

**CBSE Board**  
**Class XII Physics**  
**Sample Paper - 1**

**Time: Three Hours**
**Maximum Marks: 70**
**General Instructions**

- (a) All questions are compulsory.
- (b) There are 29 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 16 carry two marks each, questions 17 to 25 carry three marks each and questions 27 to 29 carry five marks each.
- (c) Question 26 is a value based question carrying four marks.
- (d) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choices in such questions.
- (e) Use of calculator is not permitted.
- (f) You may use the following physical constants wherever necessary.

$$e = 1.6 \times 10^{-19} \text{ C}$$

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

$$h = 6.6 \times 10^{-34} \text{ J s}$$

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

$$K_B = 1.38 \times 10^{23} \text{ J K}^{-1}$$

$$N_A = 6.023 \times 10^{23} \text{ /mole}$$

$$m_n = 1.6 \times 10^{-27} \text{ kg}$$

- Q1.** Define the electric dipole moment. What is the direction of this vector? (1)
- Q2.** What is the SI unit of electric flux and electric field? (1)
- Q3.** The number of turns in the secondary of a transformer is 100 times the number of turns in the primary. If 1kW of power is supplied to the primary, how much power is obtained at the secondary? (1)
- Q4.** Arrange these in decreasing order of frequency: microwaves, infrared, x-ray, visible rays. (1)
- Q5.** Which of these quantities remains unchanged when light is refracted: wavelength, frequency and velocity? (1)

- Q6.** Does the frequency of incident radiation affect the stopping potential or saturation current or both? (1)
- Q7.** In an unbiased p-n junction why do holes diffuse from the p region to the n region? (1)
- Q8.** What is noise in a communication system? (1)
- Q9.** An electron, alpha particle and proton have the same kinetic energy. Which of these particles has the shortest de Broglie wavelength? (2)
- Q10.** Is it correct to say that a potentiometer is equivalent to an ideal voltmeter? (2)
- Q11.** A magician during a magic show makes a glass lens with  $n = 1.47$  disappear in a trough of liquid. What is the refractive index of the liquid? What is the focal length of the glass lens in the liquid? (2)
- Q12.** A short bar magnet placed with its axis at  $60^\circ$  with a uniform external magnetic field of  $1.0 \text{ T}$  experiences a torque of magnitude  $5 \times 10^2 \text{ N m}$ . What is the magnitude of magnetic moment of the magnet? (2)
- Q13.** Why does a paramagnetic sample display greater magnetism when cooled? Why is diamagnetism, in contrast, almost independent of temperature? (2)
- OR**
- Why are sky waves not used for transmission of TV signals? State two factors that can increase the range of transmission. (2)
- Q14.** What is power factor? Why does a low power factor imply large power loss in transmission? (2)
- Q15.** How does the resolving power of a compound microscope change on  
 i) decreasing the wavelength of light used  
 ii) decreasing the diameter of the objective lens? (2)
- Q16.** Find the maximum frequency and minimum wavelength of X-rays produced by  $30 \text{ keV}$  electrons. (2)
- Q17.** Define the term electric potential. Give the dependence of electric potential due to a small electric dipole at a far off point lying on  
 i) the axial line and  
 ii) equatorial line (3)
- Q18.** The electron drift arises due to the force experienced by electrons in the electric field inside the conductor. A force causes acceleration in accordance with Newton's second law. Why then do the electrons acquire a steady average drift speed but no acceleration?  
 What is the path of electrons along a straight line between successive collisions in the presence of an electric field? (3)

- Q19.** With the help of a labelled diagram, briefly describe the construction of a coaxial cable. What is the upper limit of frequency up to which a coaxial cable can be used? (3)
- Q20.** Two devices A and B are connected independently to a variable frequency alternating voltage source. The current in A leads the applied voltage whereas the current in B lags the applied voltage.
- Identify the circuit element A and B.
  - How will the current in these circuit elements change if the applied frequency is decreased? (3)
- Q21.** An ac voltage  $E = E_0 \sin \omega t$  is applied across a pure inductor of inductance L. Show mathematically that the current flowing through it lags behind the applied voltage by a phase angle of  $\pi/2$ . (3)
- Q22.** Briefly explain the principle of working of an ac generator. What is the maximum emf produced by it? (3)
- Q23.** Explain, with the help of a labelled diagram, the principle and construction of a cyclotron. (3)
- Q24.** A semiconductor has equal electron and hole concentrations of  $2 \times 10^8 /\text{m}^3$ . On doping with a certain impurity, the hole concentration increases to  $4 \times 10^{10} /\text{m}^3$ .
- What type of semiconductor is obtained on doping?
  - Calculate the new electron hole concentration of the semiconductor.
  - How does the energy gap vary with doping? (3)
- OR**
- It is often heard "The domestic supply is at a voltage of 220V". What voltage value is this referring to? Express both peak & rms values.
  - What is the instantaneous and average power per cycle supplied to the Capacitor? (3)
- Q25.**
- Draw a labeled ray diagram to show the formation of an image by a compound microscope. Write expression for its magnifying power.
  - How does the resolving power of a compound microscope change, when (i) refractive index of the medium between the object and the objective lens is increased and (ii) wavelength of the radiation used is increased? (3)
- Q26.** In a dark night, a thief was climbing up on a wall of the building with the help of a pipeline attached to that building. A man on the roof of the adjacent building saw him and to stop him he focused the torch to the pond at the ground floor lying between both the buildings, so that the reflected light reaches the eyes of the thief. As the same happened, the thief got afraid and lost his control over the pipe and fell in the pond.
- What is the interesting matter in this event?
  - Explain reflection and its laws with suitable ray diagram. (4)

**Q27.**

- (a) State the essential condition for diffraction of light to take place.
- (b) Use Huygen's principle to explain diffraction of light due to a narrow single slit and the formation of a pattern of fringes obtained on the screen.
- (c) Sketch the pattern of fringes formed due to diffraction at a single slit showing variation of intensity with angle  $\theta$ .

**OR**

- (a) What are the coherent sources of light? Why are coherent sources required to obtain sustained interference pattern?
- (b) State three characteristic features which distinguish the interference pattern due to two coherently illuminated sources as compared to that observed in a diffraction pattern due to a single slit. (5)

**Q28.** State Biot-Savart's law. Use it to obtain the magnetic field at an axial point at a distance  $x$  from the centre of a circular coil of radius  $a$  carrying a current  $I$ . Compare the magnitude of the magnetic field at the centre of the coil and at an axial point for which  $x = \sqrt{3}a$ .

**OR**

Distinguish between the magnetic properties of para, diamagnetic and ferromagnetic substances in terms of

- i) susceptibility
- ii) permeability
- iii) coercivity

Give one example of each of these materials. Draw magnetic field lines near a diamagnetic and paramagnetic substance. (5)

**Q29:** A transistor is used in common emitter mode in an amplifier circuit. When a signal of 20 mV is added to the base-emitter voltage, the base current changes by 20  $\mu A$  and the collector current changes by 2 mA. The load resistance is 5  $k\Omega$ . Calculate (a) the factor  $\beta$ , (b) the input resistance  $R_{BE}$ , (c) the transconductance and (d) the voltage gain. (5)

**OR**

Draw a labeled diagram of a compound microscope when the image is formed at infinity. Deduce the expression for its magnifying power. How can the magnifying power be increased?