

KENDRIYA VIDYALAYA SANGATHAN, LUCKNOW REGION

PREBOARD EXAM-II

TIME ALLOWED : 3 HRS

SUB: PHYSICS (THEORY)

M.M. 70

GENERAL INSTRUCTIONS:

1. All questions are compulsory. There are 33 questions in all.
2. The question paper has five sections. Section A, Section B, Section C, Section D and Section E.
3. Section A contains 10 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.

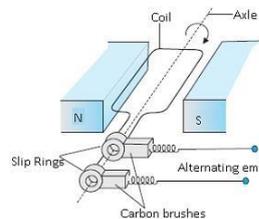
SECTION-A		
All questions are compulsory. In case of internal choices, attempt any one of them.		
1.	Name the physical quantity which has V/m as its SI unit. Is it a scalar or a vector quantity?	1
2.	Two infinite plane parallel sheets separated by a distance d having equal and opposite uniform charge densities σ . What will be the electric field at a point between the sheets? OR A point charge of $+10\mu\text{C}$ is at the centre of a cube of side 5cm, what is the magnitude of electric flux through one face of the cube?	1
3.	What is the value of kinetic energy of electron emitted, when the frequency of light incident on the metal surface is equal to the threshold frequency of the metal?	1
4.	Two long straight wires are set parallel to each other. Each carries a current in the same direction and the separation between them is $2r$. What will be the intensity of the magnetic field midway between them?	1
5.	If the ratio of mass numbers of two nuclei is 1:2, then what will be the ratio of their nuclear densities?	1
6.	If the length of a metallic wire is increased to thrice its original length, then what would be the effect on the drift velocity of electrons in the wire?	1
7.	What is the ratio of velocity of X-rays to Infrared rays in vacuum? OR What is the ratio of amplitude of electric field vector to magnetic field vector for an electromagnetic wave?	1
8.	Calculate the resonating frequency of a Series LCR circuit, when $L = 40\text{ H}$ and $C = 10\mu\text{F}$? OR At what frequency, the inductive reactance of 0.7 H inductor will be $220\ \Omega$?	1
9.	What is the velocity of electron in terms of 'c', the speed of light in vacuum, for the ground state of hydrogen atom?	1
10.	If h is the Planck's constant, then what is the momentum of photon of wavelength $0.01\ \text{\AA}$. OR What is the de-Broglie wavelength of electron accelerated by a potential difference of 100 V .	1
For question number 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 correct and R is the correct explanation of A. (b) Both A and R are correct 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.		
11.	ASSERTION: Work done in moving a charge between two points in an electric field is independent of the path followed by the charge between these points. REASON: Electrostatic force is a conservative force.	1

5. How can you increase the magnetic field inside a toroid?

- (a) by increasing the radius
- (a) by decreasing the current
- (b) by introducing a soft iron core inside a toroid
- (d) by decreasing the total number of turns

16. **AC GENERATOR:**

The phenomenon of electromagnetic induction has been technologically exploited in many ways. An exceptionally important application is the generation of alternating current (ac). The ac generator with a typical output capacity of 100 MW is a highly evolved machine. The Yugoslav inventor Nicola Tesla is credited with the development of the machine. As the coil rotates in a magnetic field B , the effective area of the loop (the face perpendicular to the field) is $A \cos \theta$, where θ is the angle between Area vector and magnetic field vector B . This method of producing a flux change is the principle of operation of a simple ac generator. An ac generator converts mechanical energy into electrical energy.



