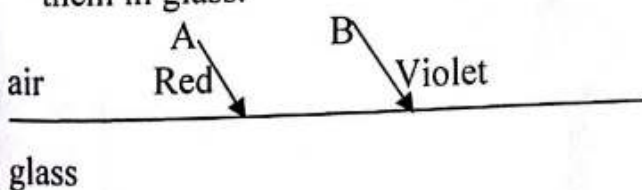
(Attempt any four questions)

Question-5

- a) i) Define centre of gravity. (3)
 - ii) Name the factor on which it depends.
 - iii) State the position of centre of gravity of a triangular lamina.
- b) i) 'Wheel Barrow' belongs to which class of lever? (3)
- ii) Give example for the same class of lever mentioned in part (i) above, found in human body.
 - iii) What is the mechanical advantage of the above mentioned class of lever? (3)
- c) A block and tackle system has the velocity ratio 3. (4)
- i) Draw a labelled diagram of the system indicating the point of application of effort, load and tensions.
 - ii) What is the maximum load that can be raised with this pulley system if its efficiency is 75%? The effort applied is 60kgf.

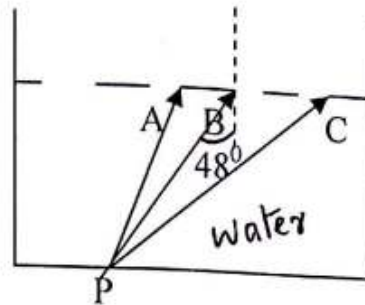
Question-6

- a) The diagram below shows two parallel rays A and B of red and violet light respectively incident from air on air-glass boundary. Complete the diagram showing the refracted rays in them in glass.



- i) How do the speeds of the rays differ in glass?

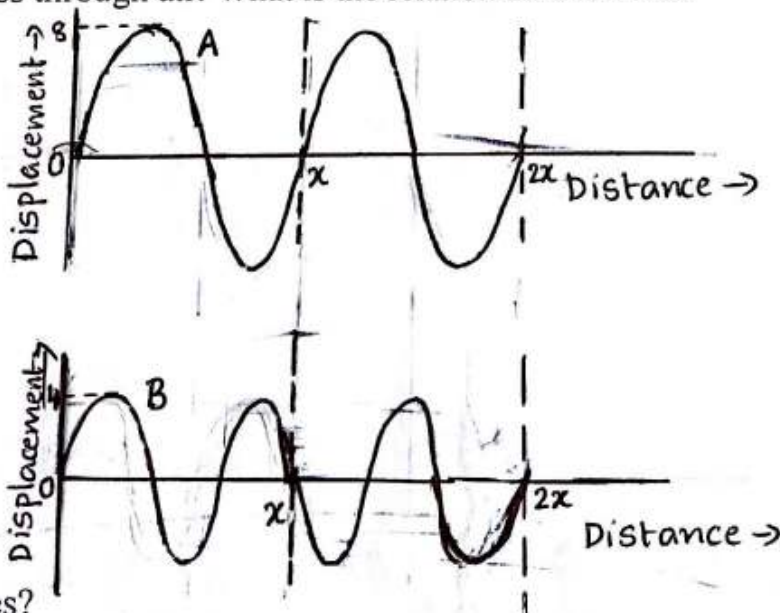
- ii) How does the refractive index of glass differ for the two rays? (3)
- b) Figure below shows a point source P inside a water container. Three rays A, B and C starting from the source P are shown up to the water surface.
- i) Show in the diagram the path of these rays after striking the water surface.
- ii) The critical angle for water-air surface is 48° . Name the phenomenon which the rays A, B and C exhibits. (3)



- c) A lens forms an upright and diminished image of an object placed at its focal point.
- i) Name the lens. (3)
- ii) Draw a ray diagram to show the formation of image. (4)
- iii) Give one use of the lens mentioned in (i) above. (4)

