

# CBSE Sample Paper 8

## **General Instruction:**

1. Answer all questions
2. Internal choices are provided for some questions
3. Question numbers 1 to 8 are very short answer questions and carry 1 mark each.
4. Question numbers 8 to 18 are short answer questions and carry 2 marks each.
5. Question numbers 19 to 27 are also short answer questions and carry 3 marks each.
6. Question numbers 28 to 30 are long answer questions and carry 5 marks each.
7. Use log tables if necessary.
8. There is no overall choice. However, an internal choice has been provided in questions of five marks each. You have to attempt only one of the choices in such questions.

9. You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$e = 1.602 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$$

$$\text{Mass of electron } m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Mass of neutron } m_n = 1.675 \times 10^{-27} \text{ kg}$$

$$\text{Boltzmann's constant } k = 1.381 \times 10^{-23} \text{ JK}^{-1}$$

$$\text{Avogadro's number } N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$\text{Radius of earth} = 6400 \text{ km}$$

## **Question 1**

Define electric Flux and Write it SI units?

## **Question 2**

Three charges  $Q_1, Q_2, Q_3$  are present in the xyz plane at  $(0,0,5)$   $(-3,0,0)$  and  $(0,4,0)$ . What is the electric flux through a sphere with center as origin and radius as 4.5 m?

## **Question 3**

Two test charges are brought separately near a charge  $+Q$ .

Case 1: Test charge  $+q$  are brought to within a distance  $r$  from the charge  $+Q$  (i.e. to point A).

Case 2: Test charge  $+2q$  are brought to within a distance  $2r$  from the charge  $+Q$  (i.e. to point B).

1. In which situation is the Electric Potential Energy of the system the greatest?
2. At which position is the Electric Potential the greatest

**Question 4**

A lens of refractive index 1.6 disappears when immersed in a liquid. What is the value of refractive index of the liquid?

**Question 5**

What is work function and threshold frequency for the metal?

**Question 6**

What is the relationship between Relative Permeability and Magnetic Susceptibility?

**Question 7**

A cylindrical wire has diameter  $d$  and length  $L$ . It has a resistance  $R$ . If you increase the diameter of the wire four times what will happen to the resistance of the wire?

**Question 8**

State the conditions for the phenomenon of total internal reflection to occur?

**Question 9**

Three identical charges of  $+2Q$  are placed at three corners of a square with sides of length  $L$ . Find the absolute electric potential (i.e. if  $V = 0$ , at  $r = \infty$ ) at the center of the square?

**Question 10**

How much current is drawn by the primary of a transformer which steps down 220 V to 22 V to operate a device having an impedance of 440 ohm?

**Question 11**

Why is core of an electromagnet made of ferromagnetic materials?

**Question 12**

When a charged particle moves in the magnetic field, what is the impact on these of the charged particle?

- (1) Kinetic energy
- (2) Velocity
- (3) Momentum
- (4) Speed

**Question 13**

A battery of emf  $E$  and internal resistance  $r$  is supplying current to an external resistance  $R$ .

- a) What is the value of  $R$  for which power dissipation is maximum?
- b) What is the maximum power?

**Question 14**

Which of these are true about photoelectric effect?

- (i) The maximum energy of the photo-electrons increases with increasing intensity of the light
- (ii) It converts light energy into electric energy
- (iii) The unit of Planck's constant is of angular momentum
- (iv) The stopping potential does not depend on the intensity of the light
- (v) The Number of electrons emitted will increase on increasing the intensity of the light

**Question 15**

*Give reason for any three of these*

- a) Why our appetite is increased in winter?
- b) Why cloudy nights are hotter than clear sky nights?
- c) Why white cloths are comfortable in summers?
- d) Why does the apparent color of radiation emitted from hot body shift from red to yellow and finally to blue as the temperature of the body is increases

**Question 16**

An ant sitting 40 cm from a converging lens of focal length 20 cm moves to 1.00 m away from the lens. As it makes this move the distance of the image of the ant from the lens changes.

- a) Find the initial distance of image?
- b) Find the final distance of image?
- c) Is the ant images nearer to lens in final position?

**Question 17**

What are photoelectric cells? Explain the working of Photovoltaic cell?

