CBSE Class 12 Physics Board-Style Question Paper (2024-25)

Maximum Marks: 70 Time: 3 Hours

Section A: Multiple Choice Questions (1 mark each)

1. Gauss's Law: The net electric flux through any closed surface that encloses charge Q is equal to: (A) Q/epsilon0 (B) Q (C) 0 (D) Qepsilon0

2. For a sinusoidal AC supply, the ratio of peak value V_peak to rms value V_rms is: (A) 1 (B) sqrt2 (C) 1/sqrt2 (D) pi

3. The magnetic field lines around a long straight current-carrying conductor are: (A) Radial (B) Concentric circles (C) Helical (D) Straight

4. In Young's double-slit experiment, if the slit separation d is doubled, the fringe width will: (A) Double (B) Halve (C) Same (D) Four times

5. Doping silicon with boron produces: (A) p-type (B) n-type (C) Insulator (D) Metal

6. 1 volt equals: (A) C/J (B) J/C (C) A/Ohm (D) Ohm/A

7. The stopping potential in a photoelectric experiment depends on: (A) Intensity (B) Frequency (C) Area (D) Polarization

8. The electric field inside a uniformly charged spherical shell is: (A) Zero (B) kQ/R^2 (C) kQ/(R^2 - r^2) (D) Varies

9. Capacitors in series: (A) C1+C2 (B) C1C2/(C1+C2) (C) 1/C1+1/C2 (D) (C1+C2)/(C1C2)

10. Resistance at 100°C is 1.4R. Find alpha: (A) 4x10-^3 (B) 6x10-^3 (C) 4x10-^4 (D) 6x10-^4

11. Lenz's Law: Induced current opposes: (A) Flux increase (B) Flux change (C) Irrelevant (D) Resistance

12. de Broglie wavelength is inversely proportional to: (A) Velocity (B) Momentum (C) Kinetic Energy (D) Charge

13. A diode in forward bias shows: (A) Zero current (B) Large current (C) Reverse current (D) Breakdown

14. Interference pattern in a thin film is colorful because: (A) Varying thickness (B) Different lambda interfere (C) Refraction varies (D) Absorption

15. Time constant RC. If R is halved, C doubled, tau becomes: (A) 1/4 RC (B) 1/2 RC (C) RC (D) 2RC

16. Magnetic moment mu has units of: (A) J/T (B) C·m^2/s (C) Wb·A (D) m^3/s

Section B: Short Answer Questions (2-3 marks)

17. Write the expression for electric potential at distance r from a point charge Q. State its SI unit.

18. A ring of radius R has charge Q. Find electric field at point x on its axis.

19. A wire of area 1.0x10-^6 m^2 carries 2.0 A. Find current density.

20. State lens formula and sign convention for real images.

21. 5 V across resistor gives 0.2 A. Find resistance. What happens if voltage doubles?

22. Sketch electric field and equipotentials for a dipole.

23. Charge +Q at center of cube. Find flux through one face.

24. Capacitors 2muF, 3muF, 6muF in series. Find equivalent capacitance.

25. Describe resonance in L-C circuit and define quality factor.

26. Find energy of 500 nm photon in eV.

27. Explain p-n-p transistor and how it acts as a switch.

Section C: Long Answer Questions (5 marks)

28. Write Maxwell's equations in vacuum. Show EM waves travel at c = 1/sqrt(mu_0*epsilon_0).

29. Derive radius of N-th bright fringe in Newton's rings.

30. Calculate binding energy from mass defect: mass = 238.05078 u, separate nucleons = 238.06894 u.

31. Sodium photoelectric threshold lambda = 600 nm. Find work function. For 400 nm light, find max KE.

32. Define dipole moment. Derive E-field on axis of dipole at far point.

33. Draw and explain full-wave bridge rectifier with capacitor filter.