COMMON HALF YEARLY EXAMINATION - 2024

CLASS : XII PHYSICS

I. Answer all the questions : 15X1 = 15

Q.No.	option code	Answer
1.	c	C remains same , Q doubled
2.	c	4.5 Ω
3.	c	480 W
4.		$3/\pi$ P_m
5.	c	$Q/\sqrt{2}$
6.	a	$\pi/4$
7.	c	+z direction
8.	b	its wavelength
9.	d	polarisation
10.	d	$\lambda_p \alpha \lambda_e^2$
11.	b	3750 Å
12.	b	h/π
13.	b	0.3 V
14.	d	voltage regulator
15.	c	Albert Einstein

II Answer any six questions . Qn. No. 24 is compulsory : 6X2 = 12

16.	Number of electric field lines crossing a given area kept normal to the electric field lines is called electric flux.	2

TCP

17. Q factor is defined as the ratio of voltage across L or C at resonance to applied voltage. — 2

(OR)

$$Q \text{ factor} = \frac{\text{voltage across } L \text{ (or) } C \text{ at resonance}}{\text{Applied voltage}}$$ — 2

(OR)

$$Q = \frac{I_m X_L}{I_m R} \quad \text{(or)} \quad Q = \frac{X_L}{R} \quad \text{(OR)} \quad Q = \frac{\omega_r L}{R}$$ — 1

$$\text{(OR)} \quad Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

19. Force of attraction or repulsion between two magnetic poles is directly proportional to the product of their pole strengths and inversely proportional to the square of the distance between them. — 2

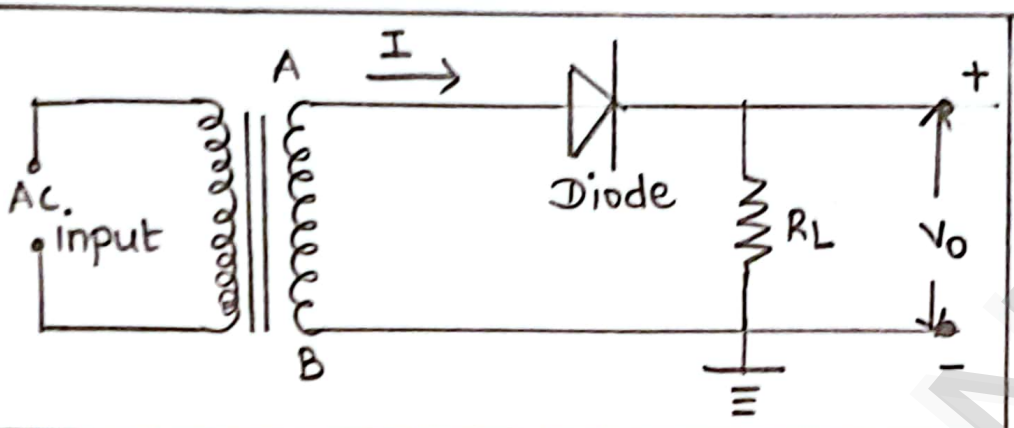
(OR)

$$\vec{F} \propto \frac{q_{mA}\, q_{mB}}{r^2}\hat{r} \quad \text{(OR)} \quad \vec{F} = k\frac{q_{mA} q_{mB}}{r^2}\hat{r}$$ — 1

