

12TH STANDARD PHYSICS

QUESTION WISE PYQ

PRINT KAR AND STUDY KAR
SERIES 2026



$$V_E = \frac{m_s}{\rho} \quad k = \sqrt{(a+n)^2}$$

$$f \times r$$

$$V = cr$$

19

$$V = \frac{\pi}{\lambda}$$

$$E = mc^2 = h\nu$$

12th Science (HSC) | Physics | Question wise PYQ

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June 2025 | Q.1 Select and Write the correct Answer

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Q.1. Select and write the correct answer for the following multiple choice type of questions:

[10]

- i. For which of the following bodies, the principle of perpendicular axes is applicable?
(A) Spherical (B) Conical (C) Cylindrical (D) Laminar
- ii. Which of the following equation represents a simple harmonic progressive wave travelling along the negative X-direction?
(A) $Y = a \sin(kx - \omega t)$ (B) $Y = a \sin(kx + \omega t)$
(C) $Y = a \sin(ky - \omega t)$ (D) $Y = a \sin(ky + \omega t)$
- iii. In a cyclotron final kinetic energy of a particle revolving in a circular path of radius 'R' exit is:
(A) $K.E. \propto R_{\text{exit}}$ (B) $K.E. \propto R_{\text{exit}}^2$
(C) $K.E. \propto \frac{1}{R_{\text{exit}}}$ (D) $K.E. \propto \frac{1}{R_{\text{exit}}^2}$
- iv. For which of the following metals, photoelectric effect is possible for visible radiation?
(A) Zinc (B) Cadmium (C) Magnesium (D) Sodium
- v. The gyromagnetic ratio of electron is _____.
(A) $\frac{2m_e}{e}$ (B) $\frac{2m_e}{e^2}$
(C) $\frac{e}{2m_e}$ (D) $\frac{e^2}{2m_e}$
- vi. Two capillary tubes of radii 0.3 cm and 0.6 cm are dipped in the same liquid, the ratio of heights to which the liquid will rise in the tubes is _____.
(A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1
- vii. Kirchoff's Voltage Law applied to a loop deals with the conservation of _____.
(A) momentum (B) mass (C) energy (D) charge
- viii. How many times the intensity of an unpolarized light wave reduces after passing through a polarizer?
(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{6}$ (D) $\frac{1}{8}$
- ix. If pressure of gas contained in a closed vessel is increased by 0.4% when heated by 1°C, its initial temperature must be _____.
(A) 200°C (B) 250°C (C) 300°C (D) 350°C
- x. The wavelength and power of the incident light is 4000 Å and 0.1W respectively. The number of incident photons is _____.
(A) 2.011×10^{17} (B) 3.011×10^{17}
(C) 4.011×10^{17} (D) 5.011×10^{17}

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Easy Notes By Sai Sir

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

- i. "If two systems are each in thermal equilibrium with a third system, they are also in thermal equilibrium with each other." This statement refers to:
- (A) zeroth law of thermodynamics (B) first law of thermodynamics
(C) second law of thermodynamics (D) Carnot's law
- ii. In Bernoulli's theorem, which of the following is constant?
- (A) Linear momentum (B) Angular momentum
(C) Mass (D) Energy
- iii. Which of the following materials belongs to diathermanous substance?
- (A) wood (B) iron
(C) glass (D) copper
- iv. Electric potential 'V' at a distance 'r' from a point charge is directly proportional to _____.
- (A) r (B) r^2
(C) $\frac{1}{r}$ (D) $\frac{1}{r^2}$
- v. Which of the following equations gives correct expression for the internal resistance of a cell by using potentiometer?
- (A) $r = R\left(\frac{V}{E} - 1\right)$ (B) $r = R\left(1 - \frac{E}{V}\right)$
(C) $r = R\left(1 - \frac{V}{E}\right)$ (D) $r = R\left(\frac{E}{V} - 1\right)$
- vi. An electron, a proton, an α -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) α -particle
- vii. The gate which produces high output, when its both inputs are high is –
- (A) X-OR gate (B) AND gate
(C) NAND gate (D) NOR gate
- viii. The power rating of a ceiling fan rotating with a constant torque of 2 Nm with an angular speed of 2π rad/s will be _____.
- (A) π W (B) 2π W
(C) 3π W (D) 4π W
- ix. A string of length 2 m is vibrating with 2 loops. The distance between its node and adjacent antinode is _____.
- (A) 0.5 m (B) 1.0 m
(C) 1.5 m (D) 2.0 m
- x. A transformer increases an alternating e.m.f. from 220V to 880V. If primary coil has 1000 turns, the number of turns in the secondary coil are _____.
- (A) 1000 (B) 2000
(C) 3000 (D) 4000

Q.1. Select and write the correct answers for the following multiple choice type of questions:

[10]

