DIRECTORATE OF GOVERNMENT EXAMINATIONS, CHENNAI- 6
HIGHER SECONDARY SECOND YEAR EXAMINATION - MAY - 2022
PHYSICS KEY ANSWER

NOTE:

1. Answers written with Blue or Black ink only to be evaluated.
2. Choose the most suitable answer in Part A from the given alternatives and write the option code and their corresponding answer.
3. For answers in Part – II , Part – III , Part – IV like reasoning , explanation, narration, description and listing of points, students may write in their own words but without changing the concepts and without skipping any point.
4. In numerical problems if formula is not written , marks should be given for the remaining correct steps.
5. In graphical representation, physical variables for X-axis and Y-axis should be marked.

TOTAL MARKS : 70

PART - I

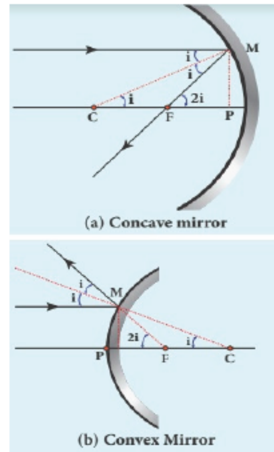
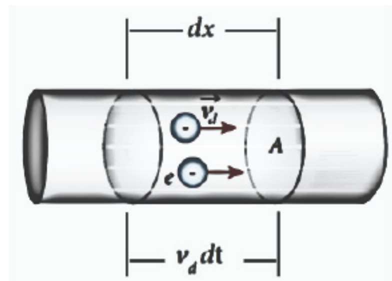
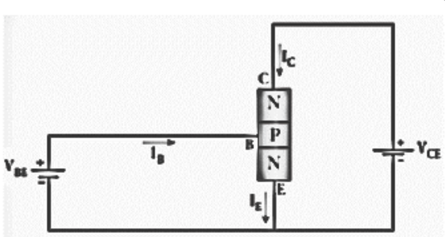
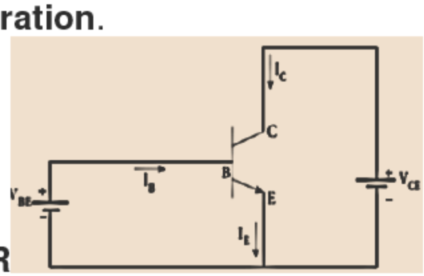
Answer all the questions. 15 X 1 = 15

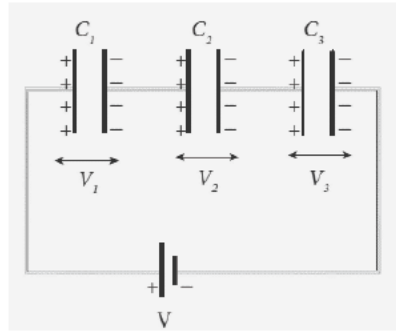
Q.NO	OPTION	TYPE – A	Q.NO	OPTION	TYPE B
1	b	Peacock feather	1	d	Frequency modulation
2	a	decrease by 4 times	2	a	Thermionic
3	d	Frequency modulation	3	a	decrease by 4 times
4	d	All the above	4	b	γ- rays
5	b	3 X 10^{-2} C	5	a	12 cm
6	b	γ rays	6	b	3 X 10^{-2} C
7	a	12 cm	7	b	Peacock feather
8	a	$\frac{R}{4}$	8	b	$\sqrt{\frac{2}{3}\beta Il}$
9	b	$\sqrt{\frac{2}{3}\beta Il}$	9	d	All the above
10	a	Thermionic	10	d	0.83
11	d	337.5 C	11	d	$r_n \propto n$
12	d	Negative	12	c	Polarisation
13	d	0.83	13	d	Negative
14	d	$r_n \propto n$	14	a	$\frac{R}{4}$
15	c	Polarisation	15	d	337.5 C

