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MODEL QUESTION PAPER

II PUC

2024

MODEL QUESTION PAPER 2023-24

II PUC - PHYSICS (33)

Time: 3 hours 15 min. **Max Marks: 70**

General Instructions:

1. ***All parts are compulsory.***
2. ***For Part – A questions, first written-answer will be considered for awarding marks.***
3. ***Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.***
4. ***Direct answers to numerical problems without detailed solutions will not carry any marks.***

PART – A

I. Pick the correct option among the four given options for ALL of the following questions: **15 × 1 = 15**

1. A glass rod is rubbed with silk cloth. The charge acquired by glass rod is _____ .

(A) negative (B) positive

(C) zero (D) positive on one end and negative on the opposite end

2. A spherical conductor of radius R is carrying a charge of +Q. The ratio of the electric potentials corresponding to a point on the surface of the conductor and a point at a distance $\frac{R}{2}$ from the centre of the conductor are in the ratio

(A) 1: 2 (B) 2: 1 (C) 1:1 (D) 4:1

3. The resistivity of a metallic conductor _____ with decrease in temperature.

(A) increases (B) decreases

(C) first increases and then decreases (D) first decreases and then increases

4. The Lorentz force is the force on a charged particle moving in a region containing _____ .

(A) only electric field (B) only magnetic field

(C) both electric and magnetic fields (D) only crossed electric and magnetic fields

5. Below are the two statements related to magnetic field lines:

Statement-I : The magnetic field lines do not intersect.

Statement-II: The direction of magnetic field at a point is unique.

(A) Both the statements I and II are correct and II is the correct explanation for I

(B) Both the statements I and II are correct and II is not the correct explanation for I

(C) Statement I is wrong but the statement II is correct

(D) Statement I is correct but the statement II is wrong

6. A straight conductor of length '*l*' is moving with a velocity 'v' in the direction of uniform magnetic field of strength 'B'. The magnitude of emf induced between the ends of the conductor is

(A) *Blv* (B) $\frac{Blv}{2}$ (C) 0 (D) 2*Blv*

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7. The SI unit of magnetic flux is:

(A) Wb m^{-1} (B) T m^{-2} (C) weber (D) Wb m^{-2}

8. The average power dissipated in an ac circuit is maximum if the ac source is connected :

(A) only to pure resistor (B) only to pure inductor

(C) only to pure capacitor (D) to a series combination of capacitor and inductor

9. The electromagnetic waves with lowest frequency among the following are :

(A) gamma rays (B) UV rays (C) microwaves (D) radio waves

10. A ray of light coming from an object which is incident parallel to the principal axis of a convex lens placed in air after refraction _____.

(A) appears to diverge from first principal focus (B) emerges without any deviation

(C) appears to diverge from second principal focus (D) passes through second principal focus

11. If unpolarised light of intensity 'I_0' is passed through a polaroid, the intensity of emergent light is

(A) $\frac{I_0}{4}$ (B) $\frac{2I_0}{3}$ (C) $\frac{I_0}{3}$ (D) $\frac{I_0}{2}$

12. The following are the statements related to photo emission:

(i) Photoelectric current is independent of intensity of incident radiation.

(ii) Stopping potential is different for different photosensitive metal surfaces for a radiation of particular frequency ($\nu > \nu_o$).

(iii) Maximum speed of photoelectrons is independent of frequency of incident radiation.

(iv) Saturation current is different for radiations of different intensities having same frequency.

(A) Only (i) and (iii) are correct (B) Only (i) and (ii) are correct

(C) Only (iii) and (iv) are correct (D) Only (ii) and (iv) are correct

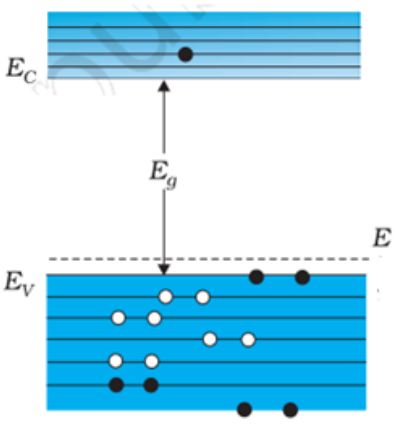
13. The minimum energy required to free the electron from the ground state of a hydrogen atom is

(A) 0.85 eV (B) 3.4 eV (C) 13.6 eV (D) 1.51 eV

14. The radioactive decay in which a helium nucleus is emitted is called _____.

(A) gamma decay (B) alpha decay (C) negative β decay (D) positive β decay

15. In the figure, E_V and E_C are the valence band and conduction band corresponding to an extrinsic semiconductor. E is the energy state corresponding to the impurity present in it. The impurity present in it can be



(A) arsenic .