Question-7

- a) i) State the principle on which SONAR is based. (3)
- ii) Name the waves used for echo depth sounding.
- iii) State one reason for using the wave mentioned in part (ii) above. (3)
- b) A person standing at a distance x in front of a cliff fires a gun. Another person B standing behind the person A at a distance y from the cliff hears two sounds of the fired shot after 2s and 3s respectively. Calculate x and y . Take speed of sound 320m/s. (3)
- c) Figure below shows the displacement-distance graph for two sound waves A and B when they pass through air. What is the relation between their



- i) velocities?
- ii) wavelength?
- iii) pitch?
- iv) loudness?

(4)

Question-8

- a) An electrical appliance is rated 1500W, 250V. This appliance is connected to mains of voltage 250V. Calculate
- the current drawn.
 - the electrical energy consumed in 60 hours.
 - the cost of electrical energy consumed at a rate ₹ 4.5 per kWh.
- (3)
- b. In a three pin plug, why
- is the top pin thicker?
 - is the top pin longer?
 - are the pins splitted at the ends?
- (3)
- c) A cell is used to send current to an external circuit.
- How does the voltage across its terminals compare with its emf?
 - Under what condition is the emf of the cell equal to its terminal voltage?
 - How should two resistors be joined to the cell so that same current flows in each resistor?
 - How should two resistors be joined to the cell so that their equivalent resistance is less than either of the two resistances?
- (4)

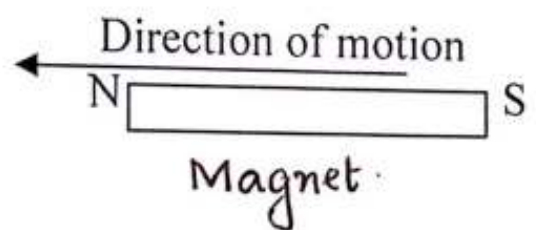
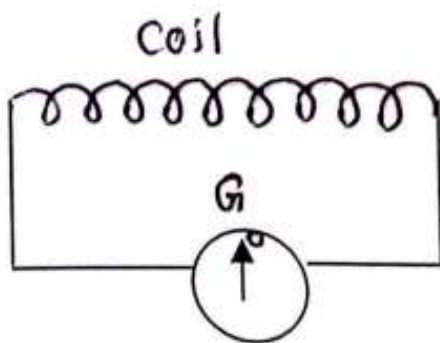
Question-9

- a) i) Name the material used for making calorimeter.
ii) Give reason for your answer in part (i) above.
iii) How can heat loss by conduction be prevented?
- (3)
- b) i) The surrounding become pleasantly warm when water in a lake starts freezing in cold countries. Give reason.
ii) It is generally cold after a hailstorm than during or before a hailstorm. Give reason.
iii) Water is used as an effective coolant in car radiators. Give reason.
- (3)
- c) A metal piece is heated to a constant temperature of 100°C . Then it is added in a calorimeter of mass 50g, containing 50g of water at 20°C . After stirring the water, the highest temperature recorded is 22°C . Calculate the thermal capacity of the metal. Given specific heat capacity of calorimeter $r = 0.42\text{Jg}^{-1}\text{K}^{-1}$, specific heat capacity of water $= 4.2\text{Jg}^{-1}\text{K}^{-1}$.
- (4)

Question-10

- a) i) What is a d.c motor?
ii) State its principle.
iii) When is the deflecting couple 1) maximum 2) minimum?
- (3)
- b) The diagram shows a fixed coil of several turns connected to a centre zero galvanometer G and a magnet NS which can move in the direction shown in the diagram.
Describe the observation if

- i) magnet is moved rapidly.
- ii) the magnet is kept stationary after it has moved into the coil.
- iii) the magnet is pulled out of the coil.



- c)
 - i) Name a device used to transform 12V ac to 200V ac.
 - ii) Name and define the principle on which it works.
 - iii) Draw a labelled diagram of the device mentioned in part(i) above.