PART – II Answer any Six questions: Q.No 24 is Compulsory. 6×2=12

16	**Corona Discharge :** The total charge of the charged conductor near the sharp edge reduces (or) Leakage of charges from the sharp points of the charged conductor		**2**
17	The current sensitivity of a galvanometer can be increased by 1. increasing the number of turns (N) 2. increasing the magnetic induction (B) 3. increasing the area of the coil (A) 4 **by decreasing** the couple per unit twist of the suspension wire (K) (or) $I_s = \frac{\theta}{I} = \frac{NAB}{K}$ Only formula	½ ½ ½ ½ **1**	**2**
18	**Work function :** The minimum energy needed for an electron to escape from the metal surface **Unit : electron volt (eV)** (or) J (or) $h\nu_0 = \phi_0$, $\nu_0 -$ threshold frequency	**1½** ½ **1**	**2**
19	**R= R_0 $A^{1/3}$** $R = 1.2 \times 10^{-15} \times (197)^{1/3}$ $R = 6.97 \times 10^{-15}$ m or **R = 6.97 F**	**1** ½ ½	**2**
20	**Fleming's right hand rule:** Correct Statement		**2**
21	**Doping:** The process of adding impurities to the intrinsic semiconductor		**2**
22	**Displacement current:** The current which comes into play in the region in which the **electric field or the electric flux** is changing with time. (or) $i_d = \varepsilon_0 \frac{d\phi_E}{dt}$ Only formula	**2** **1**	**2**
23	**Electrical resistivity** : The resistance offered to current flow by a conductor of unit length having unit area of cross section. **(or)** $\boldsymbol{\rho} = \frac{RA}{l}$ **(or)** $\boldsymbol{\rho} = \frac{R(\pi r^2)}{l}$ (or) $\rho = R$ if $l = 1m, A = 1m^2$	**2** **1**	**2**
24	$n = \frac{sin(\frac{A+D}{2})}{sin\,(\frac{A}{2})}$ substitution n=1.532	**1** ½ ½	**2**

PART – III w a uestions : s '. 6×3=18

25	Any one Diagram $tan\ i = \frac{PM}{PC}$, $tan\ 2i = \frac{PM}{PF}$ $tan\ i \approx i$, $tan\ 2i \approx 2i$ $i = \frac{PM}{PC}$, $2i = \frac{PM}{PF}$ 2PF =PC 2f = R or $f = \frac{R}{2}$  (a) Concave mirror (b) Convex Mirror	1 1 1	3
26	Diagram **(or)** Explanation $\boldsymbol{v_d = \frac{dx}{dt}}$ $\boldsymbol{dQ = e(Av_d dt)n}$ $\boldsymbol{I = \frac{dQ}{dt}}$ $\boldsymbol{I = neAv_d}$ 	**1** **1** **1**	**3**
27	**Laws of photoelectric e 'ect:** i) For a given metallic st h ssi o e ro a place only if the frequency of incident light is greater than n m imum r e hreshed frequency ii) If $(\nu > \nu_0)$ number photoelectrons emitted is proportional to r e i d t radiation iii) Maximum kin rgy of photoelectron is independent of nsity of the incident radiation iv) M i . toelectrons is proportional to frequency of cident radiation v) There is no time la etween incidence of light and ejec ion of photoelectrons	**1** ½ ½ ½ ½	**3**
28	**n E nfiguration.**  **OR** 		**3**

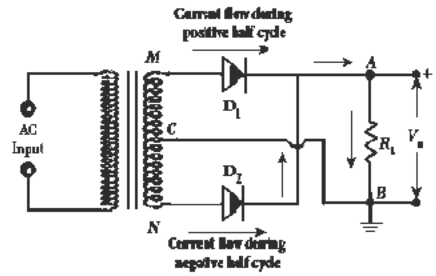
29	Any **three** uses of Polaroid's.	**3×1**	**3**
30	Diagram & Explanation  V= $V_1 + V_2 + V_3$ Upto $\frac{Q}{C_S} = Q\left(\frac{1}{C_1}+\frac{1}{C_2}+\frac{1}{C_3}\right)$ $\frac{1}{C_S} = \frac{1}{C_1}+\frac{1}{C_2}+\frac{1}{C_3}$ **(or)** uivalent Statement	1 ½ ½ 1	3
31	(i) Formula $l = \frac{nh}{2\pi}$ Substitution l = 5.25 X 10^{-34} kg m^2s^{-1} (ii) Formula v $= \frac{l}{mr}$ Substitution v = 4 4 X 10^5 ms^{-1} **(or)** **e ıtive method** (ii) v $= \frac{1}{137}\frac{c}{n}$ v $= \frac{1}{137}\frac{3\times10^8}{5}$ v = 4.4 X 10^5 ms^{-1}	½ ½ ½ ½ ½ ½ ½ ½ ½	3
32	Any **three** r of **Lorentz force** **OR** $F_m = qvB\ \sin\theta$ (OR) $\vec{F}_m = q\left(\vec{v}\times\vec{B}\right)$	3×1 1	**3**
33	(i) **Impedance** Z = $\sqrt{R^2 + (\ _L - X_c)^2}$ Substitution $Z = \sqrt{30^2 + \quad 34 - \ 144)^2}$ Z = 50 Ω (ii) **Phase Angle** tanϕ = $\frac{X_L - X_C}{R}$ Substitution $\tan\phi = \frac{184 - 1\ 4}{30} = 1\ 33$ Voltage leads curren by ϕ : $\tan^{-1}\left(\frac{4}{3}\right) = \tan^{-1}(1.33) = 53.1^\circ$	½ ½ ½ ½ ½ ½	**3**

PART – IV Answer the questions: 5×5=25

34 (a)

