Pre-Board Examination : 2025-26

Sub : Physics

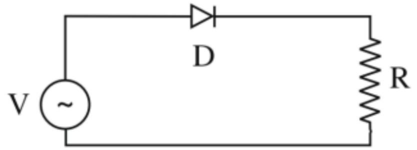
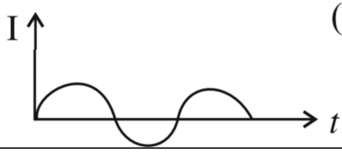
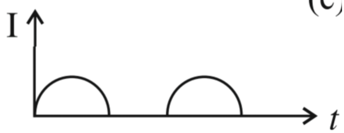
(The figures in the margin indicate full marks for the questions)

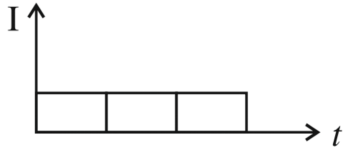
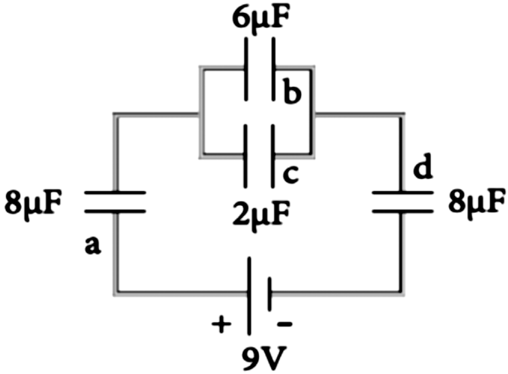
Time – 3 hours **Full marks-70**

1.	**Answer following questions : 1x8=8**
i	A charge q is distributed over a metal sphere of radius R. The electric field and the electric potential at the centre are: (a) $E = 0, V = 0$ (b) $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}, V = \frac{1}{4\pi\varepsilon_0}\frac{q}{R}$ (c) $E = 0, V = \frac{1}{4\pi\varepsilon_0}\frac{q}{R}$ (d) $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}, V = 0$
Ans	**Inside a conductor:** The electric field E is zero throughout the interior of a charged conducting sphere. **Potential:** Since $E = -\frac{dV}{dr} = 0$, the potential V must be constant inside, matching the surface potential $V = \frac{kq}{R}$
ii	The Relaxation time in conductor (a) increases with increase in temperature (b) decreases with increase in temperature

	(c) is independent of temperature (d) First increase then decreases with increase in temperature
Ans	(b) decreases with increase in temperature
iii	The force per unit length between two, long current carrying conductors is F. If the current in each conductor is doubled and distance between theme is halved, what will be the new force per unit length between them? (a) 2F (b) F (c) 8F (d) 16 F
Ans	**Initial Force:** $F = \frac{\mu_0 I_1 I_2}{2\pi d}$ **New Conditions:** Currents $I_1' = 2I_1$, $I_2' = 2I_2$; Distance $d' = \frac{d}{2}$ **New Force Calculation:** $F' = \frac{\mu_0 (2I_1)(2I_2)}{2\pi(\frac{d}{2})} = \frac{4\mu_0 I_1 I_2}{2\pi d \times \frac{1}{2}}$ $= 8\left(\frac{\mu_0 I_1 I_2}{2\pi d}\right) = 8F$
iv	Current in a circuit falls from 5.0 A to 0.0 A in 0.1 s. If an average EMF of 200V is induced, the self Inductance of the coil is: (a) 4H (b) 5H (c) 3H (d) 40H

