

PHYSICS
SCIENCE Paper – 1
(Two hours)

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 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 is compulsory. Attempt any four questions from Section II.

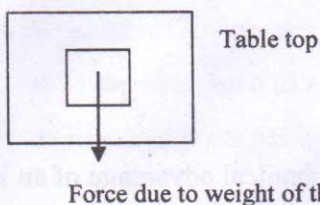
The intended marks for questions or parts of questions are given in brackets [].

SECTION I (40 Marks)

Attempt all questions from this Section.

Question 1

- (a) When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall.



- (i) Name the force exerted by the table top.
- (ii) What is the direction of the force? [2]
- (b) (i) Name one factor that affects the lateral displacement of light as it passes through a rectangular glass slab.
- (ii) On reversing the direction of the current in a wire, the magnetic field produced by it gets ----- [2]
- (c) (i) On what factor does the position of the centre of gravity of a body depend?
- (ii) What is the S.I. unit of the moment of force? [2]
- (d) Name the factors affecting the turning effect of a body. [2]

This Paper consists of 7 printed pages and 1 blank page.

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Turn over

- (e) (i) Define equilibrium.
- (ii) In a beam balance when the beam is balanced in a horizontal position, it is in _____ equilibrium. [2]

Question 2

- (a) How is work done by a force measured when the force :
- (i) is in the direction of displacement
- (ii) is at an angle to the direction of displacement. [2]
- (b) State the energy changes in the following while in use:
- (i) Burning of a candle.
- (ii) A steam engine. [2]
- (c) (i) A scissor is a _____ multiplier.
- (ii) 1 kWh = _____ J. [2]
- (d) Explain the motion of a planet around the sun in a circular path. [2]
- (e) Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 m/s. [2]
Calculate the power exerted.

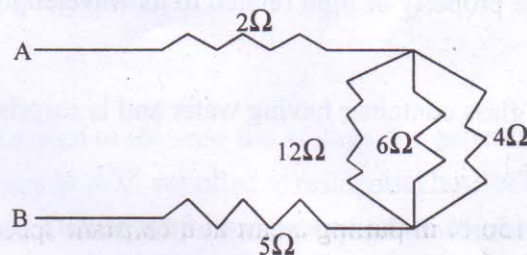
Question 3

- (a) (i) Give the expression for mechanical advantage of an inclined plane in terms of the length of an inclined plane.
- (ii) Name a common device where a gear train is used. [2]
- (b) The speed of light in glass is 2×10^5 km/s. What is the refractive index of glass? [2]
- (c) (i) Draw a graph between displacement and the time for a body executing free vibrations.
- (ii) Where can a body execute free vibrations? [2]
- (d) (i) What happens to the resistivity of semi-conductors with the increase of temperature?
- (ii) For a fuse, higher the current rating _____ is the fuse wire. [2]

- (e) (i) Name the high energetic invisible electromagnetic waves which help in the study of the structure of crystals.
- (ii) State an additional use of the waves mentioned in part (e) (i). [2]

Question 4

- (a) Rishi is surprised when he sees water boiling at 115°C in a container. Give reasons as to why water can boil at the above temperature. [2]
- (b) (i) Why does a current carrying, freely suspended solenoid rest along a particular direction?
- (ii) State the direction in which it rests. [2]
- (c) Find the equivalent resistance between points A and B.



- (d) Give two similarities between an A.C. generator and a D.C. motor. [2]
- (e) (i) Why is a cathode ray tube evacuated to a low pressure?
- (ii) What happens if the negative potential is changed on a grid? [2]

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 5

- (a) Draw a simplified diagram of a lemon crusher, indicating direction of load and effort. [2]
- (b) (i) Name the physical quantity measured in terms of horse power.
- (ii) A nut is opened by a wrench of length 20cm. If the least force required is 2N, find the moment of force needed to loosen the nut.
- (iii) Explain briefly why the work done by a fielder when he takes a catch in a cricket match is negative. [4]

- (c) A block and tackle system has V.R. = 5.
- Draw a neat labelled diagram of a system indicating the direction of its load and effort.
 - Rohan exerts a pull of 150 Kgf. What is the maximum load he can raise [4]
with this pulley system if its efficiency = 75%?

