DELHI PUBLIC SCHOOL PANVEL

PRE-BOARD EXAMINATION-1

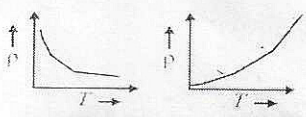
ACADEMIC YEAR 2022-23

Date: 02/12/2022 **Subject: PHYSICS** **Max. Marks: 70**

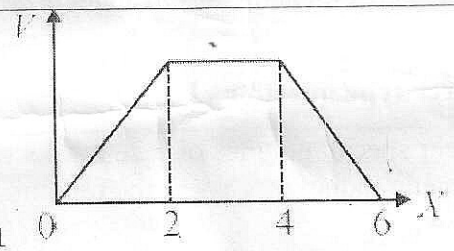
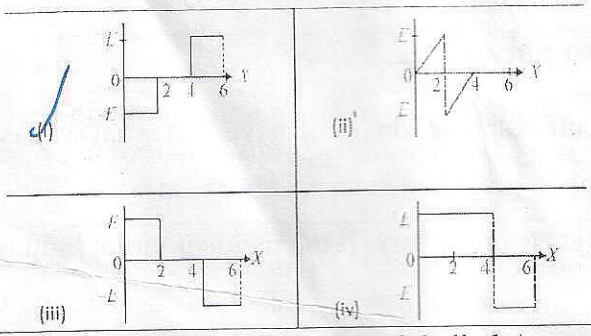
Class: XII **SET A** **Time: 3 hrs.**

General Instructions:

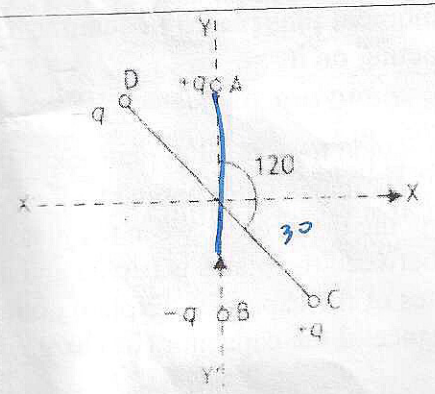
1. There are 35 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3. Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, 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, C, D and E. You have to attempt only one of the choices in such questions.
5. Use of calculators is not allowed.

	Section A	
1	The electrostatic potential on the perpendicular bisector due to an electric dipole is _____. (i) Zero (ii) 1 (iii) Infinite (iv) Negative	[1]
2	Consider a uniform electric field in the z-direction. The potential is a constant (i) for any x for a given z (ii) for any y for a given z (iii) on the x-y plane for a given z (iv) all of these	[1]
3	The temperature (T) dependence of resistivity of materials A and material B is represented by fig (i) and fig (ii) respectively. Identify material A and material B.  fig. (i) fig. (ii) (i) material A is copper and material B is germanium (ii) material A is germanium and material B is copper (iii) material A is nichrome and material B is germanium (iv) material A is copper and material B is nichrome	[1]

4	The magnetic moment of a current I carrying a circular coil of radius r and number of turns N varies as (i) r4 (ii) r2 (iii) 1/r4 (iv) R	[1]
5	Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field $B = B_0k$. (i) They have equal z-components of momenta. (ii) They must have equal charges. (iii) They necessarily represent a particle- antiparticle pair. (iv) The charge to mass ratio satisfy: (e/m)1+(e/m)2=0	[1]
6	Which of the following has higher magnetic susceptibility? (i) Diamagnetic (ii) Paramagnetic (iii) Superparamagnetic (iv) Ferromagnetic	[1]
7	An induced e.m.f. is produced when a magnet is plunged into a coil. The strength of the induced e.m.f. is independent of (i) the strength of the magnet (ii) number of turns of coil (iii) the resistivity of the wire of the coil (iv) speed with which the magnet is moved	[1]
8	Which of the following has maximum penetrating power? (i)Ultraviolet radiation (ii) Microwaves (iii)γ-rays (iv) Radio waves	[1]
9	The polarity of induced emf is given by (i) Ampere's circuital law (ii) Biot-Savart law (iii) Lenz's law (iv) Fleming's right hand rule	[1]
10	What is the geometric shape of the wavefront that originates when a plane wave passes through a convex lens? (i) Converging spherical (ii) Diverging spherical (iii) Plane (iv) None of the above	[1]
11	Kinetic energy of emitted electrons depends upon (i) frequency (ii) intensity (iii) nature of atmosphere surrounding the electrons (iv) none of these	[1]