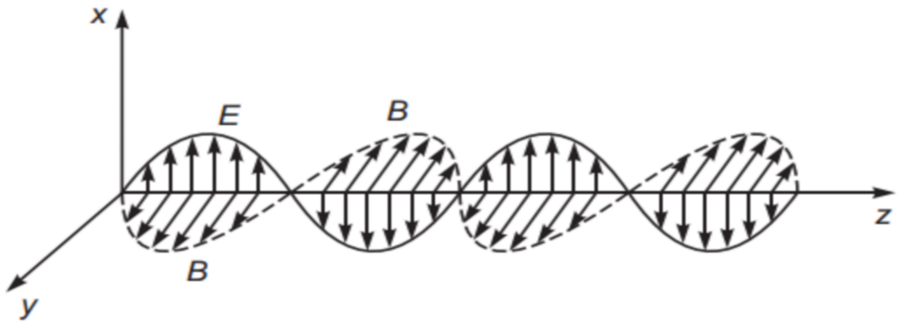
Ans	Initial current (I_1): 5.0 A Final current (I_2): 0.0 A Time interval (Δt): 0.1 s Average induced emf (ε): 200 V The induced **emf** in a coil is $\varepsilon = L \frac{\lvert\Delta I\rvert}{\Delta t} \Rightarrow L = \frac{\varepsilon \cdot \Delta t}{\lvert\Delta I\rvert}$ $\Rightarrow L = \frac{200 \cdot 0.1}{5.0} = \frac{20}{5.0} = 4\ \mathrm{H}$
v	The power factor of LCR circuit at resonance is (a) 0.707 (b) 1 (c) Zero (d) 0.5
Ans	In an AC series LCR circuit, the **power factor** is $\cos\phi = \frac{R}{Z}$ at resonance, $Z = \sqrt{R^2 + 0} = R$ $\cos\phi = \frac{R}{R} = 1$
vi	A proton and electron have same velocity. Which one option is correct for deBroglie wavelength of Proton (λ_P) and electron (λ_e) ? (a) $\lambda_P = \lambda_e \neq 0$ (b) $\lambda_P < \lambda_e$ (c) $\lambda_P > \lambda_e$ (d) $\lambda_P = \lambda_e = 0$

Ans	de Broglie wavelength (λ) is given as $\lambda = h/mv$ Given $v_p = v_e$ where v_p = velocity of proton v_e = velocity of electron From the given relation $\lambda \propto \frac{1}{m}$ Since $m_p > m_e$, hence $\lambda_p < \lambda_e$ Thus, electron has greater de Broglie wavelength, if accelerated with same speed.
vii	Nucleus of an atom of mass no. 24 and atomic no. 11 consists of:Two nuclei of mass numbers 1 and 27 have their radii ratio as— (a) 2 : 5 (b) 5 : 2 (c) 1 : 5. (d) 1 : 3
Ans	Since $\frac{R_1}{R_2} = [\frac{A_1}{A_2}]^{\frac{1}{3}} = [\frac{1}{27}]^{\frac{1}{3}} = \frac{1}{3}$
viii	A half wave rectifier circuit is constructed using a p-n function diode D, load resistance R and AC source as shown below:  The output current through R varies as— (a)  (b)  (c)

	(c)  (d) 
Ans	Ans-(b) as it a half wave rectifier
2	For the given capacitor configuration  (a) Find the total capacitance of the given combination of capacitors. (b) Total charges stored in arrangement. 2
Ans	**a. Capacitor b and c in parallel combination** $C_p = C_b + C_c = (6 + 2)\ \mu F = 8\ \mu F$ **Capacitor a, c_p and d are in series combination, so the resulatant copacitance** $\frac{1}{C_s} = \frac{1}{C_a} + \frac{1}{C_{cp}} + \frac{1}{C_d}$ $= \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$ $C_s = \frac{8}{3}\ \mu F$