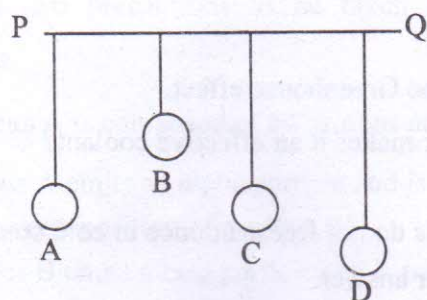
Question 6

- Where should an object be placed so that a real and inverted image of the same size as the object is obtained using a convex lens?
 - Draw a ray diagram to show the formation of the image as specified in the part a (i) [3]
- Why does the Sun appear red at sunrise?
 - Name the subjective property of light related to its wavelength. [3]
- Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state.
 - What change is observed in the appearance of the pencil?
 - Name the phenomenon responsible for the change.
 - Draw a ray diagram showing how the eye sees the pencil. [4]

Question 7

- State the safe limit of sound level in terms of decibel for human hearing.
 - Name the characteristic of sound in relation to its waveform. [2]
- A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3s and the second echo 2s later.
Calculate:
 - The speed of sound.
 - The distance of the other cliff from the person. [3]
- In the diagram below, A, B, C, D are four pendulums suspended from the same elastic string PQ. The length of A and C are equal to each other while the length

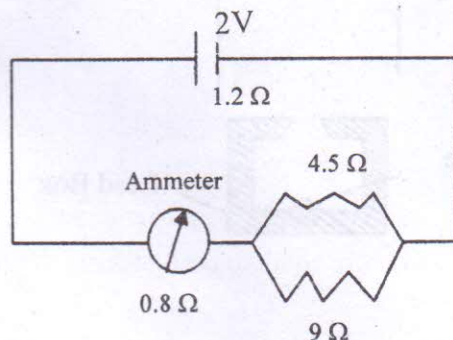
of pendulum B is smaller than that of D. Pendulum A is set into a mode of vibrations.



- (i) Name the type of vibrations taking place in pendulums B and D?
- (ii) What is the state of pendulum C?
- (iii) State the reason for the type of vibrations in pendulums B and C. [5]

Question 8

- (a)
 - (i) Name the device used to increase the voltage at a generating station.
 - (ii) At what frequency is A.C. supplied to residential houses?
 - (iii) Name the wire in a household electrical circuit to which the switch is connected. [3]
- (b) The relationship between the potential difference and the current in a conductor is stated in the form of a law.
 - (i) Name the law.
 - (ii) What does the slope of V- I graph for a conductor represent?
 - (iii) Name the material used for making the connecting wire. [3]
- (c) A cell of Emf 2V and internal resistance 1.2Ω is connected with an ammeter of resistance 0.8Ω and two resistors of 4.5Ω and 9Ω as shown in the diagram below:



- (i) What would be the reading on the Ammeter?
- (ii) What is the potential difference across the terminals of the cell? [4]

Question 9

- (a) (i) Name a gas caused by the Greenhouse effect.
- (ii) Which property of water makes it an effective coolant? [2]
- (b) (i) Water in lakes and ponds do not freeze at once in cold countries. Give a reason in support of your answer.
- (ii) What is the principle of Calorimetry?
- (iii) Name the law on which this principle is based.
- (iv) State the effect of an increase of impurities on the melting point of ice. [4]
- (c) A refrigerator converts 100 g of water at 20°C to ice at -10°C in 35 minutes.

Calculate the average rate of heat extraction in terms of watts.

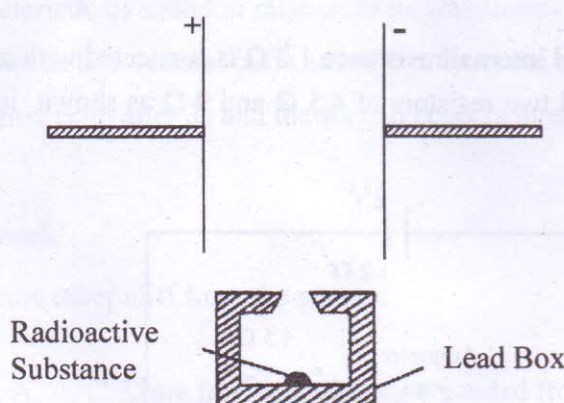
Given: Specific heat capacity of ice = $2.1 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$

Specific heat capacity of water = $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$

Specific Latent heat of fusion of ice = 336 J g^{-1} [4]

Question 10

- (a) (i) What is thermionic emission?
- (ii) Name the unit in which the work function of a metal is expressed. [2]



- (b) (i) Complete the diagram as given above by drawing the deflection of radioactive radiations in an electric field.
- (ii) State any two precautions to be taken while handling radioactive substances. [5]
- (c) An atomic nucleus A is composed of 84 protons and 128 neutrons.
- (i) The nucleus A emits an alpha particle and is transformed into nucleus B. What is the composition of nucleus B?
- (ii) The nucleus B emits a beta particle and is transformed into a nucleus C. What is the composition of nucleus C?
- (iii) Does the composition of nucleus C change if it emits gamma radiations? [3]