

**Kendriya Vidyalaya Sangathan, Lucknow Region**  
**Second Pre-Board Examination**  
**Class-12<sup>th</sup> Session-2022-23**  
**Subject-Physics (Theory)**

**Maximum Marks: 70 Marks**

**Time : 3 hours**

**General Instructions:**

- (1) There are 35 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. All the sections are compulsory.
- (3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks each.
- (4) There is no overall choice. However, an internal choice has been provided in section B, C and D. You have to attempt only one of the choices in such questions.
5. Use of calculators is not allowed.

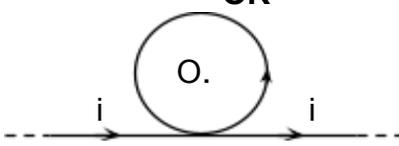
**SECTION A**

Q.		Mrk
1	Q1. Whenever a body is negatively charged its mass (i) increases (ii) decreases (iii) remains unaffected (iv) unpredictable	1
2	Maximum possible work that can be done in rotating a dipole of dipole moment $p$ in uniform electric field $E$ is (i) $pE$ (ii) $2pE$ (iii) $3pE$ (iv) $1.5pE$	1
3	The condition in which internal resistance of cell is greater than its EMF is (i) while charging (ii) while discharging (iii) always (iv) never	1
4	In mixed combination of cells maximum current is withdrawn in the circuit in the case when (i) internal resistance of combination of cells is greater than external resistance (ii) internal resistance of combination of cells is smaller than external resistance (iii) always (iv) internal resistance of combination of cells is = external resistance	1
5	If current flowing through the circular coil is doubled then percentage increase in the magnetic field at the center is (i) 50 % (ii) 100 % (iii) 150 % (iv) 200 %	1
6	When a para magnetic material is subjected to magnetizing field then it gets magnetized strongly in the direction of magnetic field due to (i) rotation of atomic magnetic dipole (ii) increase in area of magnetic domain (iii) rotation of magnetic domains (iv) None of the above.	1
7	A circular loop is pulled out of a uniform magnetic field with constant velocity, the magnitude of emf induced in the coil (i) increases with time (ii) decreases with time (iii) remain unchanged (iv) increases and then decreases with time	1

8	A magnet is allowed to fall freely along the axis of a closed loop with its axis along the axis of loop, the acceleration of magnet in this situation is (i) greater than acceleration due to gravity (ii) less than acceleration due to gravity (iii) equal to acceleration due to gravity (iv) unpredictable	1
9	Which electromagnetic wave is used in radars for their directional properties (i) x-rays (ii) U.V. rays (iii) radio waves (iv) microwaves	1
10	An air bubble in water (i) appears as a concave lens but behaves as a diverging lens (ii) appears as a convex lens but behaves as a converging lens (iii) appears as a convex lens but behaves as a diverging lens (iv) appears as a concave lens and behaves as a diverging lens	1
11	Which statement out of the following is false (i) Prism gets disappeared when dipped in a liquid of refractive index greater than that of lens material. (ii) Prism gets disappeared when dipped in a liquid of refractive index less than that of lens material. (iii) Prism gets disappeared when dipped in a liquid of refractive index same as than that of lens material. (iv) Prism dipped in liquid never disappears	1
12	In Bohr's model if radius of first orbit is $r_0$ , then radius of nth orbit is (i) $nr_0$ (ii) $r_0/n$ (iii) $n^2r_0$ (iv) $r_0/n^2$	1
13	What is the energy needed to ionize hydrogen atom from its second excited state if its energy in the ground state is $-E_0$ (i) $-E_0/4$ (ii) $-E_0/9$ (iii) $E_0/16$ (iv) $E_0/9$	1
14	Which transitions are responsible for the occurrence of Bracket series in the spectrum of hydrogen? (i) $n_i = 5,6,7$ to $n_f = 4$ (ii) $n_i = 4,5,6$ to $n_f = 3$ (iii) $n_i = 6,7,8$ to $n_f = 5$ (iv) $n_i = 4,5,6$ to $n_f = 2$	1
15	Light of frequency 1.5 times the threshold frequency is incident on a photosensitive metal. If frequency is halved and intensity is doubled the photoelectric current is (i) doubled (ii) halved (iii) same as initial (iv) zero	1
16	Two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is NOT the correct explanation of A c) A is true but R is false d) A is false and R is also false ASSERTION: In photoelectric effect cut off potential remains unchanged on increasing the intensity of incident radiation. REASON: When light is in the form of a wave its energy depends upon its intensity.	1

