MODEL QUESTION PAPER

Physics

XII Standard(CBSE)

Time Allowed: 3 Hours **Maximum Marks: 70**

General Instructions

1. There are 33 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. All the sections are compulsory.
4. Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study based questions of four marks each and Section E contains three long answer questions of five marks each.
5. There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.
6. Use of calculators is not allowed.
7. You may use the following values of physical constants where ever necessary

   i. c = 3 x 108 m/s

   ii. m_e = 9.1 x10-^{31} kg

   iii. e = 1.6 x 10-19 C

   iv. $\mu_0 = 4\pi$ x 10-7 Tm$\boldsymbol{A^{-1}}$

   v. h = 6.63 x10^{-34}Js

   vi. ε_0 = 8.854 x10-12 $\boldsymbol{C^2N^{-1}m^{-2}}$

   vii. Avogadro's number = 6.023 X $\mathbf{10^{23}}$ per gram mole

SECTION-A

Answer all the questions **16×1=16**

S.No.	Questions	Marks
1	The magnetic lines of force inside a bar magnet (a) do not exist (b) are from north-pole to south-pole of the magnet (c) are from south-pole to north-pole of the magnet (d) depend upon the area of cross-section of the bar magnet	1
2	The radius of the inner most electron orbit of a hydrogen atom is 5.3×10^{-11}m. The radius of the n=3 orbit is (a) $1.01x10^{-10}$m (b) $1.59X10^{-10}$m (c) $2.12\ x10^{-10}$m (d) $4.77\ X10^{-10}$m	1
3	The frequency of X-rays is (a) 10^{12} Hz (b) 10^{14} Hz (c) 10^{16} Hz (d) 10^{18} Hz	1
4	The power factor of a series LCR circuit at resonance will be (a) 1 (b) 0 (c) ½ (d) $1/\sqrt{2}$	1
5	Cathode rays can be deflected by (a) electric field (b) magnetic field (c) both types of fields (d) none of these fields	1
6	If a wire of length 2 m is moving with a velocity of $1\,m-s^{-1}$ perpendicular to a magnetic field of 0.5 T, then E.M.F. induced in the wire will be (a) 0.2 V (b) 0.5 V (c) 1 V (d) 2 V	1
7	Two solenoids of the same length having number of turns in the ratio of 2:3 are connected inseries. The ratio of magnetic fields at their centers is (a) 2:1 (b) 3:1	1

	(c) 2:3 (d) 3:2	
8	The frequency of X-rays is (a) 10^{12} Hz (b) 10^{14} H_z (c) 10^{16} Hz (d) 10^{18} Hz	1
9	The wavelength and intensity of light emitted by an LED depend upon (a) Forward bias and energy gap of the semiconductor. (b) Energy gap of the semiconductor and reverse bias. (c) Energy gap only. (d) Forward bias only	1
10	The core of a transformer is laminated, so as to (a) make it light weight (b) make it robust and strong (c) increase the secondary voltage (d) reduce energy loss due to eddy current	1
11	Electron-volt (eV) is the measure of (a) charge (b) potential difference (c) current (d) energy	1
12	When a ray of light enters a glass slab its wavelength (a) decreases (b) increases (c) remains unchanged (d) data are not complete	1
For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. **a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.** **b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.** **c) If Assertion is true but Reason is false.** **d) If both Assertion and Reason are false.**		
13	**Assertion :** A charge, whether stationary or in motion produces a magnetic field around it. **Reason :** Moving charges produce only electric field in the surrounding space.	1

	(a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are correct, but Reason is not the correct explanation ofAssertion. (c) Assertion is correct but Reason is incorrect. (d) Assertion is incorrect but Reason is correct.	
14	**Assertion :** No power loss associated with pure capacitor in ac circuit. **Reason :** No current is flowing in this circuit. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are correct, but Reason is not the correct explanation ofAssertion. (c) Assertion is correct but Reason is incorrect. (d) Assertion is incorrect but Reason is correct.	1
15	**Assertion :** If a compass needle be kept at magnetic north pole of the earth the compass needlemay stay in any direction. **Reason :** Dip needle will stay vertical at the north pole of earth. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are correct, but Reason is not the correct explanation ofAssertion. (c) Assertion is correct but Reason is incorrect. (d) Assertion is incorrect but Reason is correct. .	1
16	**Assertion (A) :** The surface of a conductor is an equipotential surface. **Reason (R) :** Conductor allows the flow of charge. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are correct, but Reason is not the correct explanation ofAssertion. (c) Assertion is correct but Reason is incorrect. (d) Assertion is incorrect but Reason is correct.	1

SECTION-B

Answer all the questions **5×2=10**

17	Is the steady electric current the only source of magnetic field? Justify your answer	2
18	Magnetic field lines can be entirely confined with the core of toroid, but not within a straightsolenoid, why?	2
19	How are infrared waves produced? Why are these referred to as heat waves? Write their oneimportant use	2
20	A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65 what isthe nature of the lens?	2
21	Why are two bulbs lighting the same walls considered as incoherent sources? How do theirintensities add up? OR When a tiny circular obstacle is placed in the path of light from a distant source, a bright spotis seen at the centre of shadow of the obstacle. Explain	2

