

KENDRIYA VIDYALAYA SANGATHAN, LUCKNOW REGION
SECOND PRE BOARD EXAMINATION : 2020-21
SUBJECT: PHYSICS
CLASS: XII

QUESTION PAPER

Maximum Marks: 70 Marks

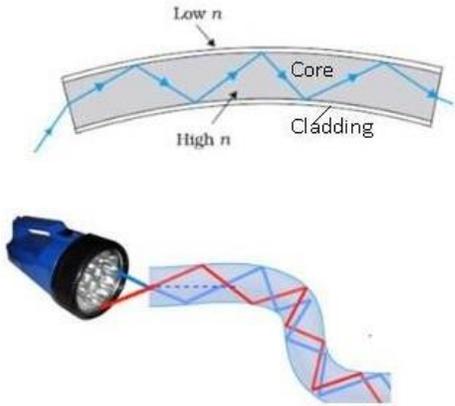
Time Allowed: 3 hours

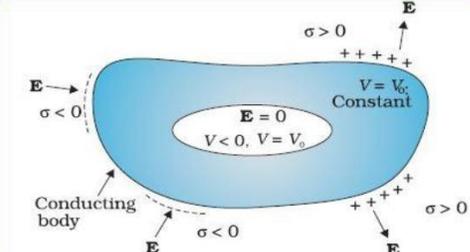
General Instructions:

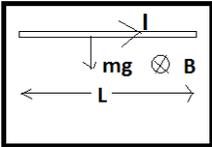
- (1) All questions are compulsory. There are 33 questions in all.
- (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
- (3) Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer questions of 3 marks each and Section E contains three long answer questions of 5 marks each.
- (4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

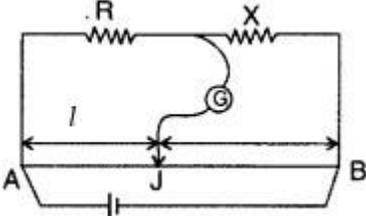
Sr. no.	Questions	Marks
1	Section-A A beam of alpha particle projected along + X axis, experiences a force due to a magnetic field along the + Y axis. What is the direction of the magnetic field?	1
2	If λ_x , λ_m and λ_v represent wavelength of X-Rays, microwaves & visible rays then arrange the waves in increasing order of wavelength. OR Name the device used for the production of microwaves.	1
3	An alpha particle enters in a uniform magnetic field with constant velocity v at an acute angle with magnetic field. Draw its path.	1
4	A metallic piece gets hot when surrounded by a coil carrying high frequency alternating current. Why? OR If alternating voltage produced by generator is given by $V = 10 \sin 628 t$ and is applied across a 1000 ohm resistance, then what will be effective voltage?	1
5	What is the value of angular momentum of electron in the third orbit of Bohr's model of hydrogen atom?	1
6	The work function for a metal is 2 eV. When a photon of 5 eV falls on its surface, find the maximum KE of emitted electrons.	1
7	Compare the nuclear densities of hydrogen and Helium nuclei. OR Which two particles are also produced during conversion of a proton into neutron?	1
8	Name two important processes which occur during the formation of p-n	1

	junction. OR Draw V-I characteristics of a photodiode.	
9	What is the working principle of solar cell?	1
10	Draw circuits having a p-n junction diode in (a) Forward bias (b) Reverse bias	1
	For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled 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 but R is NOT the correct explanation of A c) A is true but R is false d) A is false but R is true	
11	Assertion(A) : When a charge moves on equatorial line of an isolated electric dipole, the work done is zero. Reason (R) : The electric potential is same at every point of equatorial line of any isolated electric dipole.	1
12	Assertion(A) : Electric filed lines not form closed loops. Reason (R) : Electric filed lines are always normal to the surface of a conductor.	1
13	Assertion(A) : There is no dispersion of light refracted through a rectangular glass slab. Reason (R) : Dispersion of light is the phenomenon of splitting of a beam of white light into its constituent colours.	1
14	Assertion(A) : If the angles of the base of the prism are equal, then in the position of minimum deviation, the refracted ray will pass parallel to the base of prism. Reason (R) : In the case of minimum deviation, the angle of incidence is equal to the angle of emergence.	1
	Section – B Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.	
15	Optical fibres: Optical fibres are fabricated with high quality composite glass/quartz fibres which is used for the transmission of optical signal.Each fibre consists of a core and cladding. The refractive index of the material of the core is higher than that of the cladding.As there is difference in the refractive index of core and cladding, core acts as a denser medium and cladding acts as a rarer medium.	