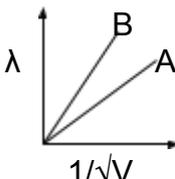
17	Two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is NOT the correct explanation of A c) A is true but R is false d) A is false and R is also false ASSERTION: P-type extrinsic semiconductor is positively charged. REASON: Positively charged holes are in majority in n-type extrinsic semiconductor.	1
18	Two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is NOT the correct explanation of A c) A is true but R is false d) A is false and R is also false ASSERTION: In forward biasing of p-n junction diode, at low potential difference almost no current flows through the diode. REASON: In forward biasing of p-n junction diode external field supports the internal field.	1

### SECTION B

19	What is the percentage change in the capacitance of a parallel plate capacitor when the separation between the plates is doubled and space between the plates is filled with the dielectric medium of dielectric constant 4.	2
20	 <p>Resistance of each resistor is 2 ohm. Find the current through the combination when a source of potential difference 10 volt is connected across AB.</p> <p style="text-align: center;"><b>OR</b></p> <p>A wire of resistance R is compressed to half of its initial length, find the new resistance.</p>	2
21	<p>A proton and an alpha particle both are projected in uniform magnetic field B perpendicular to their velocity with same kinetic energy. Find the ratio of their radii of circular path.</p> <p style="text-align: center;"><b>OR</b></p>  <p>Find magnetic field at O if radius of the circular loop is r and current is i.</p>	2
22	Magnetic field B is passing perpendicular to a square loop of each side 2a. If the shape of loop is turned into a rectangle of length 3a in time t find the emf induced.	2
23	Give construction and working of full wave rectifier. Draw input and output wave form.	2
24	Draw binding energy curve showing the region of fission, fusion and maximum stability.	2
25	Draw graph between photoelectric current and plate voltage (i) at different frequency and same intensity (ii) at same frequency and different intensity	2

### SECTION C

26	An electron and alpha particle have the same de-Broglie wavelength associated with them. How are their kinetic energies related to each other?	3
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	<b>OR</b>	
	 <p>Two lines, A and B, in the plot given above show the variation of de-Broglie wavelength, <math>\lambda</math> versus <math>1/\sqrt{V}</math>, Where <math>V</math> is the accelerating potential difference, for two particles carrying the same charge. Which one of two represents a particle of smaller mass ?</p>	
27	<p>In a plane electromagnetic wave, the electric field oscillates sinusoidally with a frequency of <math>2 \times 10^{10}</math> Hz and amplitude 48 V/m.</p> <p>(a) What is the wavelength of the electromagnetic wave?  (b) Calculate the amplitude of the oscillating magnetic field.  (c) Calculate average energy density of the electric field of the wave?</p> <p style="text-align: center;"><b>OR</b></p> <p>Find the wavelength of electromagnetic waves of frequency <math>5 \times 10^{19}</math> Hz in free space. Give its two applications. Name the electromagnetic wave with frequency lower than the above wave. Give its one use.</p>	3
28	Using Huygens's principle deduce the laws of refraction? What is the source of plane wavefront?	3
29	State Gauss' law. Use it to derive electric field due to uniform sheet of charge.	3
30	Write the two processes that take place in the formation of a p-n. junction. Explain with the help of a diagram, the formation of depletion region and barrier potential in a p-n junction diode.	3

