KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION

PRE – BOARD I EXAMINATION 2025-26 **SET NO.1**

CLASS: XII **MAX MARKS: 70**

SUBJECT: PHYSICS **TIME ALOTED: 3 hours**

General Instructions:

(1) There are 33 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.

(3) All the sections are compulsory.

(4) Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.

(5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.

(6) Use of calculators is not allowed.

(7) You may use the following values of physical constants where ever necessary

i. $c = 3 \times 10^8$ m/s

ii. $m_e = 9.1 \times 10^{-31}$ kg

iii. $e = 1.6 \times 10^{-19}$ C

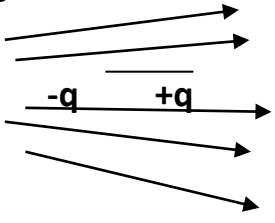
iv. $\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1}

v. $h = 6.63 \times 10^{-34}$ Js

vi. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2N^{-1}m^{-2}$

vii. Avogadro's number = 6.023×10^{23} per gram mole

SECTION A

Q. NO.	Statement of questions	MARKS
1	Given Fig. shows electric field lines in which an electric dipole is placed as shown. Which of the following statement is correct?  **(a)** The dipole will not experience any force **(b)** The dipole will experience a force towards right	1

	(c) The dipole will experience a force towards left **(d)** The dipole will experience a force upwards.	
2	Two parallel infinite line charges with linear charge density +ƛ C/m and –ƛ C/m are placed at a distance of 2R in free space. What is the electric field midway between the two line charges? (a) Zero (b) $\frac{2ƛ}{\pi \varepsilon 0 R}$ N/C (c)) $\frac{ƛ}{\pi \varepsilon 0 R}$ N/C (d) $\frac{ƛ}{2\pi \varepsilon 0 R}$ N/C	1
3	When a potential difference V is applied across a conductor at temperature T, the drift velocity of the electrons is proportional to (a)T (b) √T (c) V (d) √V	1
4	A circular loop of conducting wires of radius 'a' carries a steady current I. The ratio of magnitudes of the magnetic field at a point along its axis at distances '2a' and '3a' from its centre is (a) 2:1 (b) 2√2:1 (c) √2: 1 (b)3:√2	1
5	The voltage across a resistor, an inductor and a capacitor connected in series to an a.c. source are 20 V, 15 V and 30 V respectively. The resultant voltage in the circuit is (a)5 V (b) 20 V (c) 25 V (d) 65 V	1
6	The rms current in a circuit connected to a 50 Hz ac source is 15 A. The value of the current in the circuit (1/600) s after the instant the current is zero, is – (a) 15/√2 (b) 15√2 (c) √2/15 (d) 8A	1
7	In a series LCR circuit, resistance R = 10Ω and the impedance Z = 20Ω. The phase difference between the current and the voltage is (a) 30° (b) 45° (c) 60° (d) 90°	1
8	Pencil in a beaker filled with water seems bent due to – (a) Reflection (b) Refraction (c) Diffraction (d) Total Internal Reflection	1
9	A thin convex lens of glass (n=1.5) has focal length+10 cm is immersed in water (n=1.33). The focal length of lens in water is –. (a) 12cm (b) 20cm (c) 40 cm (d) 48 cm	1
10	In young's double slit experiment the separation between the slits is halved and the distance between the slits and screen is doubled. The fringe width becomes (a)Unchanged (b) halved (c) doubled (d) quadrupled	1
11	The distance of closest approach of an alpha particle is *d* when it moves with kinetic energy 'K' towards a nucleus. Another alpha particle is projected with higher energy such that the new distance of the closest	1

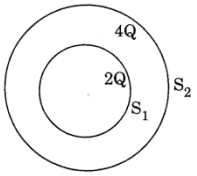
	approach is *d*/2. What is the kinetic energy of projection of the alpha particle in this case? (a) K /2 (B) $\sqrt{2}$ K (c) 2 K (d) 4K	
12	Mass defect of helium atom is 0.305 amu .its binding energy is :- A)3.83Mev B)7.66Mev C)2.32Mev D)None of these	1

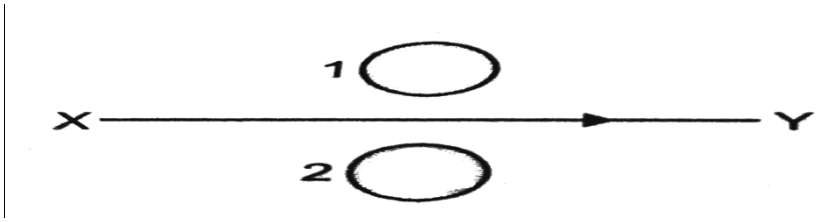
For Questions 13 to 16, two statements are given –one labeled Assertion (A) and other labeled Reason (R). Select the correct answer to these questions from the options as given below.

a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
c) If Assertion is true but Reason is false.
d) If both Assertion and Reason are false.