		
(i)	<p>The function of core and cladding in optical fiber.</p> <p>(a) Core behave as rarer medium and cladding behave as a denser medium (b) Core behave as denser medium and cladding behave as a rarer medium (c) both have same refractive index (d) none of these</p>	1
(ii)	<p>On which principle optical fibre works?</p> <p>(a) Refraction of light (b) Interference (c) Diffraction (d) Total internal reflection</p>	1
(iii)	<p>Optical fibres are used for.</p> <p>(a) Transmission of optical signal (b) transmission of electrical signal (c) Use to store electrical energy (d) all of the above</p>	1
(iv)	<p>What is the angle of refraction when angle of incidence is critical angle?</p> <p>(a) Equal to the angle of incidence (b) Equal to the critical angle (c) Right angle (d) None of these</p>	1
(v)	<p>The critical angle is actually</p> <p>(a) Angle of incidence (b) Angle of reflection (c) Angle of refraction (d) All of these</p>	1
16	<p>Electrostatic shielding:</p> <p>The electric field inside the cavity is zero, whatever be the size and shape of the cavity and whatever be the charge on the conductor and the external fields in which it might be placed. The electric field inside a charged spherical shell is zero. But the vanishing of electric field in the (charge-free) cavity of a conductor is, as mentioned above, a very general result. A related result is that</p>	

	<p>even if the conductor is charged or charges are induced on a neutral conductor by an external field, all charges reside only on the outer surface of a conductor with cavity.</p> <p>The proofs of the results noted in Fig. are omitted here, but we note their important implication. Whatever be the charge and field configuration outside, any cavity in a conductor remains shielded from outside electric influence: the field inside the cavity is always zero. This is known as electrostatic shielding. The effect can be made use of in protecting sensitive instruments from outside electrical influence.</p>	
<p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p> <p>(v)</p>	 <p>A metallic shell having inner radius R_1 and outer radii R_2 has a point charge Q kept inside cavity. Electric field in the region $R_1 < r < R_2$ where r is the distance from the centre is given by</p> <p>(a) depends on the value of r</p> <p>(b) Zero</p> <p>(c) Constant and nonzero everywhere</p> <p>(d) None of the above</p> <p>The electric field inside the cavity is depend on</p> <p>(a) Size of the cavity</p> <p>(b) Shape of the cavity</p> <p>(c) Charge on the conductor</p> <p>(d) None of the above</p> <p>Electrostatic shielding is based</p> <p>(a) electric field inside the cavity of a conductor is less than zero</p> <p>(b) electric field inside the cavity of a conductor is zero</p> <p>(c) electric field inside the cavity of a conductor is greater than zero</p> <p>(d) electric field inside the cavity of a plastic is zero</p> <p>During the lightning thunderstorm, it is advised to stay</p> <p>(a) inside the car</p> <p>(b) under trees</p> <p>(c) in the open ground</p> <p>(d) on the car</p> <p>Which of the following material can be used to make a Faraday cage (based on electrostatic shielding)</p> <p>(a) Plastic</p> <p>(b) Glass</p> <p>(c) Copper</p> <p>(d) Wood</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
	<p>Section – C</p> <p>All questions are compulsory. In case of internal choices, attempt anyone</p>	

17	<p>A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B. What is the magnitude of the magnetic field?</p> 	2
18	<p>Draw the ray diagram of a compound microscope, when the final image is formed at the least distance of distinct vision. Write the formula for magnifying power in the above noted case. OR Draw the graph showing intensity distribution of fringes with phase angle due to diffraction through single slit.</p>	2
19	<p>A parallel plate capacitor is charged to a potential difference V by d.c. source and then disconnected. The distance between the plates is then doubled. Then write the change in</p> <p>(a) Electric potential difference between the plates</p> <p>(b) Capacitance of parallel plate capacitor.</p> <p>OR</p> <p>Find the expression of potential energy stored in an electric dipole, when it is rotated by an angle θ, in a uniform electric field E.</p>	2
20	<p>Draw the energy band diagram when intrinsic semiconductor (Ge) is doped with impurity atoms of Phosphorous (p). Name the extrinsic semiconductor so obtained and majority charge carriers in it.</p>	2
21	<p>The horizontal component of the earth's magnetic field at a place is B and angle of dip is 60°. What is the value of vertical component of the earth's magnetic field at equator?</p>	2
22	<p>Verify using Huygens's principal Snell's law of refraction of a plane wave propagating from a denser to a rarer medium.</p>	2
23	<p>Explain, with the help of a circuit diagram, the working of a p-n junction diode as a half-wave rectifier.</p>	2
24	<p>A magnetic needle free to rotate in a vertical plane parallel to the magnetic meridian has its North tip down at 60° with the horizontal. The horizontal component of the earth's magnetic field at the place is known to be 0.4 G. Determine the magnitude of the earth's magnetic field at the place. OR If the horizontal and vertical components of the earth's magnetic field are equal at a certain place. The magnitude of the earth's magnetic field is 0.6 G at that place. Find the vertical component of the earth's magnetic field at the place.</p>	2
25	<p>With the help of a ray diagram, show the formation of image of a point object by refraction of light at a spherical surface separating two media of refractive indices n_1 and n_2 ($n_2 > n_1$) respectively. Using this</p>	2