### SECTION D

31	<p>(i) When refraction occurs of a convex spherical refracting surface and the ray travels from rarer to denser medium establish relation between image distance, object distance and radius of curvature of refracting surface.</p> <p>(ii) Using the above expression derive lens makers formula.</p> <p style="text-align: center;"><b>OR</b></p> <p>(i) Derive expression for angular magnification produced by refraction type telescope in normal adjustment using proper diagram  (ii) Draw the diagram of reflecting type telescope. Give three reasons why reflection type telescope is superior to that of refraction type telescope.</p>	5
32	<p>(i) In a given LCR circuit inductive reactance is <math>10\Omega</math>, capacitive reactance is <math>10\Omega</math> and impedance is <math>20\Omega</math>. What is the resistance of the circuit. If frequency is 50 Hertz find the value of inductance. What is the phase difference between <math>V</math> and <math>i</math> in above circuit.</p> <p>(ii) Plot a graph showing variation of (a) capacitive reactance (b) inductive reactance with the frequency of the AC source.</p> <p style="text-align: center;"><b>OR</b></p> <p>(i) Give labeled diagram of a moving coil galvanometer. Give its construction and working.  (ii) A galvanometer gives full scale deflection for 1 mA current. How will you convert it into an ammeter of range 10 A. Resistance of galvanometer coil is 10 ohms.</p>	5
33	<p>(i) Derive an expression for torque on a dipole in uniform electric field. Give the conditions for stable and unstable equilibrium.</p> <p>(ii) Derive electric field due to ideal dipole at axial and equatorial point.</p> <p style="text-align: center;"><b>OR</b></p> <p>(i) An ideal electric dipole is placed in a cubical box. Find electric flux linked with the cube. How will the answer change if each side of cube is doubled.</p>	5

(ii) Charge  $q$  is distributed uniformly over the surface of a spherical shell of radius  $R$ . Find electric field at a point (a) inside the shell, (b) on the surface of the shell and (c) outside the shell.

### SECTION E

34	<p>Lens is a portion of transparent refracting medium bounded by two curved surfaces or one curved and one flat surface. Depending upon their shapes lenses are of basically two types:-</p> <p>Convex Lens – They are thicker in the middle and thinner at periphery. They are further divided into three parts</p> <ol style="list-style-type: none"> <li>1. Bi-convex – Which are convex on both side.</li> <li>2. Plano-convex – Which are convex on one sides and plane on the other side.</li> <li>3. Concavo-convex – Which are concave on one side and convex on the other side.</li> </ol> <p>Concave lens – They are thinner in the middle and thicker at periphery. They are further divided into three parts</p> <ol style="list-style-type: none"> <li>1. Bi-concave – Which are concave on both side.</li> <li>2. Plano-concave – Which are concave on one sides and plane on the other side.</li> <li>3. Convexo-concave – Which are convex on one side and concave on the other side.</li> </ol> <p>An equi bi-convex lens of focal length 10 cm is cut into two halves making two plano convex lenses. Both the plano convex lenses are turned so that their curved surface come in contact.</p> <p>(i) What is the focal length of each plano convex lens?  (ii) What is the change in the power of bi-convex lens and the combination of the two plano convex lenses and What will be the new focal length of a bi-convex lens if it is cut along the axis?</p> <p style="text-align: center;">OR</p> <p>What will be the nature and position of image formed if an object is placed between focus and optical centre of bi- convex lens? Draw ray diagram for image formation by bi convex when object is placed between focus and optical centre of bi- convex lens.</p> <p>(iii) How will the nature of convex lens change if it is immersed in liquid of refractive index greater than that of lens material?</p>	4
35	<p>The instruments which use the heating effect of the current for knowing their magnitude such type of instrument is known as the hot wire instrument. It works on the principle that the length of the wire increases because of the heating effect of the current flowing through it. The hot wire instrument is used for both the AC and DC current.</p> <p>The following are the advantage of the hot wire instrument.</p> <ol style="list-style-type: none"> <li>1. The instrument is used for both AC and DC measurement.</li> <li>2. It is a transfer-type instrument i.e, the calibration is same for both the AC and DC measurement.</li> <li>3. The hot wire instrument is free from the stray magnetic field.</li> <li>4. Their construction is very simple and cheap.</li> </ol> <p>Disadvantages of Hot Wire Instrument</p> <p>The following are the disadvantages of the hot-wire instrument.</p> <ol style="list-style-type: none"> <li>1.The Hot Wire instrument gives the slow response.</li> <li>2.The instability occurs in the instruments because of the stretching of the wire.</li> <li>3.The instrument consumes more power.</li> <li>4.The instrument is not able to withstand under overload and mechanical shock.</li> </ol> <p>(i) If hot wire instrument measure alternating potential difference to be 220 Volts, then what is the peak value? Which is more fatal, 220 volt A.C. or 220 volt DC and why? Explain.</p> <p style="text-align: center;">OR</p>	4

	<p>What is the principle of working of hot wire instruments? Why AC and DC both can be measured by hot wire instruments?</p>	
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(ii) Why is A.C. measured only by using hot wire instrument? Explain.

(iii) Which value of alternating current is measured by hot wire instrument?