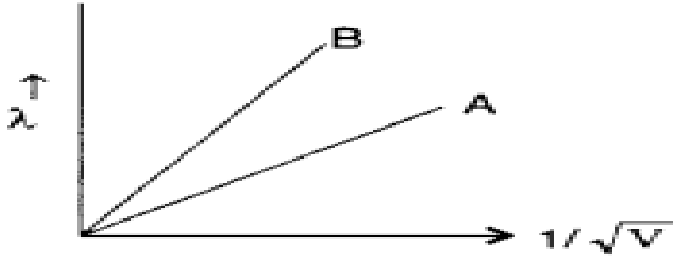
13	**Assertion:** If the distance between parallel plates of a capacitor is halved and dielectric constant is three times, then the capacitance becomes 6 times. **Reason:** Capacity of the capacitor does not depend upon the nature of the material.	1
14	**Assertion**: Microwaves are better carrier of signals than optical waves. **Reason:** Microwaves move faster than optical waves.	1
15	**Assertion:** Infrared radiation plays an important role in maintaining the average temperature of earth. **Reason** : Infrared radiations are also referred to as heat waves	1
16	**Assertion (A):** The de Broglie wave length of an electron is greater than proton, when both are moving with same speed. **Reason (R):** de Broglie's wavelength of a particle is directly proportional to its linear momentum.	1

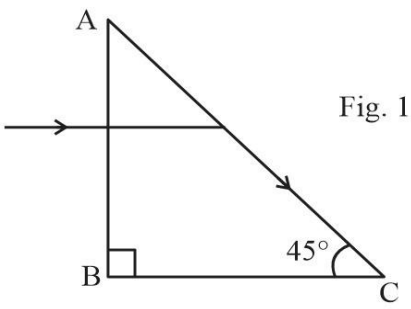
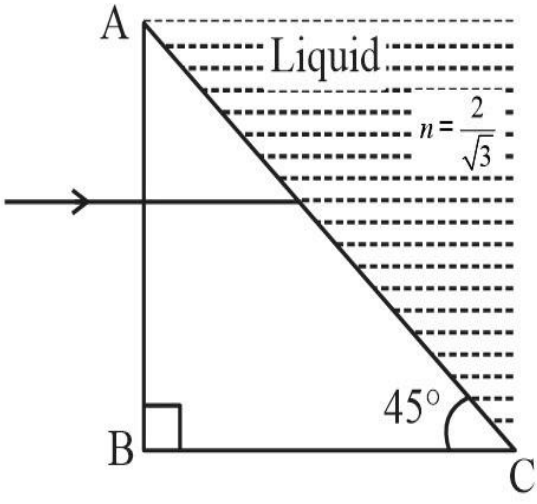
SECTION B

17	Why are electric fields lines perpendicular at a point on an equipotential surface of a conductor?	2
18	S1 and S2 are two hollow concentric spheres enclosing charges Q and 2Q resp. as shown in figure. What is the ratio of electric flux through S1 and S2 ? How will the electric flux through the sphere S1 change, if a medium of dielectric constant is introduced in the space inside S1 in place of air ? 	2

19	Draw a schematic ray diagram of an astronomical reflecting type telescope showing how rays coming from a distant object are received at the eye piece. Write its magnification	2
20	Calculate the mass defect of a nitrogen nucleus ($^{14}_{7}N$) from the following data:- Mass of proton=1.00727 u, mass of neutron =1.00866 u and mass of Nitrogen nucleus ($^{14}_{7}N$) = 14.00307 u	2
21	An aircraft with a wing span of 40m flies with a speed of 1080km/h in the eastward direction at a constant altitude in the northern hemisphere, where the vertical component of earth's magnetic field is 1.75x 10^{-5} T. Calculate the e.m.f that develops between the tips of the wings OR Predict the directions of induced currents in metal rings 1 and 2 lying in the same plane where current I in the wire is increasing steadily. Explain the Reason 	2