	<p>diagram, derive the relation $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$.</p>	
	<p>Section -D All questions are compulsory. In case of internal choices, attempt any one.</p>	
26	<p>State Lenz's law and using it predict the direction of induced current in metal rings 1 and 2 when current I in the wire is steadily decreasing?</p> 	3
27	<p>A wire of 15 Ω resistance is gradually stretched to double its original length. It is then cut into two equal parts. These parts are then connected in parallel across a 3.0 volt battery. Draw the final circuit and find the current drawn from the battery.</p> <p>OR</p> <p>In the meter bridge experiment, balance point was observed at J with AJ = L.</p>  <p>(i) The values of R and X were doubled and then interchanged. What would be the new position of balance point? (ii) If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected? (iii) Write the working principle of meter bridge.</p>	3
28	<p>(a) Calculate the ratio of the accelerating potential required to accelerate a Proton and an α-particle to have the same de-Broglie wavelength associated with them. (b) Draw a plot showing the variation of de Broglie wavelength of electron as a function of its K.E.</p> <p>OR</p> <p>Sketch the graph showing variation of stopping potential with frequency of incident radiations for two photosensitive materials A and B having threshold frequencies $\nu_A > \nu_B$.</p> <p>(i) In which case is the stopping potential more and why? (ii) Does the slope of the graph depend on the nature of the material used?</p>	3
29	<p>a) Give one point of difference between nuclear fission and nuclear fusion. b) Draw the variation of potential energy of a pair of nucleons as a function of their separation. Show stable equilibrium on the graph.</p>	3
30	<p>Find the lowest and highest wavelength of Balmer series. In which region of EM spectrum it falls?</p>	3
	<p>Section – E All questions are compulsory. In case of internal choices, attempt any one.</p>	

31	<p>(a) Two charges of 5 nC and – 2 nC are placed at points (5 cm, 0, 0) and (23 cm, 0, 0) in the region of space, where there is no other external field. Calculate the electrostatic potential energy of this charge system.</p> <p>(b) Find the work done on moving an alpha particle from (2 cm,0,0) to (5 cm, 0, 0) in the field of two static charges 2 C and -2 C placed at (0,3 cm,0) and (0, -3cm,0) respectively.</p> <p>OR</p> <p>(a) State Gauss's law of electrostatics. Use it to find electric field near an infinitely long, uniformly charged wire.</p> <p>(b) find the net electric flux through the surface S.</p>	5
32	<p>(a) State the working principle of transformer. Why laminated cores are used in it?</p> <p>(b) A step-up down transformer operated on a 2.5 kV line. It supplies a load with 20 A. The ratio of the primary winding to the secondary is 10 :1. If the transformer is 90% efficient, calculate</p> <p>(i) the power output</p> <p>(ii) the voltage and</p> <p>(iii) the current in the secondary coil.</p> <p>OR</p> <p>(a) Prove that the current lags behind the voltage by 90° in pure inductive circuit.</p> <p>(b) In an series LCR circuit find the expression of</p> <p>(i) Impedance</p> <p>(ii) Frequency at which impedance is pure resistive</p> <p>(iii) Current versus frequency curve showing resonance frequency.</p>	5
33	<p>(a) State Huygens principle.</p> <p>(b) Define a wave front.</p> <p>(c) Draw the diagram to show the shape of plane wave front as they pass through (i) a thin prism and (ii) a thin convex lens (iii) Concave lens</p> <p>OR</p> <p>(a) State the advantages of reflecting type telescope over the refracting type?</p> <p>(b) Draw ray diagram of Cassese grain telescope.</p> <p>(c) What do you meant by the term " Resolving power"</p>	5

