

**Physics Question Paper  
2005**

**Question 1**

- (a) Which physical quantity does the electron volt measure? How is it related to the S.I. unit of this quantity? [2]
- (b) What should the angle between force and displacement be to get the
  - i. Minimum work
  - ii. Maximum work
- (c) State Newton's second law of motion. [2]
- (d) The work done by the heart is 1 Joule per beat. Calculate the power of the heart if it beats 72 times in one minute.[2]
- (e) Mention two properties of a wave: one property which varies and the other which remains constant when the wave passes from one medium to another.[2]

**Question 2**

- (a) Explain briefly what causes the twinkling of stars at night. [2]
- (b) State two advantages of an aneroid barometer. [2]
- (c) Explain why a gas bubble released at the bottom of a lake grows in size as it rises to the surface of the lake. [2]
- (d) What is meant by the statement, 'the critical angle of diamond is  $24^\circ$ '? How is the critical angle of a material related to its refractive index? [2]
- (e) A block of wood of volume  $25\text{cm}^3$  floats in water with  $20\text{cm}^3$  of its volume immersed. Calculate:

- i. the density and
- ii. the weight of the block of wood.

**Question 3**

- (a) Name any two electromagnetic waves which have a frequency higher than that of violet light. State one use of each. [2]
- (b) State two ways by which the frequency of transverse vibrations of a stretched string can be decreased. [2]
- (c) Why does the temperature of the surroundings start falling when the ice of a frozen lake starts melting? [2]
- (d) Four resistances of  $2.0$  each are joined end to end to form a square ABCD. Calculate the equivalent resistance of the combination between any two adjacent corners. [2]
- (e) In a three-pin plug, why is the earth pin made longer and thicker than the other two pins? [2]

**Question 4**

- (a) State the energy change which takes place when a magnet is moved inside a coil having a galvanometer at its ends. Name this phenomenon. [2]
- (b) Draw a labelled diagram of an A.C. generator. [2]
- (c) Calculate the heat energy that will be released when  $5.0$  kg of steam at  $100^\circ\text{C}$  condenses to form water at  $100^\circ\text{C}$ . Express your answer in S.I. unit. (Specific latent heat of vaporization of steam is  $2268$  KJ /Kg.) [2]
- (d) How many alpha and beta particles are emitted when Uranium nucleus

238

${}_{92}\text{U}$  decays to Lead 206

${}_{82}\text{Pb}$ [2]

(e) With the help of an equation, state the mechanism of energy production in a nuclear fusion reaction. [2]

SECTION II (40 Marks)

Attempt any four questions from this Section.

Question 5 [3]

(a) (i) State the law of conservation of energy.

(ii) Name the chief energy transformation that occurs

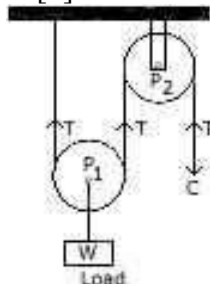
i. in a Loudspeaker;

ii. in an Electrical cell (Primary).

(b) (i) Define an Inclined plane.

(ii) Draw a labelled sketch of a class II lever. Give one example of such a lever. [3]

(c) The alongside figure shows the combination of a movable pulley. P1 with a fixed pulley P2 used for lifting a load W. [4]



i. State the function of the fixed pulley P2.

ii. If the free end of the string moves through a distance C, find the distance by which the load W is raised.

iii. Calculate the force to be applied at C to just raise the load  $W = 20 \text{ kgf}$ , neglecting the weight of the pulley P1 and friction.

Question 6

(a) Water falls from a height of 50 m. Calculate the rise in the temperature of water when it strikes the bottom.

( $g = 10 \text{ ms}^{-2}$ )

-2

Specific heat capacity of water =  $4200 \text{ J/kg}^\circ\text{C}$

0

C) [3]

(b) Draw a labelled diagram of a common hydrometer and state the principle used in its working. [3]

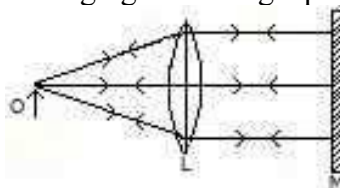
(c) A solid body weighs  $2.10 \text{ N}$  in air. Its relative density is 8.4. How much will the body weigh if placed: [4]

1. in water;

2. in a liquid of relative density 1.2?