(B) indium

(C) phosphorous

(D) antimony

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II. Fill in the blanks by choosing appropriate answer given in the bracket for ALL the following questions: **5 × 1 = 5**

(maximum, decrease, thermonuclear fusion, generator, increase, cell)

16. A convenient way to increase the current sensitivity of a galvanometer is to _____ the number of turns of the coil.

17. The device used to convert mechanical energy into electrical energy is called a _____.

18. If two waves coming from two coherent sources superpose at a point in phase, then the intensity of light at that point is _____ .

19. The source of energy output in the interior of stars is _____.

20. The width of depletion region of a pn-junction diode will_____ on increasing the forward bias voltage**.**

PART – B

III. Answer any FIVE of the following questions: **5 × 2 = 10**

21. Mention any two basic properties of electric charges.

22. The amount of work done in bringing a point charge of 3 mC from infinity to a point P is 0.06 J. Find the electric potential at the point P.

23. Write the expression for magnetic force per unit length between two long straight parallel conductors carrying current. Give the nature of force between two parallel conductors carrying current in same direction.

24. State and explain Gauss's law in magnetism.

25. Mention any two factors on which self inductance of a long solenoid depends.

26. Briefly explain the construction of a transformer.

27. What is displacement current? Give expression for the same.

28. Write the two conditions required for total internal reflection.

29. Differentiate conductors from insulators on the basis of band theory of solids.

PART – C

IV. Answer any FIVE of the following questions: **5 × 3 = 15**

30. State and explain Coulomb's law. Define '1 çoulomb'.

31. Obtain the expression for potential energy of an electric dipole placed in a uniform electric field.

32. Mention three limitations of Ohm's law.

33. Obtain an expression for the radius of circular path taken by a charged particle moving perpendicular to a uniform magnetic field.

34. Mention any three differences between paramagnetic and diamagnetic materials.

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35. Explain briefly the coil and magnet experiment to demonstrate electromagnetic induction.

36. Write the Cartesian sign conventions used in analyzing reflection of light by spherical mirrors.

37. Give de Broglie's explanation of Bohr's second postulate of quantisation of angular momentum.

38. Calculate the mass defect and binding energy of $_7N^{14}$, given that the rest mass of nitrogen nucleus is 14.00307 u, rest mass of proton is 1.00783 u and rest mass of neutron is 1.00867 u.

PART – D

V. Answer any THREE of the following questions: 3 × 5 = 15

39. Derive the expression for capacitance of a parallel plate capacitor with air as dielectric. Write the expression for capacitance of a parallel plate capacitor with some dielectric medium introduced between the plates.

40. Obtain the condition for balance of Wheatstone bridge using Kirchhoff's rules.

41. Derive an expression for the magnetic field at a point on the axis of a circular current loop.

42. a) State Huygens principle. **(2)**

b) Using Huygens principle arrive at Snell's law of refraction for a plane wave. **(3)**

43. a) Define work function of a photosensitive material. **(1)**

b) What is meant by photoelectric effect? Give Einstein's explanation of photoelectric effect. **(4)**

44. What is rectification? Explain the working of a full wave rectifier using the circuit diagram. Also draw input-output waveforms.

VI. Answer any TWO of the following questions: 2 × 5 = 10

45. Two point charges each of +2 μ C are placed at the two corners A and B of an equilateral triangle ABC of side 0.2 m. Find the magnitude and direction of the resultant electric field at C.

46. The number density of free electrons in copper is estimated to be 8.5 x 10^{28} m^{-3}. A copper wire of length 3.0 m and area of cross-section 2.0 mm^2 is carrying a current of 3.0 A. Calculate the drift velocity of electrons. How long does an electron take to drift from one end of the wire to its other end?

47. A sinusoidal voltage of rms value 200 V and frequency 50 Hz is applied to a series RC circuit in which R = 5 Ω and C = 800 μF.

Calculate: a) impedance of the circuit and b) the current through the circuit.

48. A parallel beam of light is incident on one face of an equilateral prism. By rotating the prism, the angle of minimum deviation is measured to be 40^o. Determine the refractive index of the material of the prism. If the prism is immersed completely in water (refractive index = 1.33), calculate the new angle of minimum deviation.

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