	b. Charge on each capacitor, Charge on capacitor a, $Q_a = C_s V = \frac{8}{3} \times 9 = 24\ \mu C$ Charge on capacitor, d, $Q_d = C_s V = \frac{8}{3} \times 9 = 24\ \mu C$ Capacitor b and c in parallel Charge on capacitor, b, $Q_b = \frac{6}{3} \times 9 = 18\ \mu C$ Charge on capacitor, c, $Q_c = \frac{2}{3} \times 9 = 6\ \mu C$
3	Give the limitation of Ohm's law with proper diagrams.2
4	The oscillating magnetic field of an electromagnetic wave is given by: ½ + ½ +1 =2 $B_z = 10^{-4} \sin [2 \times 10^{10}\ t - 30\ \pi\ x]\ Vm^{-1}$ **T** (i) Obtain the value of the wavelength of the em wave. (ii) Give the direction of propagation of the em wave (iii)Write down the expression for the oscillating magnetic field
Ans	Angular frequency $\omega = 2 \times 10^{10}$ rad/s Wave number $k = 30\pi\ \mathrm{m}^{-1}$ Amplitude $E_0 = 10^{-4}$ V/m (i) $\lambda = \frac{2\pi}{k} \Rightarrow \lambda = \frac{2\pi}{30\pi} = \frac{1}{15} \approx \mathbf{0.0667}$ m (ii) the wave is propagating in the **positive x-direction.** (iii) Using $c = \frac{E_0}{B_0} \Rightarrow B_0 = \frac{E_0}{c} = \frac{10^{-4}}{3 \times 10^8} \approx 3.33 \times 10^{-13}$ T $B_y = 3.33 \times 10^{-13} \sin(2 \times 10^{10} t - 30\pi x)$ T

5	Electromagnetic wave with wavelength (i) λ_1 is used in satellite communication. (ii) λ_2 is used to kill germs in water purifier. (iii) λ_3 is used to detect leakage of oil in underground pipelines. (iv) λ_4 is used to improve visibility in runways during fog and mist conditions. Identify and name the part of electromagnetic spectrum to which these radiations belong. 2
Ans	○ λ_1: Microwaves Used in satellite communication because they can easily penetrate the Earth's atmosphere without significant attenuation. ○ λ_2: Ultraviolet (UV) radiation Used in water purifiers to kill germs (bacteria and viruses) by destroying their molecular bonds and DNA. ○ λ_3: X-rays Used to detect leakage of oil in underground pipelines due to their high penetrating power. ○ λ_4: Infrared (IR) radiation Used to improve visibility on runways during fog and mist conditions because they have longer wavelengths than visible light and suffer less scattering by atmospheric particles.
	Or Identify the following electromagnetic radiations as per the frequencies given below. Write one

	application of each. (a) 10^{20} Hz (b) 10^{9}Hz (c) 10^{11}Hz 2
Ans	The electromagnetic radiations and their applications are: 1. Gamma Rays (10^{20} Hz): Used for sterilizing medical equipment or cancer treatment. 2. Radio Waves (10^{9} Hz): Used for broadcasting and cellular communication. 3. Microwaves (10^{11} Hz): Used in radar systems and microwave ovens for cooking.
6	Draw the wavefront due to -- (i) point source of light (ii) due to refraction of light through convex lens with point object at the focus 2
7	Draw the graphs showing that stopping potential and the frequency of the incident light. From it obtain (i) Threshold frequency (ii) Planck's constant 2 Or Give the photon picture of electromagnetic radiation.2
8	Draw the diagram showing an electromagnetic wave propagating along +X axis . Write down the Important points related to it . 2
Ans	

	Important Points: 1. Mutual Perpendicularity: E, B, and the direction of propagation (vector k) are all mutually orthogonal. 1. Propagation Direction: The wave moves in the direction of the vector $\vec{E} \times \vec{B}$. . 2. Speed in Vacuum: All EM waves travel at c = 299,792, 458 m/s in a vacuum. 3. No Medium Required: Unlike mechanical waves, EM waves can propagate through a vacuum because they consist of self-sustaining oscillating fields.
9	The work function of caesium metal is 2.14 eV. When light of frequency 6 $\times 10^{14}$Hz is incident on the metal surface, photoemission of electrons occurs. What is the (a) maximum kinetic energy of the emitted electrons, (b) Stopping potential, and (c) maximum speed of the emitted photoelectrons? 2
Ans	Using Einstein's photoelectric equation, $K_{max} = h\nu - \phi$ **Incident Photon Energy (E):** $E = h\nu = (6.626 \times 10^{-34}\ \text{J} \cdot \text{s}) \times (6 \times 10^{14}\ \text{Hz})$ $= 3.9756 \times 10^{-19}\ \text{J}$ $E = \dfrac{3.9756 \times 10^{-19}\ \text{J}}{1.602 \times 10^{-19}\ \text{J/eV}} \approx 2.482\ \text{eV}$ $K_{max} = 2.482\ \text{eV} - 2.14\ \text{eV} = \mathbf{0.342}\ \text{eV}$