1. What is the principle of ac generator?

- (a) Conservation of charge
- (b) Conservation of magnetic flux
- (c) Electrostatic induction
- (d) Electromagnetic induction

2. Current reverses its direction after every

- (a) Half-rotation
- (b) One-fourth rotation
- (c) Three-fourth rotation
- (d) One complete rotation

3. The value of maximum emf induced in the coil is

- (a) NBA/ω
- (b) $NBA\omega$
- (c) $NBA\omega^2$
- (d) NBA

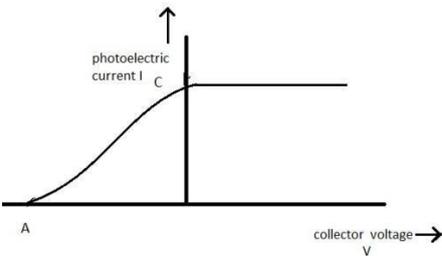
4. The induced emf induced is maximum at time-interval

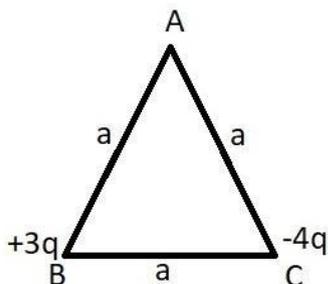
- (a) $T/4$
- (b) $T/2$
- (c) $3T/4$
- (d) Both a and c

5. The emf is induced in the coil of ac generator due to

- (a) Change in the area of the coil
- (b) Change in the magnitude of current
- (c) Change in the orientation of the coil
- (d) None of these.

4

SECTION-C		
All questions are compulsory. In case of internal choices, attempt any one.		
17.	In a single-slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band.	2
18.	Draw the energy band diagrams of P-type semiconductor and N-type semiconductor. OR Draw the symbol of the diode which emits photons. Under which biasing is it used?	2
19.	How does mutual inductance of a pair of coils change when (i) Distance between the coils is decreased? (ii) Number of turns in the coils are increased?	
20.	An ammeter of resistance 0.6Ω can measure current upto 10 A. Calculate (i) The shunt resistance required to enable the ammeter to measure current upto 5A. (ii) The combined resistance of the ammeter and the shunt.	2
21.	Two charges $3 \times 10^{-8} \text{ C}$ and $-2 \times 10^{-8} \text{ C}$ are located 15 cm apart. At what point on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero. OR Give the relation between electric field and electric potential at a point. Draw the equipotential surfaces for an electric field pointing in + Z direction with its magnitude increasing at a constant rate along -Z direction.	2
22.	Draw the diagram to show the shape of plane wave front as they pass through (i) A thin prism (ii) A thin convex lens State the nature of the refracted wave front.	2
23.	Calculate the ratio of energies of third permitted energy level to first excited energy level in H-atom. OR Calculate the ratio of maximum wavelength to minimum wavelength in the Balmer series of H-atom.	2
24.	How are electromagnetic waves produced? Name the electromagnetic wave which is used in the (i) Study of crystal structure. (ii) Aircraft navigation.	2
25.	If a compass needle stays in vertical position at a place on the earth, then what will be the value of angle of dip at that place? What is the value of horizontal component of earth's magnetic field there?	2
SECTION-D		
All questions are compulsory. In case of internal choices, attempt any one.		
26.	A biconvex lens is having a focal length f_1 . It is kept in contact with a biconcave lens of focal length f_2 . Find the equivalent focal length of the combination. Will the combination behave as a converging or a diverging system if $f_1 > f_2$. Also draw the necessary ray diagram.	3
27.	The following graph shows the variation of photocurrent for a photosensitive metal:  (i) Identify the variable on the X-axis at point A. (ii) What does the point C on the Y-axis represent? (iii) Draw the graph for two different frequencies	3
28.	Two point charges $+3q$ and $-4q$ are placed at the vertices B and C of an equilateral triangle ABC of side 'a' as given in the figure. Obtain the expression for:	3



- (i) The magnitude and
- (ii) The direction of the resultant electric field at the vertex A due to these two charges.

OR

An electric dipole of dipole moment p is placed in a uniform electric field E . Obtain the expression for the torque experienced by the dipole. Identify two pairs of perpendicular vectors in the expression.

29. Write three characteristics of nuclear forces.

3

OR

Distinguish between Nuclear Fusion and Nuclear Fission.

