

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during 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 A is compulsory. Attempt any four questions from Section B.

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

SECTION A

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options.

[15X1=15]

(Do not copy the question, write the correct answers only.)

- (i) The kinetic energy of a given body depends on the
- | | |
|-----------------------------------|------------------|
| (a) position | (c) momentum |
| (b) center of gravity of the body | (d) displacement |
- (ii) When a ray of light enters from a denser medium to a rarer medium
- | | |
|--|---------------------------------|
| (a) the light ray bends towards the normal | (c) the light ray is undeviated |
| (b) speed of light increases | (d) its wavelength decreases |
- (iii) The phenomenon of light that governs the functioning of the optical fibre is
- | | |
|----------------|-------------------------------|
| (a) refraction | (c) scattering |
| (b) reflection | (d) total internal reflection |
- (iv) A moment of force has a tendency to turn the body in an anticlockwise direction. Then the moment of force is taken as
- | | |
|--------------|-------------|
| (a) positive | (c) maximum |
| (b) negative | (d) zero |
- (v) An example of a non-ohmic resistor is
- | | |
|---------------|--------------------|
| (a) aluminium | (c) silver |
| (b) copper | (d) junction diode |
- (vi) When temperature of the electrolyte of a cell increases, the internal resistance
- | | |
|---------------|-----------------------|
| (a) increases | (c) remains the same |
| (b) decreases | (d) none of the above |
- (vii) Which of the following is not a unit of energy?
- | | |
|-------------------|-------------------|
| (a) electron volt | (c) kilowatt hour |
| (b) erg | (d) dyne |
- (viii) The slope of the V-I graph gives
- | | |
|-----------------|------------------|
| (a) resistance | (c) resistivity |
| (b) conductance | (d) conductivity |
- (ix) A man exerts a force of 200 N in pulling a cart at a constant speed of 16 m/s. Calculate the power spent by the man.
- | | |
|------------|------------|
| (a) 1600 W | (c) 3200 W |
| (b) 1000 W | (d) 2000 W |
- (x) For a Class II lever, the mechanical advantage is
- | | |
|------------------------|----------------|
| (a) always more than 1 | (c) equal to 1 |
| (b) always less than 1 | (d) equal to 0 |
- (xi) The focal length of a camera lens is 20 cm. Find how far away from the film must the lens be set in order to photograph an object located at a distance 100 cm from the lens.

- (a) 25 cm (c) -20 cm
 (b) -25 cm (d) 10 cm
- (xii) Express 5 kWh into Joule.
 (a) 3.6×10^6 Joule (c) 1.8×10^5 Joule
 (b) 1.8×10^7 Joule (d) 5×10^7 Joule
- (xiii) Find the mechanical advantage of a lever in which the effort arm is 60 cm and load arm is 4 cm.
 (a) 15 (c) 60
 (b) 20 (d) 24
- (xiv) On passing electric current through a lamp, the electrical energy is converted to
 (a) heat energy (c) mechanical energy
 (b) light energy (d) heat and light energy
- (xv) When the angle of incidence increases, the lateral displacement
 (a) increases (c) remains the same
 (b) decreases (d) none of the above

Question 2

- (i) (a) Give an example of conversion of sound energy to electrical energy. [3]
 (b) How does kinetic energy change if mass and velocity are both doubled?
- (ii) (a) On which principle does a lever work? [2]
 (b) Define efficiency of a machine.
- (iii) Two copper wires A and B are of the same thickness and are at room temperature. If the length of A is twice the length of B, [2]
 (a) Compare their resistances.
 (b) Compare their resistivities.
- (iv) Draw the ray diagram for the image formation by a convex lens for an object between the optical center and the focus. [2]
- (v) Three resistors of 6Ω , 3Ω and 2Ω are connected together so that the total resistance is greater than 6Ω but less than 8Ω . Show this arrangement in a diagram and calculate its total resistance. [2]
- (vi) Define center of gravity of a body. [2]
- (vii) A crane pulls up a car of mass 500 kg to a vertical height of 4m. Calculate the work done. [2]

Question 3

- (i) State two differences between normal reflection and total internal reflection. [2]
- (ii) Define the term 'electromotive force'. [2]
- (iii) Show the variation of V and I for ohmic and non ohmic conductors using two graphs. [2]
- (iv) (a) What is velocity ratio of a machine? [2]
 (b) What happens if the velocity ratio is more than 1?
- (v) What are the conditions for the work done by a force to be zero? [2]

SECTION B

(Attempt any four questions.)

Question 4

- (i) (a) What are the two conditions for a body to be in equilibrium? [3]
 (b) What is the unit of moment of force?
- (ii) (a) What is centripetal force? [3]
 (b) Why is centrifugal force called a fictitious force?
- (iii) (a) On a seesaw, two children of masses 30 kg and 50 kg are sitting on one side of it at distances 2 m and 2.5 m respectively from the middle. Where should a man of mass 74 kg sit to balance it? [4]
 (b) A mechanic can open a nut by applying a force of 150 N using a lever handle of

length 40 cm. How long a handle is required to open it by applying a force of 50 N?

Question 5

- (i) (a) State the work-energy theorem. [3]
(b) Calculate the kinetic energy of a body of mass 0.1 kg and momentum 20 kg m/s.
- (ii) (a) When a body moves in a circular path, how much work is done by it? Why? [3]
(b) The energy of an electron is 4×10^{-19} Joule. Express it in eV.
- (iii) A boy of mass 40 kg climbs up a flight of 30 steps each 20 cm high in 2 minutes, and a girl of mass 30 kg does the same in 1.5 minutes. Compare [4]
(a) the work done by them
(b) the power developed by them.

Question 6

- (i) (a) What is refraction? [3]
(b) State the laws of refraction.
- (ii) (a) What is the condition for a light ray to pass undeviated on refraction? [3]
(b) What is the refractive index of glass with respect to water?
- (iii) Two oblique parallel rays A and B of red and violet light respectively are incident from air on an air-glass boundary. [4]
(a) Draw the diagram showing the refracted rays in the glass.
(b) How do the speeds of the rays differ in glass?
(c) Are the two refracted rays in glass parallel? Why?
(d) How does the refractive index of glass differ for the two rays?

Question 7

- (i) Draw the ray diagram of a prism to deviate a ray of light through 180° . [3]
(ii) Define first focal point and second focal point for a concave lens. [3]
(iii) (a) What is optical center of a lens? [4]
(b) Is it possible to burn a piece of paper using a convex lens in daylight without using any flame? Draw a diagram to support your answer.

Question 8

- (i) (a) What is dispersion? [3]
(b) State two uses of microwaves.
- (ii) (a) Write the complete electromagnetic spectrum in increasing order of wavelength. [3]
(b) Which is the most energetic form of electromagnetic radiation?
- (iii) (a) An electromagnetic wave has a frequency of 500 MHz and a wavelength of 60 cm. [4]
Calculate the speed of the wave and name the medium it is travelling through.
(b) Why is red light used for the danger signal?

Question 9

- (i) (a) Define electric potential at a point. [3]
(b) What are the limitations of Ohm's laws?
- (ii) (a) Define specific resistance of a material. [3]
(b) A torch bulb when cold has a resistance 1Ω . It draws a current 300 mA when glowing from a source of potential difference 3 V. Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistances.
- (iii) When a potential difference of 2 V is applied across the ends of a wire of 5 m length, a [4]
current of 1 A flows through it. Calculate:
(a) the resistance per unit length of the wire
(b) the resistance of 2 m length of the wire
(c) the resistance across the ends of the wire if it is doubled on itself.