10	State the limitation of Bohr's atomic model . 2 Or What are H_α , H_β and H_γ lines ? 2
11	How long can an electric lamp of 100W be kept Glowing by fusion of 2.0 kg of deuterium? Take the Fusion reaction as $^2_1H + ^2_1H \rightarrow ^3_2He + n + 3.27\ MeV$ 2 Or What radioactivity ? What are the different types of It ? Name the with examples . 2
Ans	Number of atoms present in 2 g of deuterium = 6×10^{23} Number of atoms present in 2.0 Kg of deuterium = 6×10^{26} Energy released in fusion of 2 deuterium atoms = 3.27 MeV Energy released in fusion of 2.0 Kg of deuterium atoms $= \frac{3.27}{2} \times 6 \times 10^{26}\ MeV = 9.81 \times 10^{26}\ MeV = 15.696 \times 10^{13}\ J$ Energy consumed by bulb per sec = 100 J Time for which bulb will glow = $\frac{15.696 \times 10^{13}}{100}$ s $= 4.97 \times 10^4$ year
12	**(i)** State the properties of electric charges. **(ii)** Draw the electric lines of force due to (a) two unequal and positive charges . (b) an electric dipole , made up of +q and - q , seperated by a distance of d . 1+2= 3 Or (i) Prove that electric intensity is negative gradiant of electric potential at a point in an electric field .

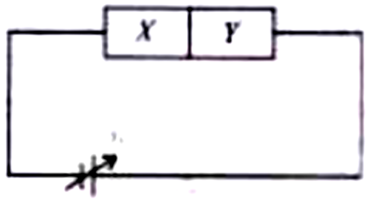
	(ii) Prove that no work is done in moving a test charge over an equipotential surface . 2+1=3
13	Find the expression for energy stored in a capacitor . Find its energy density . 3 Or **(i)** Give the difference between polar and non polar molecules . **(ii)** What do you mean by polarisation of a dielectric ? **(iii)** What is electric susceptibility ? 1½+½+1=3
14	What is drift velocity ? Find an expression for it. 3 Or The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point is 5.2 Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.8 Ω. Calculate the temperature of the bath. 3
Ans	$R_0=5\,\Omega,\ R_{100}=5.2\,\Omega,\ R_t=5.8\,\Omega$ $\alpha=\frac{R_{100}-R_0}{R_0\times 100}=\frac{R_t-R_0}{R_0\times t}\Longrightarrow t=\frac{R_t-R_0}{R_{100}-R_0}\times 100$ $\Longrightarrow t=\frac{5.8-5}{5.2-5}\times 100=\frac{0.8}{0.2}\times 100=400^\circ C$
15	(i) Express Biot Savart's law in vector form . (ii) Mention the similarities and dissimilarities between Biot Savart's law and Coulomb's law. 1+2=3 Or (i) Prove that a charged particle entering a magnetic field perpendicularly follows a circular path . (ii) Find the radius of the circular path and the time

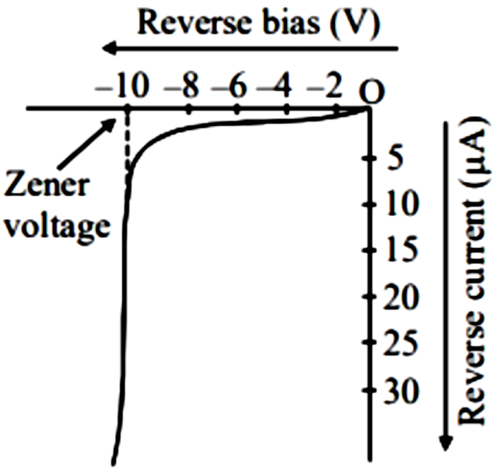
	period of revolution . 1½ +1½ = 3
16	Derive an expression for the self inductance of a solenoid. On what factor it depends ? What will happen if a insulating medium is placed inside it . 2+ ½ + ½ = 3 Or (i) State Faraday's laws of electromagnetic induction . **(ii)** The magnetic flux passing perpendicular to the plane of coil is given by $\phi = 4t^2+5t+2$ where ϕ is in weber and t is in second. Calculate the magnitude of instantaneous emf induced in the coil when t = 2 sec. 1+2=3
Ans	According to **Faraday's Law of Induction,** the magnitude of the instantaneous induced EMF (e) is $\lvert e \rvert = \frac{d\phi}{dt}$ Given $\phi = 4t^2 + 5t + 2$ $\frac{d\phi}{dt} = \frac{d}{dt}(4t^2 + 5t + 2) = 8t + 5$ The **instantaneous EMF** at $t = 2$ seconds, $\Longrightarrow \lvert e \rvert = 8(2) + 5 = 16 + 5 = 21$ V
17	A sinusoidal voltage is applied to an electric circuit containing element X in which voltage leads the current by π/2. (a) Identify X . (b) Find the power consumed in X during full cycle of the AC . (c) What is wattless current . ½+1½+1=3