Question 7 [3]

(a) The ray diagram given below illustrates the experimental set up for the determination of the focal length of a converging lens using a plane mirror.



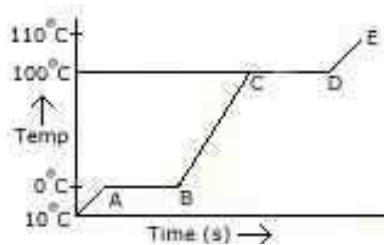
- i. State the magnification of the image formed.
  - ii. Write two characteristics of the image formed.
  - iii. What is the name given to the distance between the object and optical centre of the lens in the diagram?
- (b) (i) A glass slab is placed over a page on which the word VIBGYOR is printed with each letter in its corresponding colour.
- a. Will the image of all the letters be in the same place?
  - b. If not, state which letter will be raised to the maximum. Give a reason for your answer.
- (ii) What will be the colour of an object which appears green in white light and black in red light?
- (c) (i) What is meant by refraction?
- (ii) Express the refractive index  $n$  of a medium:
- (1) in terms of the velocity of light;
  - (2) in terms of the angle of incidence  $i$  in air and the angle of refraction  $r$  in a denser medium.
- (iii) If a ray of light passes from medium I to medium II without any change of direction, what can be said about the refractive indices of these media (angle  $i$  is not 0)?

Question 8 [3]

(a) A radar is able to detect the reflected waves from an enemy aeroplane, after a time interval of 0.02 milliseconds. If the velocity of the waves is  $3 \times 10^8 \text{ ms}^{-1}$

calculate the distance of the plane from the radar. [3]

(b) A piece of ice is heated at a constant rate. The variation of temperature with heat input is shown in the graph below:



- a. What are represented by AB and CD ?
- b. What conclusion can you draw regarding the nature of ice from the alongside graph?
- (c) If there is no heat loss to the surroundings, the heat released by the condensation of  $m_2$ g of ice at, 0
- 0
- C into water at 0
- 0
- C. [4]
- (i) Find:
  - i. the heat lost by steam in terms of  $m_1$
  - ii. the heat gained by ice in terms of  $m_2$ .
- (ii) Form a heat equation and find the ratio of  $m_2 : m_1$  from it.

(Specific latent heat of vaporization of steam = 2268 kJ/kg;

Specific latent heat of fusion of ice = 336 kJ/kg.

Specific heat capacity of water = 4200 J/kg

0

C).

Question 9 [3]

(a) An electrical appliance is rated 1500 W, 250 V. This appliance is connected to 250 V mains. Calculate:

i. the current drawn,

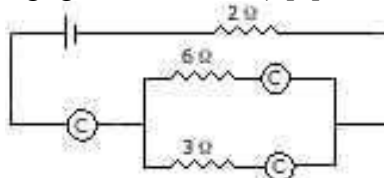
ii. the electrical energy consumed in 60 hours,

iii. the cost of electrical energy consumed at Rs. 2.50 per KWH.

(b) (i) State the function of a split ring in a D.C. motor. [4]

(ii) Mention two reasons why a soft iron core is used within the coil of a moving coil galvanometer.

(c) In the figure given alongside, A, B and C are three ammeters. The ammeter B reads 0.5A. (All the ammeters have negligible resistance.) [4]



Calculate:

1. the readings in the ammeters A and C.

2. the total resistance of the circuit.

Question 10 [3]

(a) State the functions of the following in a nuclear reactor:-

a. Moderator,

b. Control rods,

c. Coolant.

(b) (i) Mention two important precautions that should be taken while handling radioactive materials. [3]

(ii) State one use of radioisotopes.

(c) (i) Draw a labelled diagram of a hot cathode ray tube. [4]

(ii) Why are materials of low work function preferred as thermionic cathode materials?

(iii) Write an equation to show the fission of a nucleus of U

$^{235}_{92}\text{U}$

with the

production of three neutrons