Physics Question Paper
2002

General Instructions

1. Section I is compulsory. Attempt any four questions from Section II.
2. 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) (i) A machine raises a load of 750 N through a height of 16 m in 5 seconds. Calculate the power at which the machine works. [2]

(ii) State the principle of conservation of energy. [2]

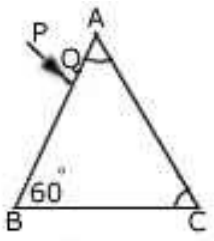
(b) (i) A cook uses a 'fire tong' of length 28 cm to lift a piece of burning coal of mass 250 g. If he applies his effort at a distance of 7 cm from the fulcrum, what is the effort in S.I. unit? Take g = 10 m/s^2. [3]

(ii) State the S.I. unit of the momentum of a body. [1]

(c) (i) State the law of transmission of pressure in liquids. [2]

(ii) Calculate the hydrostatic pressure exerted by water at the bottom of a beaker, side ways. Take the depth of water as 10 cm, the density of water is 1000 kg/m3 and g = 9.8 m/s^2. [2]

(d) (i) In the diagram given below, a ray of light PQ is incident normally on one face AB of an equilateral glass prism. What are the angles of incidence at the faces AB and AC? [2]



(ii) Complete the ray diagram showing its emergence into air after passing through the prism. [2]

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

i. Name the type of lens, which forms the above image. [1]

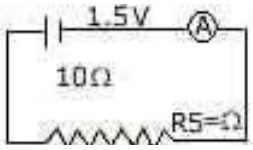
ii. Draw a ray diagram to show the formation of the image with the above characteristics. [3]

(f) (i)Write the name of a pair of two colours which combine to give white light. What is the name given to such a pair of colours? [2]

(ii) State two similarities between a photographic camera and the human eye. [2]

(g) (i) An observer stands at a distance of 850 m from a cliff and fires a gun. After what time-gap will he hear the echo, if sound travels at a speed of 350 ms^{-1} in air? [2]

(ii) A cell of emf 1.5 V and internal resistance 10 ohms is connected to a resistor of 5 ohms, with an ammeter in series (see figure). What is the is reading of the ammeter? [2]



(h) (i) A geyser has a label 2 kW, 240 V. What is the cost of using it for 30 minutes, if the cost of electricity is Rs. 3 per commercial unit. [2]
(ii) State two advantages of an electromagnet over a bar magnet. [2]
(i) Draw a sketch of an electric bell with electrical connections and label the main parts. Why is the armature made of soft iron and not of steel? [4]
(j) (i) Mention two possible sources of background radiations. [2]
(ii) An element X changes to another element Y with the emission of beta particles. Write down the equation showing changes in the nucleus. Take the proton number and mass number of X, as Z and A respectively. [2]

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 2

(a) Define: (i) Work (ii) Power and (iii) Energy. [3]
(b) How is work done related to the applied force? [1]
(c) By what factor does the kinetic energy of a moving body change when its speed is reduced to half? [1]
(d) What do the following units measure?
i. Pascal
ii. Kilowatt hour. [2]
(e) From the ground floor, a man comes up to the fourth floor of a building using the staircase. Another person comes up to the same floor using an elevator. Neglecting friction, compare the work done in the two cases. [3]

Question 3

(i) Define specific heat capacity of a substance. State its S.I. unit. [3]
(ii) Give one example each where high specific heat capacity of water is used:
i. In cooling
ii. As heat reservoir. [2]
(b) A vessel of negligible heat capacity contains 40 g of ice in it at 0^0C. 8 g of steam at 100^0C is passed into the ice to melt it. Find the final temperature of the contents of the vessel.
(Specific latent heat of vaporization of steam, = 2268 J/g; Specific latent heat of fusion of ice = 336 J/g and Specific heat capacity of water = 4.2 J/g^{0}C) [5]

Question 4

(a) State two advantages of using a right angled prism as a reflector, rather than a plane mirror. [2]
(b) Name any four regions of electromagnetic spectrum (other than visible light) in increasing order of wavelength. [4]
(c) Draw a ray diagram to illustrate the bending of a stick in water. [2]
(d) Name any two essential parts of a single lens photographic camera. [2]

Question 5

(a) A rubber ball floats in water with one-third of its volume above the water surface.

Calculate its average relative density. [4]
(b) A vibrating tuning fork is placed over the mouth of a burette filled with water. The tap is opened and the water level gradually falls. It is observed that the sound becomes the loudest for a particular length of air column.
i. What is the name of the phenomenon taking place when this happens? [1]
ii. Why does the sound become the loudest? [1]
iii. What is the name of the phenomenon taking place when sound is produced for another length of air column and is not the loudest? [2]
(c)What change, if any, would you expect in the characteristics of a musical sound when we increase:
i. Its frequency,
ii. Its amplitude. [2]

Question 6

(a) Explain briefly the function of the following in the household wiring:
(i) a three-pin plug. (ii) main switch. [2]
(b) Four cells, each of e.m.f 1.5 V and internal resistance 2.0 ohms are connected in a parallel. The battery of cells is connected to an external resistance of 2.5 ohms. Calculate:
i. the total resistance of the circuit,
ii. the current flowing in the external circuit, and
iii. the drop in potential across the terminals of the cells. [5]
(c) Make a table with the names of three electrical appliances used in your home in one column, their power, voltage rating and approximate time for which each one is used in one day in the other columns. [3]

Question 7

(a) State briefly two uses of a cathode ray tube. [2]
(b) Name the technique used to estimate the age of very old trees, plants, wood and other such specimens. Name the isotope that forms the basis of this technique. [2]
(c) Describe briefly, two properties each of alpha particles and gamma radiation. [4]
(d) State two dissimilarities between a DC motor and an AC generator. [2]