12	The radius of the innermost electron orbit of a hydrogen atom is 5.3×10–11 m. The radius of the n =3 orbit is (i)1.01 x 10^{-10}m (ii) 1.59 X 10^{-10}m (iii)2.12 x 10^{-10}m (iv) 4.77 X 10^{-10}m	[1]
13	When the number of nucleons in nuclei increases, the binding energy per nucleon (i) increases continuously with mass number (ii) decreases continuously with mass number (iii) remains constant with mass number (iv) first increases and then decreases with increase of mass number.	[1]
14	What is the resistivity of a pure semiconductor at absolute zero ? (i) Zero (ii) Infinity (iii) Same as that of conductors at room temperature (iv) Same as that of insulators at room temperature	[1]
15	The electric potential V as a function of distance X is shown in the figure. The graph of the magnitude of electric field intensity E as a function of X is  1 The graph of the magnitude of electric field intensity E as a function of X is  	[1]
16	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 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: Thin film such as soap bubble or a thin layer of oil on water show beautiful colours when illuminated by white light. REASON: It happens due to the interference of light reflected from upper and lower face of the thin film.	[1]
17	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	[1]

	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(A) : In process of photoelectric emission, all emitted electrons do not have same kinetic energy. Reason(R) : If radiation falling on photosensitive surface of a metal consists of different wavelength then energy acquired by electrons absorbing photons of different wavelengths shall be different.	
18	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 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: A pure semiconductor has negative temperature coefficient of resistance. REASON: In a semiconductor on raising the temperature, more charge carriers are released, conductance increases and resistance decreases.	[1]
	Section B	
	Short answer type questions I	
19	Welders wear special goggles or face masks with glass windows to protect their eyes from electromagnetic radiations. Name the radiations and write the range of their frequency.	[2]
20	In what way is the behaviour of a diamagnetic material different from that of a paramagnetic, when kept in an external magnetic field?	[2]
21	Write any two characteristic properties of nuclear force. **OR** If both the number of protons and neutrons in a nuclear reaction is conserved, in what way is mass converted into energy (or vice versa)? Explain giving one example.	[2]
22	How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced with red light?	[2]
23	Draw energy band diagram for p type semiconductor. Mark its acceptor level also **OR** Explain how a depletion region is formed in a junction diode.	[2]
24	How does the fringe width of interference fringes change, when the whole apparatus of Young's experiment is kept in a liquid of refractive index 1.3?	[2]
25	Two small identical electrical dipoles AB and CD, each of dipole moment '**p**' are kept at an angle of 120° as shown in the figure. What is the resultant dipole moment of this combination? If this system is subjected to the electric field (**E**) directed along +X direction, what will be the magnitude and direction of the torque acting on this?	[2]



Section C

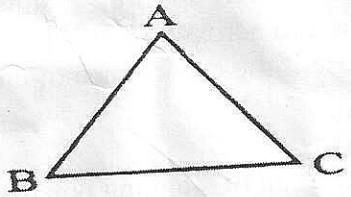
Short answer type question II

26	(a)Show how a moving coil galvanometer can be converted into an ammeter. (b) A galvanometer has a resistance 30 and gives a full-scale deflection for a current of 2mA. How much resistance in what way must be connected to convert into an ammeter of range 0.3A?	[3]
27	How is the mutual inductance of a pair of coils affected when (a) Separation between the coils is increased. (b) The number of turns of each coil is increased (c) A thin iron sheet is placed between two coils, other factors remaining the same. Explain the answer in each case.	[3]
28	Draw the phasor diagram of a series LCR connected across an ac source V= Vo sin ωt. Hence, derive the expression for the impedance of the circuit. **OR** A lamp is connected in series with a capacitor. Predict your observation when this combination is connected in turn across (i) ac source and (ii) a 'dc' battery. What change would you notice in each case if the capacitance of the capacitor is increased?	[3]
29	Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work functions W1 and W2 (W1 > W2). On what factors does the (i) slope and (ii) intercept of the lines depend?. **OR** A proton and a deuteron are accelerated through the same accelerating potential. Which one of the two has (a) greater value of de-Broglie wavelength associated with it, and (b) less momentum? Give reasons to justify your answer	[3]
30	Define the terms (i) 'cut-off voltage' and (ii) 'threshold frequency' in relation to the phenomenon of photoelectric effect. Using Einstein's photoelectric equation show how the cut-off voltage and threshold frequency for a given photosensitive material can be determined with the help of a suitable plot/graph.	[3]