$$\text{(or)} \quad F = k\frac{q_{mA} q_{mB}}{r^2}$$

19.	. Because of total internal reflection of light that happens inside the diamond. • Refractive index of diamond is 2.417 • Critical angle of diamond is about 24.4°	1 ½ ½
20.	$I \propto a^2$ (OR) $I_{max} \propto (a_1+a_2)^2$ and $I_{min} \propto (a_1-a_2)^2$ $\frac{I_{max}}{I_{min}} = \frac{(a_1+a_2)^2}{(a_1-a_2)^2}$ (or) $\frac{a_1+a_2}{a_1-a_2} = \sqrt{\frac{I_{max}}{I_{min}}}$ $= \sqrt{\frac{36}{1}}$ $\frac{a_1+a_2}{a_1-a_2} = \frac{6}{1}$ and $\frac{a_1}{a_2} = \frac{7}{5}$	1 ½ ½
21.	The minimum energy needed for an electron to escape from the metal surface is called work function. Unit : eV (or) joule (OR) $\phi_0 = h\nu_0$	1 ½ ½ 1
22.	Activity or decay rate is the number of nuclei decayed per second. Unit : Becquerel (or) curie (OR) $R = \left\lvert\frac{dN}{dt}\right\rvert$ (or) $R = \lambda N_0 e^{-\lambda t}$ (or) $R = R_0 e^{-\lambda t}$ (or) $R = \lambda N$	1 ½ ½ 1

TCP

23.		2
24.	$R_T = R_0 [1 + \alpha(T - T_0)]$ Substitution $R_{100} = 3(1 + 0.004 \times 80)$ Answer : 3.96 Ω	1 ½ ½
III	Answer any six questions. Qn.No.33 is compulsory: 6×3 = 18.	
25.	Diagram and explanation Upto $V = -\frac{1}{4\pi\varepsilon_0}\int_{\infty}^{r}\frac{q}{r^2}\hat{r}\cdot d\vec{r}$ $V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$	1 1 1
26.	Kirchoff's current rule : It states that the algebraic sum of the currents at any junction of a circuit is zero. Kirchoff's voltage rule : It states that in a closed circuit, the algebraic sum of the products of the current and resistance of each part of the circuit is equal to the total emf included in the circuit.	1 ½ 1 ½

TCP

27.	A galvanometer can be converted into an ammeter by connecting low resistance in parallel. Diagram Upto $S = \frac{I_g R_g}{(I - I_g)}$ (or) $I_g = \frac{S I}{S + R_g}$ $\frac{1}{R_{eff}} = \frac{1}{R_g} + \frac{1}{S}$ (or) $R_{eff} = \frac{R_g S}{R_g + S}$ (or) $\theta = \frac{1}{G} I_g$ (or) $\theta \propto I_g$ (or) $\theta \propto I$	1 ½ 1 ½
28.	Diagram and Explanation Upto $\frac{d\phi_B}{dt} = Blv$ $\varepsilon = Blv$	1 1 1
29.	Any three uses of Infrared rays	3
30.	• There should be positive feedback • The loop phase shift must be 0° or integral multiples of 2π • The loop gain must be unity. (OR) $\lvert AB \rvert = 1$	1 1 1

31.	$\omega = \frac{(n_V - n_R)}{(n_G - 1)}$ Substitution $\omega = \frac{1.633 - 1.613}{1.620 - 1} = \frac{0.02}{0.620}$ Answer : 0.032	1 1 1
32.	Any three laws of photoelectric effect	3
33.	Number of atoms in 1kg of U^{235}_{92} $N = \frac{6.02 \times 10^{23}}{235} \times 1000$ Total energy $Q = \frac{6.02 \times 10^{23}}{235} \times 1000 \times 200 MeV$ $Q = 5.123 \times 10^{26}$ MeV In terms of joule $Q = 8.197 \times 10^{13}$ J	1 1 1
IV	Answer all the questions : 5x5 = 25	
34.	Diagram and Explanation (Axial) Upto $\vec{E}_{tot} = \vec{E}_+ + \vec{E}_-$ Upto $\vec{E}_{tot} = \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{(r-a)^2} - \frac{1}{(r+a)^2}\right]\hat{p}$ Upto $\vec{E}_{tot} = \frac{1}{4\pi\varepsilon_0}\frac{2p}{r^3}$ $(r \gg a)$ Diagram and Explanation (Equatorial) Upto $\lvert\vec{E}_+\rvert = \lvert\vec{E}_-\rvert = \frac{1}{4\pi\varepsilon_0}\frac{q}{(r^2+a^2)}$	1 ½ ½ ½ 1 ½