30. What are coherent sources of light? If in Young's double slit experiment, the distance between slits is 1 mm and the screen is placed at a distance of 1 m from the slits. The second dark fringe is formed at a distance of 1 mm from the centre of the screen at a point P. Determine the wavelength of light used.

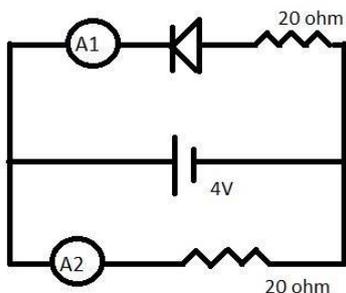
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SECTION-E

All questions are compulsory. In case of internal choices, attempt any one.

- 31. (i) With the help of a circuit diagram, explain the working of a full wave rectifier. Also show the input and output waveforms.
- (ii) Assuming that the resistance of the meters are negligible, what will be the readings of the ammeters A_1 and A_2 in the circuit shown.

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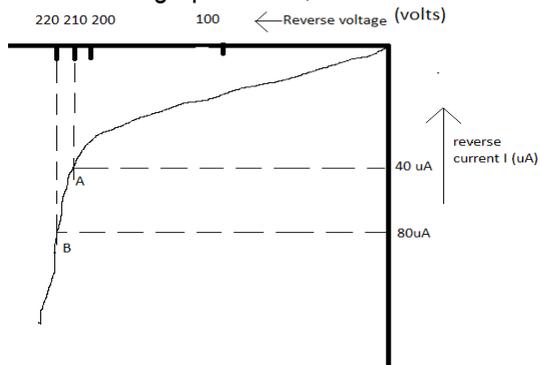


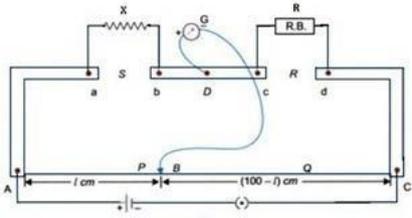
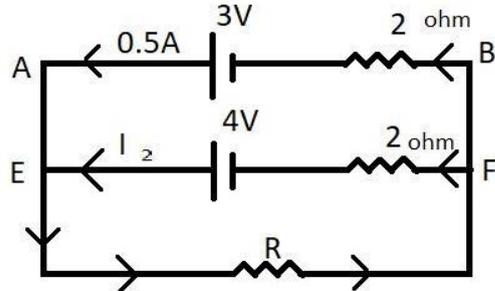
OR

Draw the circuit diagram of a PN junction diode in reverse bias and explain the following terms:

- (i) Reverse saturation current.
- (ii) Breakdown voltage.

From the VI graph shown, find the:



	<p>(i) Breakdown voltage (ii) Reverse dynamic resistance.</p>	
32.	<p>(i) Write the principle and working of a meter-bridge to determine the unknown resistance of a wire. Derive the necessary formula. If the galvanometer and the battery are interchanged at the balance point, how does it affect the balance point? Find the condition of balance point for the given circuit.</p>  <p>If a resistance of $10\ \Omega$ is placed in series with R, how does it affect the balancing length? OR State Kirchhoff's laws. On which fundamental principles, Kirchhoff's laws are based? Use Kirchhoff's laws in the given circuit,</p>  <p>determine</p> <p>(i) The voltage drop across the unknown resistor R (ii) The current I_2 in the arm EF.</p>	5
33.	<p>Draw a labelled diagram of an astronomical telescope to show image formation of a distant object in normal adjustment position.</p> <p>(i) Write the main consideration required in selecting the objective and eye-piece to have high magnifying power. (ii) Also write the expression for its magnifying power in the given case. (iii) What are the advantages of a reflecting type telescope over a refracting-type telescope? Write any two.</p> <p>OR</p> <p>Draw a graph showing the variation of angle of minimum deviation with the angle of incidence for refraction through a glass prism. Derive an expression for the refractive index of the glass prism of prism angle A, when a light is incident on one of the faces of the glass prism.</p>	5