**Question 18**

Two resistors connected in series have an equivalent resistance of  $690 \Omega$ . When they are connected in parallel, their equivalent resistance is  $150 \Omega$ . Find the resistance of each resistor?

**Question 19**

What is electric dipole? Derive an expression for the electrostatic potential at a point on the axis of the dipole?

**Question 20**

A farsighted person has eyeglasses with a power of 2.18 diopters. With these glasses she can read comfortably a newspaper held as close as the "normal" near point of 25.0 cm. Calculate the distance of her near point.

**Question 21**

A proton is projected in the positive x direction into a region of a uniform electric field given by

$E = -6.00 \times 10^5 \mathbf{i} \text{ N/C}$  at  $t = 0$ . The proton travels 7.00 cm before coming to rest.

Determine

- The acceleration of the proton,
  - Its initial speed
  - The time at which the proton comes to rest.
- $\mathbf{i}$  is the unit vector in positive x -direction

### Question 22

A parallel plate capacitor is charged by a battery. After sometime the battery is disconnected and a dielectric slab with its thickness equal to the plate separation is inserted between the plates.

What is the impact on these quantities?

- The capacitance of the capacitor
- Potential difference between the plates
- The energy stored in the capacitor

### Question 23

The electron in hydrogen atom moves around the proton with a speed of  $2.2 \times 10^6 \text{ m/s}$  in a circular orbit of radius  $5.3 \times 10^{-11} \text{ m}$ . Determine

- Charge per unit time
- Equivalent dipole moment
- Magnetic field at the center of the orbit

### Question 24

What do you understand by the binding energy of the nucleus?

### Question 25

The voltage equation of an alternating current source is given by

$$E = 120 \sin(\omega t + \frac{\pi}{6})$$

The current equation in the circuit is given by

$$I = 5 \sin(\omega t - \frac{\pi}{6})$$

Calculate following

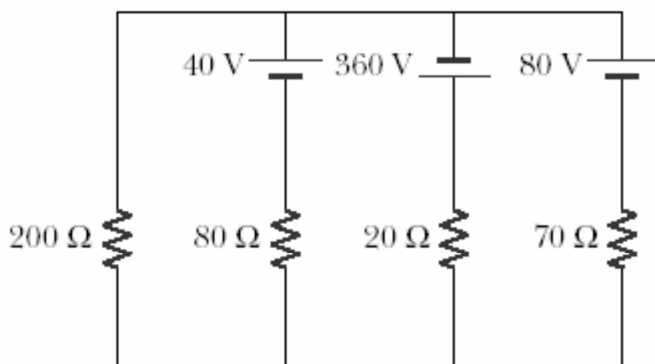
- $V_{\text{rms}}$  and  $I_{\text{rms}}$
- Impedance
- Power loss in the circuit

### Question 26

A copper rod of length  $L$  is moving with uniform velocity  $v_0$  parallel to a long straight wire carrying a current  $I$ . The rod itself is perpendicular to the wire with its ends at distance  $a$  and  $b$  from it. Calculate the EMF induced in the rod

### Question 27

- Derive the expression for the radius of the  $n$ th orbit of hydrogen atom using Bohr postulates
- What is the radius and angular momentum of the electron in the  $n$ th Bohr orbit if the radius of first orbit is  $r_0$

**Question 28**

Find the current and voltage drop across each resistor

OR

- i) The focal lengths of the objective and the eyepiece of an astronomical telescope are 200 cm and 5 cm respectively. What is the magnifying power if the final image is formed at infinity?
- ii) You are given three convex lens of focal length 20 cm, 2 cm and 3 cm which two lens should be used for the construction of a telescope in order to obtain maximum magnification?

**Question 29**

A plane wave front approaches a plane surface separating two media. If the medium one is optically denser and medium second is optically rarer, construct the refracted wave front using Huygens principle and hence prove Snell's Law

**Question 30**

What do you mean by half life time of the radioactive element?. Explain half –life time and decay constant by drawing a curve between undisintegrated atoms of the elements and time

OR

- a) What is carbon dating?
- b) What is the impact of electric and magnetic field on Gamma Rays?
- c) The half life of a radioactive substance is 3.8 days. Calculate how much substance would be left of 64 mg after 19 days