Section D

Long answer type question

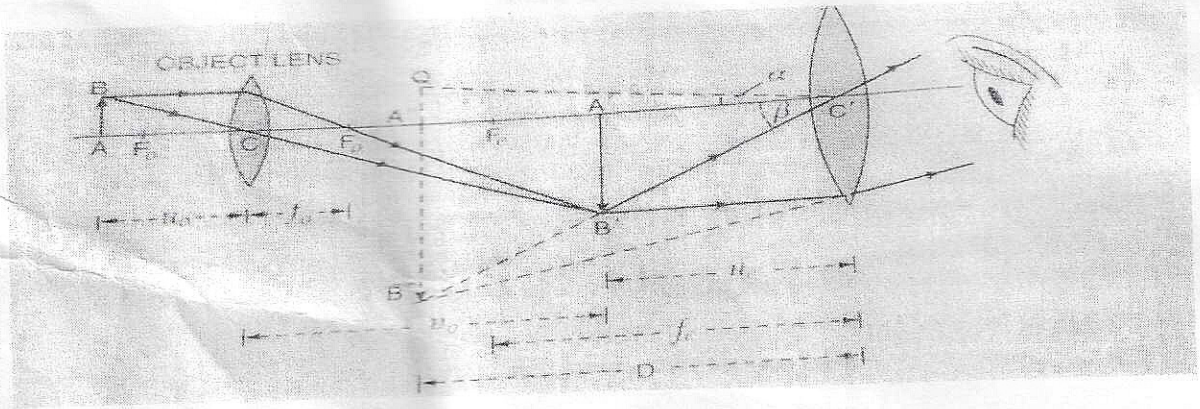
31	(a) Write two properties of equipotential surfaces. Depict equipotential surfaces due to an isolated point charge. Why do the equipotential surfaces get closer as the distance between the equipotential surface and the source charge decreases?	[5]

	(b) An electric dipole of dipole moment **p**, is placed in a uniform electric field **E** ,. Deduce the expression for the torque 'x acting on it. $-pE(\cos\theta_1 - \cos\theta_2)$ **OR** (a) Derive an expression of capacitance for a parallel plate capacitor. (b) A parallel plate capacitor of capacitance C is charged to a potential V by a battery. Without disconnecting the battery, the distance between the plates is tripled and a dielectric medium of k = 10 is introduced between the plates is tripled and a dielectric medium of k = 10 is introduced between the plates of the capacitor. Explain giving reasons, how will the following be affected: (i) capacitance of the capacitor (ii) charge on the capacitor.	
32	(a) Two cells of emfs $E1$ and $E2$ and internal resistances $r1$ and $r2$ respectively are connected in parallel as shown in the figure. (i) equivalent emf of the combination (ii) equivalent internal resistance of the combination Deduce the expression for the **OR** (a) State the two Kirchhoff's rules used in the analysis of electric circuits and explain them. (b) Derive the equation of the balanced state in a Wheatstone bridge using Kirchhoff's laws.	[5]
33	a) Draw a neat labelled ray diagram of a compound microscope. Explain briefly its working. b) Why must both the objective and the eye-piece of a compound microscope have short focal lengths? **OR** a) Write two points of difference between an interference pattern and a diffraction pattern. b) (i) A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30°. Calculate the speed of light through the prism. (ii) Find the angle of incidence at face AB so that the emergent ray grazes along the face AC. 	[5]
	Section E	
	Case Study	[4]
34	**Read the following paragraph and answer the questions** Consider a thin p-type silicon (p-Si) semiconductor wafer. By adding precisely a small quantity of pentavalent impurity, part of the p-Si wafer can be converted into n-Si. There are several processes by which a semiconductor can be formed. The wafer now contains p-region and n-region and a metallurgical junction between p-, and n- region. Two important processes occur during the formation of a p-n junction: diffusion and drift. We know that in an n-type semiconductor, the concentration of electrons (number of electrons per unit volume) is more compared to the concentration of holes. Similarly, in a p-type semiconductor, the concentration of holes is more than the concentration of electrons. During the formation of p-n junction, and due to the concentration gradient across p-, and n- sides, holes diffuse from p-side to n-side (p → n) and electrons diffuse from n-side to p-side (n → p). This motion of charge carries gives rise to diffusion current across the junction. 1. How can a p-type semiconductor be converted into n- type semiconductor? 2. Name the two processes used in formation of pn junction.	

3. What are minority charge carriers in p – type semiconductor.
4. Why diffusion occurs during formation of pn junction?

35 **Read the following paragraph and answer the questions.** [4]

A compound microscope consist of two lenses . A lens of short aperture and short focal length facing the object is called the object lens and another lens of short focal length but large aperture is called the eye lens . Magnifying power is defined as the ration of angle subtended by the final image at the eye to the angle subtended by the object is seen directly, when both are placed at least distance of distinct vision .



1. What would be the aperture & focal length of objective of a compound microscope?
2. Why compound microscope is preferred over simple microscope?
3. A compound microscope with an objective of 1.0 cm , focal length and eyepiece 2.0 cm . Focal length of a tube is 20 cm . Calculate the magnifying power of the microscope
4. What is the nature of final image formed by Final image formed by compound microscope

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