	Upto $\vec{E}_{tot} = \frac{-1}{4\pi\epsilon_0} \frac{\vec{P}}{(r^2+a^2)^{3/2}}$	½
	$\vec{E}_{tot} = \frac{-1}{4\pi\epsilon_0} \frac{\vec{P}}{r^3}$ $(r >> a)$	½
	(OR)	
	Diagram	1
	Explanation	1
	Upto $I = \frac{dQ}{dt}$	1
	$I = neAv_d$	1
	$\vec{J} = -\sigma\vec{E}$ (or) $\vec{J} = \sigma\vec{E}$	1
35.	Diagram and Explanation	1
	$\oint_C \vec{B}.d\vec{l} = \mu_0 I_{enclosed}$	1
	Upto $\int_d^a \vec{B}.d\vec{l} = 0$	½
	Upto $\int_a^b \vec{B}.d\vec{l} = B\int_a^b dl$	½
	$\int_a^b \vec{B}.d\vec{l} = BL = \mu_0 NI$ (OR) $B = \frac{\mu_0 NI}{L}$	1
	$B = \frac{\mu_0 n L I}{L}$ (or) $B = \mu_0 nI$	1
	(OR)	

	Series RLC circuit diagram and Explanation	1
	Phasor diagram or Impedance diagram	1
	Upto $V_m^2 = V_R^2 + (V_L - V_C)^2$	1
	Upto $Z = \sqrt{R^2 + (X_L - X_C)^2}$	1
	$\tan\phi = \frac{V_L - V_C}{V_R}$ (or) $\tan\phi = \frac{X_L - X_C}{R}$	1
36.	When the spectrum of self luminous source is taken, we get emission spectrum. Each source has its own characteristic emission spectrum	1/2
	Explanation of continuous emission spectrum and diagram	1 1/2
	Explanation of line emission spectrum and diagram	1 1/2
	Explanation of band emission spectrum (or) Headings only	1 1/2
	(OR)	
	Diagram and Explanation	1
	Upto $\frac{PA'}{PA} = \frac{PA' - PF}{PF}$	1
	Upto $\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$	1
	$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$	1
	Upto $m = \frac{h'}{h} = \frac{f - v}{f} = \frac{f}{f - u}$	1

TCP

37.	Diagram	1
	Explanation	1
	Path difference $\delta = \frac{a}{2}\sin\theta$	1
	Condition for first minimum $a\sin\theta = \lambda$ Condition for second minimum $a\sin\theta = 2\lambda$	1
	Condition for third minimum $a\sin\theta = 3\lambda$ Condition for n^{th} minimum $a\sin\theta = n\lambda$ where $n = 1, 2, 3 \cdots$	1
	(OR)	
	Electron emission diagram with explanation	1
	$h\nu = \phi_0 + \frac{1}{2}mv^2$	1
	Upto $h\nu = h\nu_0 + \frac{1}{2}mv^2$	1
	$K_{max} = h\nu - \phi_0$	1
	K_{max} (V_s) V graph and K_{max}(V_s) ν graph for different metals	1
38.	Law of radioactive decay - statement	1
	Upto $dN = -\lambda N dt$	1
	Upto $\ln(N/N_0) = -\lambda t$	1

	$N = N_0 e^{-\lambda t}$ Graph with explanation	1 1
	De Morgan's First theorem statement (or) $\overline{A+B} = \overline{A} \cdot \overline{B}$ Truth table NOR gate is equal to a bubbled AND gate (or) corresponding logic circuit diagram De Morgan's second theorem statement (or) $\overline{A \cdot B} = \overline{A} + \overline{B}$ Truth table NAND gate is equal to a bubbled OR gate	1 1 ½ 1 1 ½