Ans	(a)In an alternating current (AC) circuit, the phase relationship between voltage and current depends on the circuit elements. When the voltage leads the current by a phase angle of π/2(or 90^0), the circuit is purely **inductive**. Therefore, the element X is a **pure inductor**. (b)The average power consumed in an AC circuit over a complete cycle is given by the formula: $$P_{avg} = V_{rms} I_{rms} \cos\phi$$ For a pure inductor, the phase difference $\phi=\pi/2$ Since $\cos(\pi/2)=0$, the power calculation becomes: $P_{avg}=V_{rms}I_{rms}\times 0=0$ Thus, no power is consumed by a pure inductor during a full cycle. (c) Wattless current is the current flowing in purely inductive and purely capacitive circuit , which consumes no power during full cycle .
	Or What is mean or average value of AC ? Obtain its relation with peak value of the AC . 1+2=3
18	State the condition for total internal reflection of light to take place at an interface separating two transparent

	media. Hence derive the expression for the critical angle in terms of refractive indices of the two medium .Name an application of total internal reflection , used in medical science 1+1+1= 3
	Or (i) If f = 0.5 m for a glass lens, what is the power of the lens? (ii) The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. Its focal length is 12 cm. What is the refractive index of glass? **(iii)** A convex lens has 20 cm focal length in air. What is focal length in water? (Refractive index of air-water =1.33, refractive index for air-glass =1.5) ½+1+1½=3
Ans	(i) The power P of a lens is the reciprocal of its focal length f when measured in meters. $$P = \frac{1}{f}$$ Substituting $f = 0.5$ m: $P = \frac{1}{0.5} = \mathbf{2.0}$ D (ii) Using **Lens Maker's Formula:** $\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ For a double convex lens, $R_1 = 10$ cm, $R_2 = -15$ cm, $f = 12$ cm $$\Rightarrow \frac{1}{12} = (n-1)\left(\frac{1}{10} - \frac{1}{-15}\right) = (n-1)\left(\frac{1}{10} + \frac{1}{15}\right)$$ $$\Rightarrow \frac{1}{12} = (n-1)\left(\frac{3+2}{30}\right) = (n-1)\frac{5}{30} = (n-1)\frac{1}{6}$$ $$\Rightarrow n-1 = \frac{1}{2} \Rightarrow n = \frac{3}{2} = \mathbf{1.5}$$