SECTION C

22	Two semiconductor materials A and B shown are made by doping germanium crystal with arsenic and indium respectively. The two are joined end to end and connected with battery. (a) Will the junction be forward biased or reverse biased. justify (b) Sketch the VI graph for this arrangement. 	3
23	Two lines, A and B, in the plot given below show the variation of de-Broglie wavelength, λ versus $\frac{1}{\sqrt{V}}$, Where V is the accelerating potential difference, for two particles carrying the same charge. Which one of two represents a particle of smaller mass? 	3

24	If a ray of light enters from air to a convex spherical surface of refractive index ”n”, find the relation between refractive index, radius of curvature.	3
25	What is capacitive reactance? Find the phase angle between current and voltage when AC is fed up across a capacitor of capacitance C. Hence find the value of capacitive reactance.	3
26	In a moving coil galvanometer. Why is it necessary to use (i) a radial magnetic field and (ii) a cylindrical soft iron core in a galvanometer? Write the expression for current sensitivity of the galvanometer. Can a galvanometer as such be used for measuring the current? Explain.	3
27	A light ray entering a right-angled prism undergoes refraction at the face AC as shown in Fig. 1 (i) What is the refractive index of the material of the prism in Fig. 1?  Fig. 1 (ii) (a) If the side AC of the above prism is now surrounded by a liquid of refractive index 2/√3 shown in Fig. 2, determine if the light ray continues to graze along the interface AC or undergoes total internal reflection or undergoes refraction into the liquid.  Fig. 2 (b) Draw the ray diagram to represent the path followed by the incident ray with the corresponding angle values. (Given, $sin^{-1}(\frac{\sqrt{2}}{\sqrt{3}}) = 54.6^{\circ}$)	3

28	Define electric flux and write its SI unit. **(b)** Using Gauss theorem, derive an expression for the electric field due to an infinitely long straight wire of linear charge density λ. **OR** **(a)** State Gauss theorem in electrostatics **(b)** Use Gauss theorem to obtain the expression for the electric field due to a uniformly charged infinite plane sheet of charge of surface charge density **σ**	3

SECTION D

29	**SEMICONDUCTORS:** The semiconductors are classified as intrinsic semiconductors and extrinsic semiconductors also. Intrinsic semiconductors are those semiconductors which exist in pure form. And intrinsic semiconductors has number of free electron is equal to number of holes. The semiconductors doped with some impurity in order to increase its conductivity are called as extrinsic semiconductors. Two types of dopants are used they are trivalent impurity and pentavalent impurity also. The extrinsic semiconductors doped with pentavalent impurity like Arsenic, Antimony, Phosphorus etc are called as n – type semiconductors. In n type semiconductors electrons are the majority charge carriers and holes are the minority charge carriers. When trivalent impurity is like Indium, Boron, Aluminium etc are added to extrinsic semiconductors then p type semiconductors will be formed. In p type semiconductors holes are majority charge carriers and electrons are the minority charge carriers. **1.) In case of p-type semiconductors___** a) $n_h << n_e$ b) $n_h = n_e$ c) $n_h >> n_e$ d) $n_h = n_e = 0$ **2.) An intrinsic semiconductor behaves like _____ at T = 0K.** a) conductor b) metal c) non metal d) insulator **3.) If the energy band gap Eg> 3 eV then such materials are called as** a) conductors b) semiconductors c) insulators d) superconductors **4.) Define energy band gap in case of materials?** **Or** **Define Valance Band and Conduction Band**	4
30	Light waves are nothing but the electromagnetic waves which are having dual nature. That means particle as well as wave nature. The phenomenon like interference, diffraction and polarisation of light explains the wave nature of light. While the phenomenon like photoelectric effect, Compton effect explains the particle nature of light. The physicist de Broglie proposed that every moving particle of matter is associated with wave. He gave the	

