SRI DIVYA CHAITANYA MATRIC HIGHER SECONDARY SCHOOL, SHOLINGHUR. RANIPET – 631102

HSC SECOND YEAR HALF-YEARLY EXAMINATION DEC-2024

PHYSICS ANSWER KEY

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

Choose the correct answer:

Q.NO	OPTION	ANSWER
1	c	Refraction
2	d	Polarisation
3	a	$\pi/4$
4	a	Lenz
5	c	480 W
6	b	$(4500\pm5\%)\Omega$
7	b	1.2 Am^2
8	a	3×10^{-2} C
9	b	$ML^3T^{-3}A^{-1}$, NM^2C^{-1}
10	c	Longitudinal
11	d	Voltage regulator
12	c	Albert Einstein
13	c	Thermionic
14	b	1.602×10^{-19} J
15	c	3

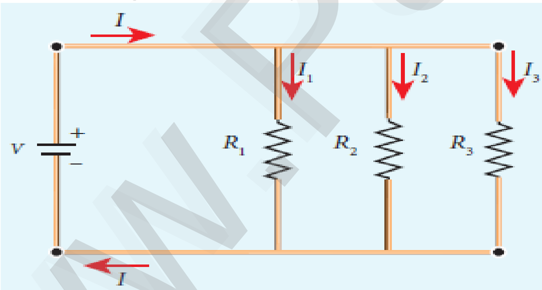
PART – II

Answer any **Six** Questions : **Q.No. 24 is Compulsory** **6x2=12**

<table>
<tr><th>Q.NO</th><th>ANSWER</th><th colspan="2">MARKS</th></tr>
<tr><td>16</td><td>Correct Definition
Unit</td><td>1½
½</td><td>2</td></tr>
<tr><td>17</td><td>
<table>
<tr><td>INTRINSIC SEMICONDUCTOR</td><td>EXTRINSIC SEMICONDUCTOR</td></tr>
<tr><td>Pure form of semiconductor without impurity. Eg: Pure Si and Pure Ge</td><td>Impurity added semiconductor</td></tr>
<tr><td>The number of electrons in the conduction band is equal to the number of holes in the valence band.</td><td>The number of electrons in the conduction band is not equal to the number of holes in the valence band.</td></tr>
<tr><td>Electrical conductivity is less.</td><td>Electrical conductivity is high.</td></tr>
</table>
(any Two point)</td><td>2×1</td><td>2</td></tr>
<tr><td>18</td><td>$A=\sqrt{a_1^2+a_2^2+2a_1a_2\cos\phi}$
$A_{max}=\sqrt{(a_1+a_2)^2}=\sqrt{(5+3)^2}=\sqrt{(8)^2}$
$=8\ units$
$A_{min}=\sqrt{(a_1-a_2)^2}=\sqrt{(5-3)^2}=\sqrt{(2)^2}$
$=2\ units$
$\frac{I_{max}}{I_{min}}=\frac{(8)^2}{(2)^2}=\frac{64}{4}=16\ (or)$
$I_{max}:I_{min}=16:1$</td><td>½
½
½
½</td><td>2</td></tr>
<tr><td>19</td><td>Any two uses of UV radiation</td><td>2×1</td><td>2</td></tr>
<tr><td>20</td><td>During sunrise and sunset, the light from sun travels a greater distance through the atmosphere. Hence, the blue light which has shorter wavelength is scattered away and the red light which has longer wavelength and less-scattered manages to reach our eye.</td><td>2</td><td>2</td></tr>
<tr><td>21</td><td>Any two ways of producing induced emf</td><td>2×1</td><td>2</td></tr>
<tr><td>22</td><td>Correct Definition</td><td>2</td><td>2</td></tr>
<tr><td>23</td><td>Any four properties of Cathode rays</td><td>4×½</td><td>2</td></tr>
<tr><td>24</td><td>$a=\frac{eE}{m}$
$=\frac{570\times1.6\times10^{-19}}{9.11\times10^{-31}}$
$=1.001\times10^{14}\ m\ s^{-2}$
(if unit not mensioned reduce ½ mark)</td><td>½
½
1</td><td>2</td></tr>
</table>