Full wave rectifier :

Circuit Diagram — 1



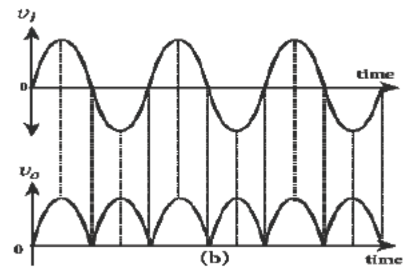
Construction — ½

Po c p ıtion — 1

Negati e ation — 1

Efficiency 81.2 % — ½

n o e r ıs — 1



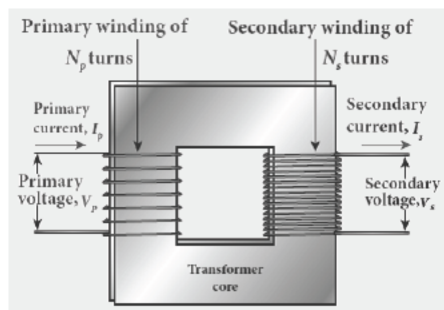
Total: 5

34 (b)

Transformer :

Principle : M u t on — ½

Diagram & Explanation — 1



$$\varepsilon_P = -N_P\frac{d\phi_B}{dt} \text{ (or) } v_P = -N_P\frac{d\phi_B}{dt}$$

$$\varepsilon_S = -N_S\frac{d\phi_B}{dt} \text{ (or) } v_S = -N_S\frac{d\phi_B}{dt}$$

— 1

For an i l o r, input power = output power — ½

$$v_P i_P = v_S i_S$$

$$\frac{v_S}{v_P} = \frac{N}{N_P} = \frac{I_P}{I_S} = K$$

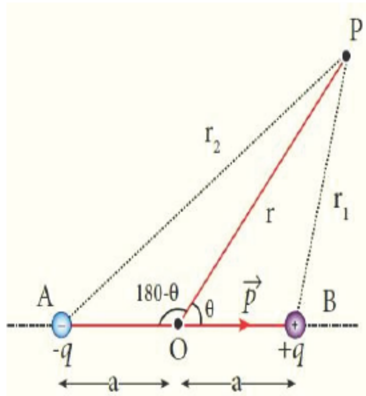
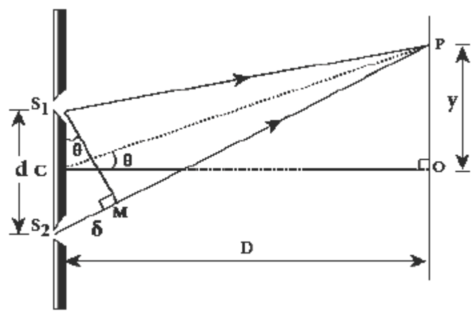
— 1

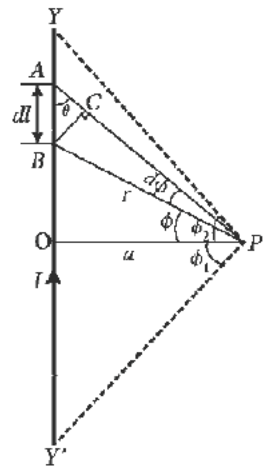
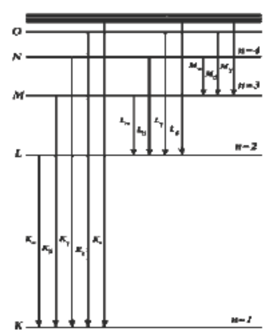
For step up transformer $K > 1$

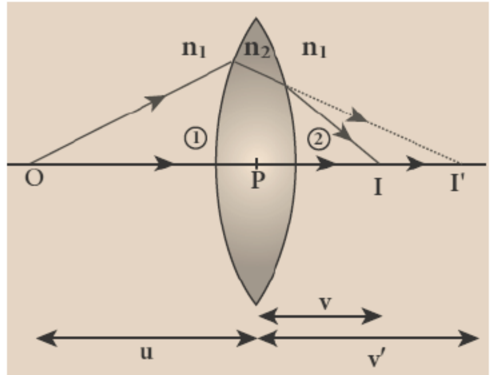
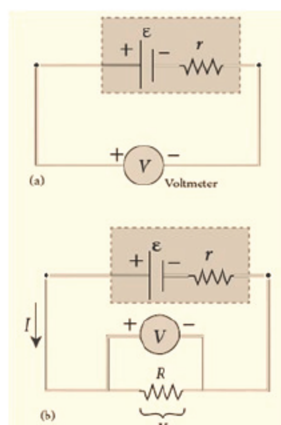
For step down transformer $K < 1$

