



PHYSICS

Class 12 - Physics

Time Allowed: 3 hours

Maximum Marks: 70

General Instructions:

The question paper is divided into **four sections**:

1. **Section A**

- Q. No. 1 contains **Ten multiple choice type** of questions carrying **One mark** each.
- Q. No. 2 contains **Eight very short answer type** of questions carrying **One mark** each.

2. **Section B**

- Q. No. 3 to Q. No. 14 contain **Twelve short answer type** of questions carrying **Two marks** each. (Attempt any Eight).

3. **Section C**

- Q. No. 15 to Q. No. 26 contain **Twelve short answer type** of questions carrying **Three marks** each. (Attempt any Eight).

4. **Section D**

- Q. No. 27 to Q. No. 31 contain **Five long answer type** of questions carrying **Four marks** each. (Attempt any Three).

5. Use of the log table is allowed. Use of calculator is not allowed.

6. Figures to the right indicate full marks.

7. For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabet. e.g.,

(a)...../(b)...../(c)...../(d) No marks(s) shall be given, if **ONLY** the correct answer or the alphabet of the correct answer is written. Only the first attempt will be considered for evaluation.

Section A

1. **Select and write the correct answers for the following multiple choice type of questions:** [10]

(a) The photoelectric threshold wavelength of certain metal is 3315 A.U. Then its work function is [1]

_____.

a) $9 \times 10^{-19} J$

b) $6 \times 10^{-19} J$

c) $7.286 \times 10^{-19} J$

d) $9.945 \times 10^{-19} J$

(b) A graph of pressure versus volume for an ideal gas for different processes is as shown. In the graph [1]
curve OA represents _____.

- a) both base-emitter and base-collector junctions are reverse biased.
- b) base-emitter junction is reverse biased and base-collector junction is forward biased.
- c) base-emitter junction is forward biased and base-collector junction is reverse biased.
- d) both base-emitter and base-collector junctions are forward biased.

2. **Answer the following questions:** [8]
- (a) State Einstein's photoelectric equation. [1]
- (b) Define the term **damped oscillations**. [1]
- (c) State the conditions for current and impedance in parallel resonance circuit. [1]
- (d) What is shunt? [1]
- (e) State and prove theorem of parallel axes about moment of inertia. [1]
- (f) State the formula for electric field intensity at a point outside an infinitely long charged cylindrical conductor. [1]
- (g) What is the value of force on a closed circuit in a magnetic field? [1]
- (h) Define gyromagnetic ratio. [1]

Section B

Attempt any 8 questions

3. Define coefficient of viscosity. State its formula and S.I. units. [2]
4. Draw a neat and labelled diagram of suspended coil type moving coil galvanometer. [2]
5. Explain the concept of centripetal force. [2]
6. Define capacitance of a capacitor and its S.I. unit. [2]
7. Define phase of S.H.M.
Show variation of displacement, velocity and acceleration with phase for a particle performing linear S.H.M. graphically, when it starts from extreme position. [2]
8. What are mechanical equilibrium and thermal equilibrium? [2]
9. A 0.1 H inductor, a $25 \times 10^{-6} F$ capacitor and a 15Ω resistor are connected in series to a 120 V, 50 Hz AC source. Calculate the resonant frequency. [2]
10. Calculate the velocity of a particle performing S.H.M. after 1 second, if its displacement is given by $x = 5 \sin\left(\frac{\pi t}{3}\right) m$. [2]
11. State the principle of superposition of waves. [2]
12. At what temperature will average kinetic energy of gas be exactly half of its value at N.T.P.? [2]
13. Resistance of a potentiometer wire is $0.1\Omega/cm$. A cell of e.m.f. 1.5 V is balanced at 300 cm on this potentiometer wire. Calculate the current and balancing length for another cell of e.m.f. 1.4 V on the same potentiometer wire. [2]
14. Determine the shortest wavelengths of Balmer and Paschen series. Given the limit for Lyman series is 912\AA . [2]

Section C

Attempt any 8 questions

15. State the conditions necessary for obtaining sharp and steady interference pattern. [3]
16. Draw neat, labelled diagram of a parallel plate capacitor with a dielectric slab between the plates. [3]
17. Define magnetization. Write its SI unit and dimensions. [3]
18. What is photoelectric effect? [3]

Define:

- i. Stopping potential
 - ii. Photoelectric work function.
19. State any 'two' possible sources of errors in metrebridge experiment. How can they be minimised? [3]
 20. State the points of comparison between progressive waves and stationary waves. [3]
 21. Explain, why the equivalent inductance of two coils connected in parallel is less than the inductance of either of the coils. [3]
 22. A simple harmonic progressive wave is given by the equation $Y = 0.1 \sin 4\pi(50t - 0.1x)$ in S.I. units. Find the amplitude, frequency, wavelength and velocity of the wave. [3]
 23. Determine the change in wavelength of light during its passage from air to glass. If the refractive index of glass with respect to air is 1.5 and the frequency of light is 3.5×10^{14} Hz, find the wave number of light in glass. [Velocity of light in air ($c = 3 \times 10^8$ m/s)] [3]
 24. A circular coil of 250 turns and diameter 18 cm carries a current of 12 A. What is the magnitude of magnetic moment associated with the coil? [3]
 25. A 100Ω resistor is connected to a 220 V, 50 Hz supply. Calculate: [3]
 - i. r.m.s. value of current and
 - ii. net power consumed over the full cycle
 26. Disintegration rate of a radio-active sample is 10^{10} per hour at 20 hours from the start. It reduces to 5×10^9 per hour after 30 hours. Calculate the decay constant. [3]

Section D

Attempt any 3 questions

27. Derive an expression for terminal velocity of a spherical object falling under gravity through a viscous medium. [4]
28. Answer the following questions: [4]
 - (a) Distinguish between step-up and step-down transformer. [2]
 - (b) An emf of 96.0 mV is induced in the windings of a coil when the current in a nearby coil is increasing at the rate of 1.20 A/s. What is the mutual inductance (M) of the coils? [2]
29. Answer the following questions: [4]
 - (a) What is a thermodynamic process? Give any two types of it. [2]
 - (b) 104 J of work is done on certain volume of a gas. If the gas releases 125 kJ of heat, calculate the change in internal energy of the gas. [2]
30. Answer: [4]
 - (a) What is perfectly black body? [2]
 - (b) The kinetic energy of nitrogen per unit mass at 300 K is 2.5×10^6 J/Kg. Find the kinetic energy of 4 kg oxygen at 600 K. [Molecular weight of nitrogen = 28, Molecular weight of oxygen = 32] [2]
31. State and prove theorem of parallel axes. [4]