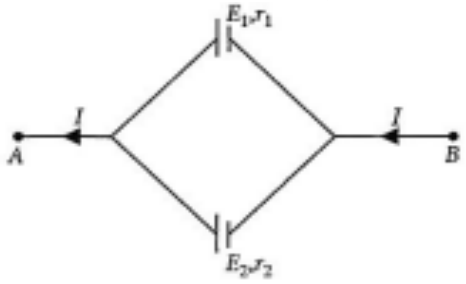
wavelength of that wave in terms of momentum as given below.
Wavelength = h/p = h/mv, Where, h is Planck's constant and m is the mass of particle and v is the speed of the particle.
The wave associated with the matter is called as matter wave having wavelength called as de Broglie wavelength.
The most important application of photoelectric effect is the photocell. It works on the phenomenon of photoelectric effect and converts light energy into an electrical energy. The de Broglie wavelength can be measured in elementary particles like electrons, protons etc. And due to huge mass of macroscopic particles or bodies it cannot be determined in them significantly.As the wavelengths associated with macroscopic particles in our daily life is not measurable hence they doesn't show the wave like nature. And in the microscopic particle or at atomic level the particles are having suitable wavelength which explains the wave nature associated with them. The de Broglie wavelength associated with the electron accelerated from the rest through a potential V is given by
Wavelength = 1.227/ √V nm

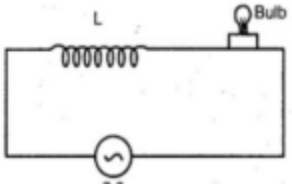
1. The de Broglie wavelength is independent of
a) mass of the particle
b) momentum of the particle
c) charge and nature of the particle
d) both a and b
2. Davidson and Germer, G. P. Thomson performed the electron diffraction experiment which proves the
a) particle nature of electrons
b) dual nature of electrons
c) both a and b
d) wave nature of electrons
3. Photoelectric current depends on the
a) intensity of incident light
b) potential difference between two electrodes
c) nature of the emitter plate material
d) all of the above
4. If the electron is accelerated with a potential of V = 100 V then what is its de Broglie wavelength?

OR

Maximum K.E of photoelectron depends upon
a) frequency of incident radiation
b)anode potential
c)intensity of light
d) stopping potential

SECTION E

31	**(a)** State the two Kirchhoff's rules used in the analysis of electric circuits and explain them.	3
	(b) Two cells of emf E1 and E2 and internal resistances $r_1$and r_2 respectively are connected in parallel as shown in the figure. Deduce the expression for : 	2
	(i) Equivalent emf of the combination. **(ii)** equivalent internal resistance of the combination **(iii)** Potential difference between the points A and B.	3
	OR	
	(a) Write two limitations of ohm's law. Plot their I-V characteristics.	
	(b) A heating element connected across a battery of 100 V having an internal resistance of 1 Ω draws an initial current of 10 A at room temperature 20.0 °C which settles after a few seconds to a steady value. What is the power consumed by battery itself after the steady temperature of 320.0 °C is attained? Temperature coefficient of resistance averaged over the temperature range involved is 3.70×10^{-4} $°C^{-1}$.	2

32	**a)** State the working principle of an AC generator. With the help of a neat and labeled diagram, explain its working and obtain the expression for the emf generated in the coil.	3
	(b) An inductor L of reactance $X_L$is connected in series with a bulb B to an ac source as shown in the figure. Explain briefly how does the brightness of the bulb change when (i) number of turns of the inductor is reduced (ii) an iron rod is inserted in the inductor.  	2
	OR	
	(a) With the help of a diagram, explain the principle of a device which changes a low ac voltage into a high voltage. Deduce the expression for the ratio of secondary voltage to the primary voltage in terms of the ratio of the number of turns of primary and secondary winding. For an ideal transformer, obtain the ratio of primary and secondary currents in terms of the ratio of the voltages in the secondary and primary coils. (b)Write any two sources of the energy losses which occur in actual transformers. (c) A step-up transformer converts a low input voltage into a high output voltage. Does it violate law of conservation of energy? Explain.	3 2
33	**(a)** State Huygens principle. **(b)** A plane wavefront is incident obliquely from denser to a rarer medium. Draw suitable Huygens construction for the same and hence deduce the Snell's law of refraction **(c)**Also show using the above that the frequency of the wave does not change with change in the medium	3 2
	OR	
	(a) Draw a labeled diagram of compound microscope when final image is formed at least distance of distinct vision.	3
	(b) A compound microscope consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at (a) the least distance of distinct vision (25 cm) and (b) infinity? What is the magnifying power of the microscope in each case?	2

**********END OF PAPER**********