— 1

Total: 5

35 a	**I t c a point due to an electric dipole:** Diagram & Explanation  $upto\ V = \frac{q}{4\pi\varepsilon_o}\left(\frac{1}{r_1} - \frac{1}{r_2}\right.$ Upto $\frac{1}{r_1} = \frac{1}{r}\left(1 + \frac{a\cos\theta}{r}\right.$ $\frac{1}{r_2} = \frac{1}{r}\left(1 - \frac{a\cos\ \theta}{r}\right.$ $upto\ V = \frac{1}{4\pi\varepsilon_o}\frac{2aq\cos\ \theta}{r^2}$ $p = 2aq$ $V = \frac{1}{4\pi\varepsilon_o}\frac{p\cos\ \theta}{r^2}$ (or) $V = \frac{\vec{p}.\hat{r}}{4\pi\varepsilon_o r^2}$	1 1 ½ ½ ½ ½ 1	5
35 (b)	**o u x riment:** Diagram & Explanation  up to $\boldsymbol{\delta = \frac{d\,y}{D}}$ n g e or maxima $\delta = n\lambda$ $\mathbf{\ = 0, 1, 2, 3, \dots\dots\dots}$ $y = n\frac{\lambda D}{d}$ (or) $y_n = n\frac{\lambda D}{d}$ n r r r m nima $\delta = (2n-1)\frac{\lambda}{2}$ $\mathbf{n = 1, 2, 3, \dots\dots\dots}$ $y = \frac{(2n-1)}{2}\frac{\lambda D}{l}$ $(\boldsymbol{or})$ $y_n = \frac{(2n-1)}{2}\frac{\lambda D}{d}$ Definition of bandwidth Equation for bandwidth ight fringe **or** dark fringe $\beta = \frac{\lambda D}{d}$	1 1 ½ ½ ½ ½ 1	5

36 (a)	**ıg straight conductor g nt :** Diagram & Explanation $d\vec{B} = \frac{\mu_o}{4\pi}\frac{I\,dl\ sin\,\theta}{r^2}\hat{n}$ $upto\ \ d\vec{B} = \frac{\mu_o I d\phi}{4\pi r}\ \hat{n}$ $d\vec{B} = \frac{\mu_o I}{4\pi a}\ \phi\, d\phi\hat{n}$ upto $\vec{B} = \frac{\mu_o I}{4\pi a}(sin\,\phi_1 + sin\,\phi_2)\hat{n}$ $\phi_1 = \phi_2 = 90^\circ$ or $\frac{\pi}{2}$ $\vec{B} = \frac{\mu_o I}{2\pi a}n$  	1 ½ 1 ½ ½ ½ 1	5
36 b	**Spectral gen atom:** p t vith explanations and formula **(or)** Names of sp t alone	5×1 2	5
37 a(i) 37 a(ii)	**Characteristic x- ꞇtra:** x – ɘ narrow peaks at some well – defined wavelengths when the tarɡ y f c trum o p ılled **characteristic x – ray spectrum**. Explanation with Diagram  $\lambda_o = \frac{12400}{V}A^\circ$ $\lambda_o = 0.62\ A^\circ$ $\nu_0 = \frac{c}{\lambda_o}$ $\nu_0 = 4.84 \times 10^{18}$ Hz	1 2 1 1	5
37 (b)	**Spectrum :** The definite patte n of colc b a n r f ɜion is called as spectrum. **Emission Spectrum :** n u pectra (ii) Line Emission Spectra n a ɔn and examples **(or)** ıe types of Emission spectrum alone	½ 1½ 1½ 1½ 1½	5

38 a	**Len's makers formula:** Diagram & Explanation  $\frac{n_2}{v} - \frac{n_1}{u} = \frac{(n_2 - n_1)}{R}$ $\frac{n_2}{v'} - \frac{n_1}{u} = \frac{(n_2 - n_1)}{R_1}$ $\frac{\iota_1}{v} - \frac{n_2}{v'} = \frac{(n_1 - n_2)}{R_2}$ $\frac{1}{v} - \frac{1}{u} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ b i a ıe image is formed at the focus of the lens. $\boldsymbol{u} = \infty$, $\boldsymbol{v} = \boldsymbol{f}$ $\frac{1}{f} : \left(\frac{n_2}{n_1} \quad 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ If the lens is kept n air, $\boldsymbol{n_1 = 1}$ **and** $\boldsymbol{n_2 = n}$. $\frac{1}{f} = (n - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	1 ½ ½ ½ 1½ 1	5
38 (b)	**:ell using voltmeter:** **Both the diagrams**  Explanation V = IR $V = \varepsilon - Ir$ (**or**) $Ir = \varepsilon - {}'$ $\frac{Ir}{IR} = \frac{\varepsilon - V}{V}$ Internal resistance $r = \left.\frac{\varepsilon - V}{V}\right] R$	1 ½ 1 1 ½ 1	5