PART – III

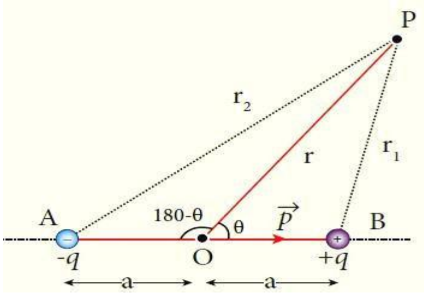
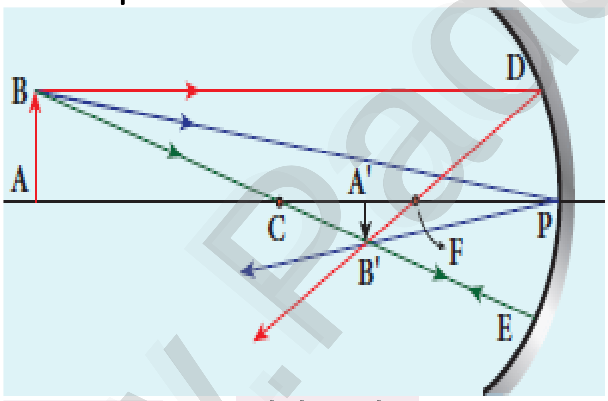
Answer any **Six** Questions : **Q.No. 33 is Compulsory** **6x3=18**

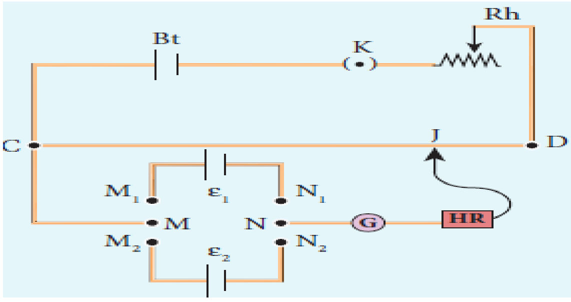
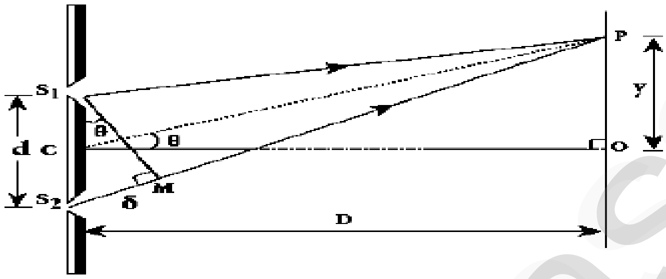
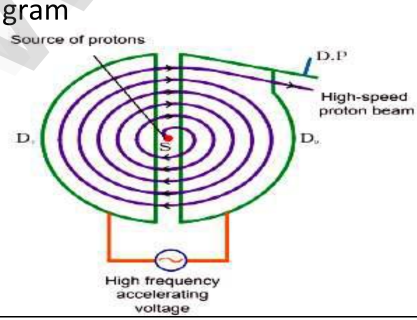
Q.NO	ANSWER	MARKS	
25	$\Phi_E = \oint \vec{E} \cdot d\vec{A}$ or $\Phi_E = \oint E dA \cos\theta$ $E = \frac{1}{4\pi\epsilon_0}\frac{Q}{r^2}$ $\Phi_E = \frac{Q}{\epsilon_0}$ (or) Correct definition of Gauss law	1 1 1 2	3
26	$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\frac{1}{v} = \frac{1}{-15} - \frac{1}{-20}$ $v = -60.0\ cm$ $m = \frac{h'}{h} = -\frac{v}{u}$ $m = \frac{h'}{h} = -\frac{(-60)}{(-20)} = -3$ As the sign of magnification is negative, the image is inverted. As the magnitude of magnification is 3, the image is enlarged three times. As the image is formed to the left of the concave mirror, the image is real.	½ ½ ½ ½ ½ ½	3
27	Circuit diagram and explanation  $I = I_1 + I_2 + I_3$ $I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$ $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	1 ½ ½ 1	3
28	Three energy losses in Transformer	3×1	3