	(iii) The ratio of focal length in air (f_a) and water (f_w) $$\frac{f_w}{f_a} = \frac{n_g - 1}{\frac{n_g}{n_w} - 1}$$ Substituting $n_g = 1.5$, $n_w = 1.33$, and $f_a = 20$ cm $$\Rightarrow \frac{f_w}{20} = \frac{1.5 - 1}{\frac{1.5}{1.33} - 1} \approx \frac{0.5}{1.1278 - 1} \approx \frac{0.5}{0.1278} \approx 3.912$$ $$\Rightarrow f_w = 20 \times 3.912 \approx \mathbf{78.24} \text{ cm}$$
19	**(i)** Give the differences between P type and N type semiconductor **(ii)** In an extrinsic semiconductor, the number density of holes is 4×10^{20} m $^{-3}$. If the number density of intrinsic carriers is 1.2×10^{15} m $^{-3}$, then find the number density of electrons in it . 1½+1½=3
Ans	We know that, $n_i^2 = n_e \times n_h$ Number of density of electrons $n_e = \frac{n_i^2}{n_h}$ Where, n_i is density of intrinsic carrier, n_h is the density of holes So $n_e = \frac{(1.2 \times 10^{15})^2}{4 \times 10^{20}}$ $= 3.6 \times 10^9$ m^{-3} **Given:** $n_i = 1.2 \times 10^{15}$ m^{-3} $n_h = 4 \times 10^{20}$ m^{-3}
	Or Draw the energy band diagrams for metal , insulator and semiconductor . Give their differences . 3
20	Two semiconductor materials X and Y shown in given figure are made by doping germanium crystal with Indium and Arsenic respectively. The two are joined end to end and connected to a battery as shown

	below  Or **(i)** Will the junction be forward biased or reverse biased ? **(ii)** Sketch I-V graph for this arrangement. **(iii)** What is the forbidden band energy of germanium ?What does it mean ? 1+1+1=3 Or (i) What is doping ? Why it required ? (ii) Sn, C and Si, Ge are all group 4 elements. Yet Sn is a conductor, C is an insulator while Si and Ge are semiconductor. Explain Why? 1½+1½=3
Ans	**Material X (Indium-doped):** Indium (In) is a trivalent impurity, making the Germanium lattice a **p-type semiconductor** **Material Y (Arsenic-doped):** Arsenic (As) is a pentavalent impurity, making the lattice an **n-type semiconductor** . The diagram shows the p-type material (X) connected to the positive terminal of the battery, and the n-type material (Y) connected to the negative terminal of the

	battery, so the junction is **reverse biased** . i) Sketch a V-I graph for this arrangement is 
	Or (i) What is doping ? Why it required ? (ii) Sn, C and Si, Ge are all group 4 elements. Yet Sn is a conductor, C is an insulator while Si and Ge are semiconductor. Explain Why? 1½+1½=3
21	**(i)** Give the construction and working principle of a moving coil galvanometer . **(ii)** What is an ideal ammeter ? **(iii)** An ammeter of resistance 0.8 Ω can measure a current up to 1.0 A. Find the value of shunt resistance required to convert this ammeter to measure a current up to 5.0 A. 2½+1+1½ =5

Ans	**Initial full-scale deflection current (I_g):** 1.0 A **Resistance of the ammeter (G):** 0.8 Ω **Total current to be measured (I):** 5.0 A To measure a current I higher than the meter's capacity I_g a **shunt resistance** (S) must be connected in **parallel** with the ammeter. The formula for the shunt resistance is: $S = \frac{I_g \cdot G}{I - I_g}$ $$S = \frac{1.0 \cdot 0.8}{5.0 - 1.0} = \frac{0.8}{4.0} = 0.2\,\Omega$$ The shunt resistance required to convert the ammeter to measure up to 5.0 A is **0.2 Ω**
	Or (i) Differentiate among the Paramagnetic , Ferromagnetic and Diamagnetic substances in respect of following parameters **(a)** Behaviour in presence of external magnetic field **(b)** Relative magnetic permeability **(c)** Effect of temperature (ii) Write two examples each of Paramagnetic , Ferromagnetic and Diamagnetic substances. 3+2 =5

Ans	**Parameter**	**Diamagnetic**	**Paramagnetic**	**Ferromagnetic**
	(a) Behaviour in External Magnetic Field	Weakly **repelled** by an external magnetic field. Tends to move from stronger to weaker parts of a non-uniform field.	Weakly **attracted** by an external magnetic field. Tends to move from weaker to stronger parts of a non-uniform field.	Strongly **attracted** by an external magnetic field. Tends to move quickly from weaker to stronger parts of a non-uniform field.
	(b) Relative Magnetic Permeability (μ_r)	Slightly **less than 1** ($\mu_r < 1$).	Slightly **greater than 1** ($\mu_r > 1$).	Very **large**, much greater than 1 ($\mu_r \gg 1$).
	(c) Effect of Temperature	Magnetism is largely **independent** of temperature.	Magnetism **decreases** as temperature increases, following **Curie's Law**.	Magnetism **decreases** with temperature. Above a specific temperature (the **Curie point**), it becomes paramagnetic.

