MAHARASHTRA BOARD · CLASS 12 · PHYSICS

Maharashtra Board Class 12 Physics Guess Paper 2027

Time: 3 hours · Maximum marks: 70 · 37 questions

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Section A

Q1 ten MCQs (1 mark each) and Q2 eight very short answer questions (1 mark each)

Q1. The Boolean equation for NOR gate is (a) Y = A.B (b) Y = (A + B) bar (c) Y = A bar (d) Y = A + B — 1 mark

Q2. A conducting rod of length l, rotates about one of its ends in a uniform magnetic field B, with a constant angular velocity omega. If the plane of rotation is perpendicular to B, the e.m.f. induced between the ends of rod is _____. (a) (1/2) B omega l^2 (b) B omega l^2 (c) 2 B omega l^2 (d) B omega l — 1 mark

Q3. The power rating of a ceiling fan rotating with a constant torque of 2 Nm with an angular speed of 2 pi rad/s will be _____. (a) pi W (b) 2 pi W (c) 3 pi W (d) 4 pi W — 1 mark

Q4. Cyclotron can not accelerate _____ (a) protons (b) alpha-particles (c) neutrons (d) deuterons — 1 mark

Q5. In a purely inductive and capacitive circuit, power factor is, _____ (a) one (b) zero (c) infinity (d) 10 — 1 mark

Q6. The MI of ring of radius 'R' and mass 'M' about its central axis is _____ (a) 2 MR^2 (b) $MR^2/2$ (c) MR^2 (d) (3/2) MR^2 — 1 mark

Q7. When n number of capacitors having each of capacity 'C' are connected in series, their equivalent capacity is (a) 1/C (b) nC (c) C/n (d) 1/(nC) — 1 mark

Q8. What is the coefficient of transmission for athermanous materials? — 1 mark

Q9. An electron, a proton, an alpha-particle and a hydrogen atom are moving with the same kinetic energy. The associated de-Broglie wavelength will be longest for - (a) proton (b) electron (c) hydrogen atom (d) alpha-particle — 1 mark

Q10. When a number of droplets coalesce to form a single drop, the total surface area of the drop _____. (a) decreases (b) becomes zero (c) remains same (d) increases — 1 mark

Q11. What is magnetization? — 1 mark

Q12. Define mutual inductance. — 1 mark

Q13. What is the mathematical formula for third postulate of Bohr's atomic model? — 1 mark

Q14. What is the resistance of an ideal voltmeter? — 1 mark

Q15. Write the differential equation for linear S.H.M. — 1 mark

Q16. State the formula for electric field intensity due to uniformly charged spherical shell. — 1 mark

Q17. Write the mathematical formula for Bohr magneton for an electron revolving in nth orbit. — 1 mark

Q18. What do you mean by logic gate? — 1 mark

Section B
Short answer questions, 2 marks each (attempt any 8 of 12)

Q19. For a thermodynamic system : Define : (a) Mechanical equilibrium (b) Chemical equilibrium — 2 marks

Q20. A galvanometer has a resistance of 100 ohm and its full scale deflection current is 0.2 mA, what resistance should be added to it to have a range of 0-10V? — 2 marks

Q21. An alternating voltage source given by e = 140 sin(314.2 t) is connected across a pure resistor of 50 ohm. Determine : (i) Frequency of the source. (ii) RMS value of emf. — 2 marks

Q22. Obtain an expression for the maximum speed of a vehicle along horizontal circular curved road. — 2 marks

Q23. Explain the working of a transformer with a neat, labelled diagram. — 2 marks

Q24. Distinguish between harmonics and overtones. [Any Two points] — 2 marks

Q25. Two tuning forks having frequencies 160 Hz and 170 Hz are sounded together to produce sound waves. The velocity of sound in air is 326.4 m/s. Calculate the difference between wavelengths of these waves. — 2 marks

Q26. Derive an expression for the magnetic field produced by a current in a circular arc of a wire using Biot-Savart law. — 2 marks

Section C
Short answer questions, 3 marks each (attempt any 8 of 12)

Q27. Calculate the shortest wavelength of Paschen series and the longest wavelength of Balmer series for hydrogen atom. — 3 marks

Q28. Derive an expression for the impedance of a series LCR circuit connected to an AC power supply. — 3 marks

Q29. What is an isothermal process? Obtain an expression for work done by a gas in an isothermal process. — 3 marks

Q30. Define photoelectric effect and explain the experimental set-up of photoelectric effect. — 3 marks

Q31. Define surface tension. Obtain the relation between surface tension and surface energy. — 3 marks

Q32. What is interference of light? State any four conditions for obtaining well defined and steady interference pattern. — 3 marks

Q33. With a neat circuit diagram, explain the working of a full wave rectifier. Draw input-output waveforms. — 3 marks

Q34. 0.5 mole of an ideal gas at 300 K, expands isothermally from an initial volume of 2 L to a final volume of 6 L. Calculate : (a) work done by the gas (b) heat supplied to the gas [Given : R = 8.31 J mol^{-1} K^{-1}] — 3 marks

Section D

Long answer questions, 4 marks each (attempt any 3 of 5)

Q35. Using analytical method, obtain an expression for the fringe width of two interfering waves. — 4 marks

Q36. Obtain an expression for magnetic induction of a toroid of N no. of turns about an axis passing through its centre and perpendicular to plane. [Second part:] A Carnot refrigerator operates between 150 K and 200 K, calculate its coefficient of performance. — 4 marks

Q37. State differential equation of linear S.H.M. hence obtain an expression for acceleration, velocity and displacement of a particle performing S.H.M. — 4 marks

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