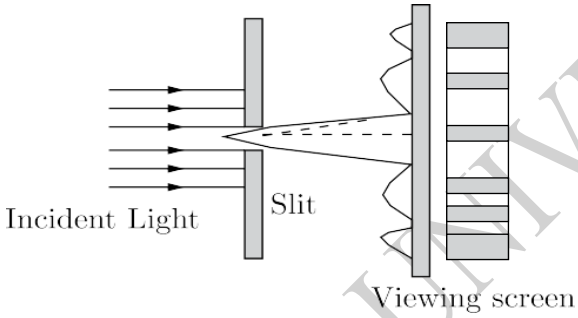
SECTION-C

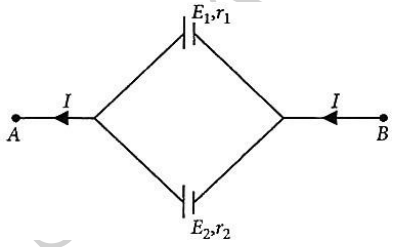
Answer all the questions **7×3=21**

22	Determine the distance of closest approach when an alpha particle of kinetic energy 4.5 MeVstrikes a nucleus of $Z = 80$, stops and reverse its direction	3
23	Distinguish between 'Intrinsic' and 'extrinsic' semiconductors?	3
24	A charge Q is given to three capacitors C_1, C_2 and C_3 connected in parallel. Determine thecharge on each.	3
25	How are electromagnetic waves produced? What is the source of energy of these waves? Write mathematical expressions for electric and magnetic fields of an electromagnetic wave propagating along the z-axis. Write any two important properties of electromagnetic waves. .	3
26	How will you explain twinkling of stars?	3
27	Describe briefly, with the help of a diagram, the role of the two important process involved in the formation of a p - n junction.	3
28	Briefly describe proton-neutron hypothesis of nuclear composition OR What are uncontrolled and controlled chain reactions?	3

SECTION-D

Answer all the questions **2×4=8**

29	When light from a monochromatic source is incident on a single narrow slit, it gets diffractedand a pattern of alternate bright and dark fringes is obtained on screen, called "Diffraction Pattern" of single slit. In diffraction pattern of single slit, it is found that i) Central bright fringe is of maximum intensity and the intensity of any secondary bright fringe decreases with increase in its order. ii) Central bright fringe is twice as wide as any other secondary bright or dark fringe.  i) A single slit of width 0.1 mm is illuminated by a parallel beam of light of wavelength 6000 Å and diffraction bands are observed on a screen 0.5 m from the slit. The distance of the third dark band from the central bright band is a) 3mm b) 1.5mm b) 9mm d) 4.5mm ii) In Fraunhofer diffraction pattern, slit width is 0.2 mm and screen is at 2 m away from the lens. If wavelength of light used is 5000 Å then the distance between the first minimum on either side the central maximum is a) 10^{-1}m b) 10^{-2} m c) $2 \neq\neq 10^{-1}m$ d) $2 \neq\neq 10^{-2}m$ iii) Light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. The angular width of central maxima in the diffraction pattern is (measured from minimum to minimum) a) 6≠≠10-3 rad b) 4≠≠10^{-3} rad	4

	c) $2.4 \# 10^{-3}$ rad d) $4.5 \# 10^{-3}$ rad iv) A diffraction pattern is obtained by using a beam of red light. What will happen, if thered light is replaced by the blue light? a) Bands disappear b) Band becomes broader and farther apart c) No change will take place d) diffraction bands become narrower and crowded Together. v) To observe diffraction, the size of the obstacle a) should be $\lambda/2$where λ is the wavelength b)should be of the order of λ c) has no relation to wavelength d) should be much larger than the wavelength	
30	(a) Explain the term drift velocity of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of drift velocity. (b) Two cells of emfs $E1$ and $E2$ and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the figure. Deduce the expression for the (i) Equivalent emf of the combination (ii) equivalent internal resistance of the combination (iii) potential difference between the points *A* and *B*.  **OR** (a) State the two Kirchhoff's rules used in the analysis of electric circuits and explain them. (b) Derive the equation of the balanced state in a Wheat stone bridge using Kirchhoff's laws.	4

SECTION-E

Answer all the questions **3×5=15**

31	1. Define electric intensity. 2. Derive an expression for electric intensity at a point situated on the axis of electric dipole. **OR** A regular hexagon of side 10 cm has charge 5 μC at each of its vertices. What is the resultantpotential at the centre of the hexagon?	5
32	Discuss the motion of a charged particle in a uniform magnetic field with initial velocity (1) parallel to the field, (2) perpendicular to the magnetic field and (3) at an arbitrary angle with the field direction. **OR** Discuss the inconsistency in Ampere's circuital law. What modification was made my Maxwellin this law?	5
33	Give postulates of Bohr's theory. Explain hydrogen spectrum on the basis of Bohr's theory **OR** What is H_a line in the emission spectrum of hydrogen atom obtained? Calculate the frequencyof the photon emitted during this transition.	5