(ii) Examples of Substances

- **Paramagnetic:** Aluminum, Platinum.
- **Ferromagnetic:** Iron, Nickel.
- **Diamagnetic:** Bismuth, Copper.

22	**(i)** Draw a labelled ray diagram of a reflecting type telescope . **(ii)** Mention the two advantages of a reflecting type telescope over the refracting telescope. **(iii)** Four lenses L_1 , L_2 , L_3 , L_4 of focal lengths +15cm , -15cm , +120 cm and +150 cm are available for making a telescope. To produce the largest magnification, which are the lenses you will choose ? 2+2+1 =5

Ans	To obtain the largest magnification, the numerator f_o must be as large as possible, and the denominator f_e must be as small as possible. **Objective lens (L_o):** Choose the lens with the maximum focal length. **Eyepiece lens (L_e):** Choose the lens with the minimum focal length. From the given lenses: Maximum focal length: $f_4 = 150$ cm (Lens **L_4**) Minimum focal length: $f_1 = f_2 = 15$ cm (Lenses **L_1** or **L_2**) $$M = \frac{150 \text{ cm}}{15 \text{ cm}} = 10$$ To achieve the largest magnification of **10**, you should choose lens **L_4** ($f = 150$ cm) as the objective and either **L_1** or **L_2** ($f = 15$ cm) as the eyepiece.
	Or (i) Define the phenomenon of interference .What are different types of it ? Define them. **(ii)** Draw the diagram of the Young's double slit experiment for interference . (iii) Write the expression for the fringe width for bright and dark fringe of interference. 1+½+1+1+1½+1= 5
23	**(i)** Write down the Rutherford's atomic model . State

	the limitations of this atomic model . **(ii)** Write the relation between radius of the atomic orbit (**r_n**) and the principal quantum number (n) . **(iii)** The radius of innermost electron orbit of a hydrogen atom is 5.3×10^{-11}m. Determine its radius in n = 3 orbit. 2+1+2 = 5
Ans	According to the **Bohr model** of the atom, the radius of the n^{th} atomic orbit is $r_n = \dfrac{n^2h^2\epsilon_0}{\pi me^2 Z}$, $r_n \propto n^2$ The radius of the n^{th} atomic orbit is $r_n = n^2 a_0$ where a_0 is the **Bohr radius** (the radius of the innermost orbit, $n = 1$) $a_0 = 5.3 \times 10^{-11}$ m Substituting n=3 $r_3 = 3^2 \times a_0 = 9 \times (5.3 \times 10^{-11} \text{ m})$ $= 4.77 \times 10^{-10}$ m
	Or **(i)** What is nuclear force ? State its properties. **(ii)** Calculate the energy released in MeV in the deuterium-tritium fusion reaction:

	$^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + n$ using data $m(^{2}_{1}H) = 2.014102u$; $m(^{3}_{1}H) = 3.016049\ u$; $m(^{4}_{2}He) = 4.002603\ u$; $m_n = 1.008665\ u$, $1u = 931.5\ MeV/c^2$ ½+2+2½= 5
Ans	Take the D-T nuclear reaction: $^{2}_{1}H + ^{3}_{1}H \longrightarrow ^{4}_{2}He + n$ It is given that: Mass of $^{2}_{1}H$ = 2.014102 u Mass of $^{3}_{1}H$ = 3.016049 u Mass of $^{4}_{2}He$ = 4.002603 u Mass of $^{1}_{0}n$ = 1.008665 u Q-value of the given D-T reaction is: $Q = [m_1 + m_2 - m_3 - m_4]\ c^2$ $= [2.014102 + 3.016049 - 4.002603 - 1.008665]\ c^2$ $= [0.018883\ c^2]\ u$ But $1\ u = 931.5\ MeV/c^2$ $\therefore Q = 0.018883 \times 931.5 = 17.59\ MeV$