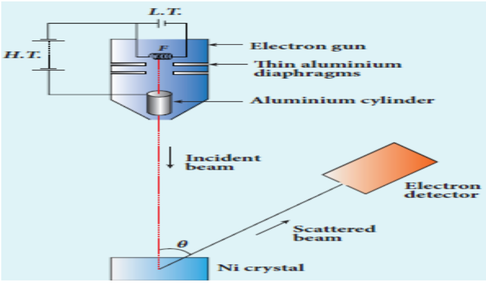
<table>
<tr><td>29</td><td>Any six properties of electromagnetic waves</td><td>6×½</td><td>3</td></tr>
<tr><td>30</td><td>
1. For a given metallic surface, the emission of photoelectrons takes place only if the frequency of incident light is greater than a certain minimum frequency called the threshold frequency.
2. For a given frequency of incident light (above threshold value), the number of photoelectrons emitted is directly proportional to the intensity of the incident light. The saturation current is also directly proportional to the intensity of incident light.
3. Maximum kinetic energy of the photo electrons is independent of intensity of the incident light.
4. Maximum kinetic energy of the photo electrons from a given metal is directly proportional to the frequency of incident light.
5. There is no time lag between incidence of light and ejection of photoelectrons.
</td><td>1
½
½
½
½</td><td>3</td></tr>
<tr><td>31</td><td>
De Morgan's First Theorem
Statement
$\overline{A+B}=\overline{A}\cdot\overline{B}$
<table>
<tr><th>A</th><th>B</th><th>$A+B$</th><th>$\overline{A+B}$</th><th>$\overline{A}$</th><th>$\overline{B}$</th><th>$\overline{A}.\overline{B}$</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
De Morgan's First Theorem
Statement
$\overline{A.B}=\overline{A}+\overline{B}$
<table>
<tr><th>A</th><th>B</th><th>$A.B$</th><th>$\overline{A.B}$</th><th>$\overline{A}$</th><th>$\overline{B}$</th><th>$\overline{A}+\overline{B}$</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
</td><td>½
½
½
½
½
½</td><td>3</td></tr>
<tr><td>32</td><td>Definition of alpha decay
Definition of Beta decay
Definition of Gamma emission</td><td>1
1
1</td><td>3</td></tr>
<tr><td>33</td><td>
$I=\frac{2RB_H}{\mu_o N}\tan\theta$
$=\frac{2\times0.12\times25\times10^{-6}}{4\times10^{-7}\times3.14\times100}\times1.732$
$I=0.082$ A (if unit not mensioned reduce ½ mark)
</td><td>1
1
1</td><td>3</td></tr>
</table>

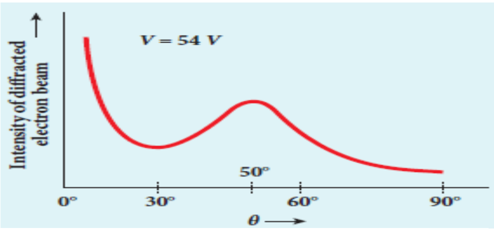
PART – IV

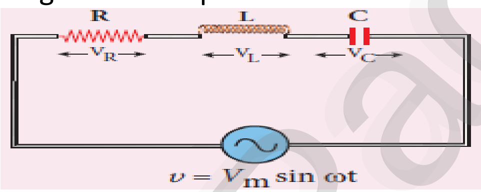
Answer all the questions: **5x5=25**

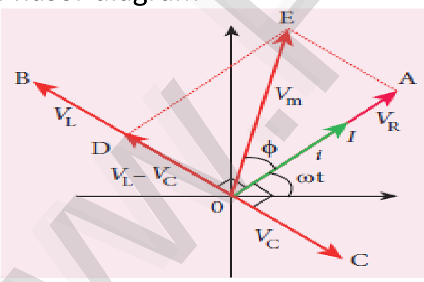
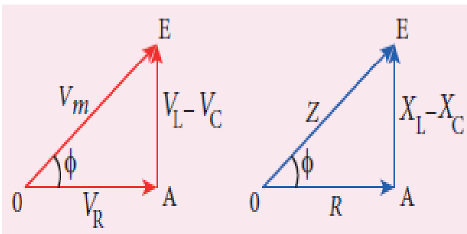
Q.NO	ANSWER	MARKS	
	Electrostatic potential at a point due to an electric dipole:		
	Diagram & Explanation 	1	
34(a)	upto $V = \frac{q}{4\pi\varepsilon_o}\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$	1	5
	Upto $\frac{1}{r_1} = \frac{1}{r}\left(1 + \frac{a\cos\theta}{r}\right)$	½	
	$\frac{1}{r_2} = \frac{1}{r}\left(1 - \frac{a\cos\theta}{r}\right)$	½	
	upto $V = \frac{1}{4\pi\varepsilon_o}\frac{2aq\cos\theta}{r^2}$	½	
	$p = 2aq$	½	
	$V = \frac{1}{4\pi\varepsilon_o}\frac{p\cos\theta}{r^2}$ (or) $V = \frac{\vec{p}.\hat{r}}{4\pi\varepsilon_o r^2}$	1	
	(OR)		
	Mirror Equation: 	1	
34(b)	$\frac{A'B'}{AB} = \frac{PA'}{PA}$ and $\frac{A'B'}{AB} = \frac{A'F}{PF}$	1	5
	$\frac{PA'}{PA} = \frac{PA'-PF}{PF}$	½	
	$PA = -u, \quad PA' = -v, \quad PF = -f$	½	
	Upto $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$	1	
	$m = \frac{h'}{h} = -\frac{v}{u}$ or $m = \frac{h'}{h} = \frac{f-v}{f} = \frac{f}{f-u}$	1	

35(a)	**Comparison of emf of two cells with a potentiometer:**  Explanation $\varepsilon_1 = Irl_1$ $\varepsilon_2 = Irl_2$ $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$	1 1 1 1 1	5
	(OR)		
35(b)	**Young's double slit experiment:** Diagram & Explanation  up to $\delta = \frac{d\,y}{D}$ Condition for bright fringe or maxima $\delta = n\lambda$ $\mathbf{n = 0, 1, 2, 3, \ldots\ldots\ldots}$ $y = n\frac{\lambda D}{d}$ (or) $y_n = n\frac{\lambda D}{d}$ Condition for dark fringe or minima $\delta = (2n-1)\frac{\lambda}{2}$ $\mathbf{n = 1, 2, 3, \ldots\ldots\ldots}$ $y = \frac{(2n-1)}{2}\frac{\lambda D}{d}$ (or) $y_n = \frac{(2n-1)}{2}\frac{\lambda D}{d}$ Definition of bandwidth Equation for bandwidth bright fringe **or** dark fringe $\beta = \frac{\lambda D}{d}$	1 1 ½ ½ ½ ½ 1	5
36(a)	**Cyclotron:** Principle Diagram 	1 1	5

<table>
<tr><td></td><td>Construction and working
Upto $r = \frac{mv}{Bq}$
$f = \frac{Bq}{2\pi m}$ (or) $T = \frac{2\pi m}{Bq}$ (or) $KE = \frac{q^2B^2r^2}{2m}$</td><td>1
1
1</td><td></td></tr>
<tr><td></td><td>(OR)</td><td></td><td></td></tr>
<tr><td>36(b)</td><td>Davisson-Germer Experiment:
Diagram


Explanation
Graph


$\lambda = \frac{12.27}{\sqrt{V}} A^0 = \frac{12.27}{\sqrt{54}} A^0 = 1.67 A^0$</td><td>1
2
1
1</td><td>5</td></tr>
<tr><td>37(a)</td><td>RLC in series:
Diagram and explanation


Phasor diagram

 or 

Upto $V_m^2 = V_R^2 + (V_L - V_C)^2$
Upto $Z = \sqrt{R^2 + (X_L - X_C)^2}$
$\tan\phi = \frac{V_L - V_C}{V_R}$ (or) $\tan\phi = \frac{X_L - X_C}{R}$</td><td>1
1
1
1
1</td><td>5</td></tr>
<tr><td></td><td>(OR)</td><td></td><td></td></tr>
<tr><td>37(b)</td><td>Spectral series of hydrogen atom:
Names of spectral series with explanations and formula.
(or)Names of spectral series alone</td><td>5×1

2</td><td>5</td></tr>
</table>

38(a)	**Absorption spectra:** Definition of absorption spectra (i) Continuous absorption spectra (ii) Line absorption spectra (iii) Band absorption spectra Explanation and examples (or) Naming the types of Emission spectrum alone	½ 1½ 1½ 1½ 1½	5
	(OR)		
38(b)	**Basic element of communication system:** Block diagram Explanation	 2 3	5

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