- i. Atoms having the same number of protons but different number of neutrons are called _____.
- (A) isotopes (B) isobars
(C) isotones (D) isomers
- ii. The molecules on the surface of liquid have _____.
- (A) minimum kinetic energy. (B) minimum potential energy.
(C) maximum kinetic energy. (D) maximum potential energy.
- iii. If coefficient of emission is 'e' for a perfectly black body and coefficient of transmission is 't' then _____.
- (A) $e = 0, t = 1$ (B) $e = 1, t = 1$
(C) $e = 0, t = 0$ (D) $e = 1, t = 0$
- iv. An LED emits light when its _____.
- (A) junction is reverse biased. (B) depletion region widens.
(C) holes and electrons recombine. (D) junction becomes hot.
- v. An electron, a proton, an α -particle and a hydrogen atom are moving with the same kinetic energy. The associated de Broglie wavelength will be the longest for _____.
- (A) electron (B) proton
(C) α -particle (D) hydrogen atom
- vi. Cyclotron is used to accelerate _____.
- (A) neutral particles (B) negatively charged particles
(C) positively charged particles (D) all types of particles
- vii. The unit henry is equal to _____.
- (A) watt (B) ohm-second
(C) dyne (D) Wb/m^2
- viii. The ratio of emissive power of a perfect black body at 927°C and 327°C is _____.
- (A) 2 : 1 (B) 4 : 1
(C) 8 : 1 (D) 16 : 1
- ix. In a series LCR circuit the phase difference between the voltage and the current is 45° . Then the power factor will be _____.
- (A) 0.6071 (B) 0.7071
(C) 0.8081 (D) 1.0
- x. When an air column in a pipe closed at one end vibrates such that two nodes are formed in it, the frequency of its vibration is _____.
- (A) two times the fundamental frequency
(B) three times the fundamental frequency
(C) four times the fundamental frequency
(D) five times the fundamental frequency

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Easy Notes By Sai Sir

Q.1. Select and write the correct answers for the following multiple choice type of questions:

- i. The moment of inertia (MI) of a disc of radius R and mass M about its central axis is _____.
- (A) $\frac{MR^2}{4}$ (B) $\frac{MR^2}{2}$ (C) MR^2 (D) $\frac{3MR^2}{2}$
- ii. The dimensional formula of surface tension is _____.
- (A) $[L^{-1}M^1T^{-2}]$ (B) $[L^2M^1T^{-2}]$ (C) $[L^1M^1T^{-1}]$ (D) $[L^0M^1T^{-2}]$
- iii. Phase difference between a node and an adjacent antinode in a stationary wave is _____.
- (A) $\frac{\pi}{4}$ rad (B) $\frac{\pi}{2}$ rad (C) $\frac{3\pi}{4}$ rad (D) π rad
- iv. The work done in bringing a unit positive charge from infinity to a given point against the direction of electric field is known as _____.
- (A) electric flux (B) magnetic potential
(C) electric potential (D) gravitational potential
- v. To convert a moving coil galvanometer into an ammeter we need to connect a _____.
- (A) small resistance in parallel with it (B) large resistance in series with it
(C) small resistance in series with it (D) large resistance in parallel with it
- vi. If the frequency of incident light falling on a photosensitive material is doubled, then kinetic energy of the emitted photoelectron will be _____.
- (A) the same as its initial value (B) two times its initial value
(C) more than two times its initial value (D) less than two times its initial value
- vii. In a cyclic process, if ΔU = internal energy, W = work done, Q = Heat supplied then
- (A) $\Delta U = Q$ (B) $Q = 0$ (C) $W = 0$ (D) $W = Q$
- viii. The current in a coil changes from 50A to 10A in 0.1 second. The self inductance of the coil is 20H. The induced e.m.f. in the coil is _____.
- (A) 800V (B) 6000V (C) 7000V (D) 8000V
- ix. The velocity of bob of a second's pendulum when it is 6 cm from its mean position and amplitude of 10 cm, is _____.
- (A) 8π cm/s (B) 6π cm/s (C) 4π cm/s (D) 2π cm/s
- x. In biprism experiment, the distance of 20th bright band from the central bright band is 1.2 cm. Without changing the experimental set-up, the distance of 30th bright band from the central bright band will be _____.
- (A) 0.6 cm (B) 0.8 cm (C) 1.2 cm (D) 1.8 cm

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Q.1. Select and write the correct answer for the following multiple choice type of questions:

- (i) A body performing uniform circular motion has constant _____.
- (a) velocity (b) kinetic energy
(c) displacement (d) acceleration
- (ii) When soluble substance such as common salt (i.e. sodium chloride) is dissolved in water, surface tension of water _____.
- (a) decreases (b) becomes zero
(c) remains the same (d) increases
- (iii) Periodic time of angular oscillations of a bar magnet is proportional to the _____.
- (a) ratio of moment of inertia and magnetic field
(b) ratio of magnetic field and moment of inertia
(c) square root of the ratio of moment of inertia and magnetic field
(d) square root of the ratio of magnetic field and moment of inertia
- (iv) The coefficient of absorption of a body is equal to its coefficient of emission at a given temperature is called _____.
- (a) Stefan's law (b) Newton's law of cooling
(c) Kirchhoff's law of heat radiation (d) Boyle's law
- (v) The second law of thermodynamics deals with the transfer of _____.
- (a) work done (b) energy
(c) pressure (d) heat
- (vi) Which of the following phenomenon proves that light is a transverse wave _____.
- (a) Reflection (b) Interference
(c) Diffraction (d) Polarization
- (vii) Magnitude of induced e.m.f. produced between the ends of a conductor of length $\frac{L}{2}$ moving with a uniform velocity 'v' at right angles to a uniform magnetic field of intensity '2B' will be _____.
- (a) $\frac{BLv}{4}$ (b) $\frac{BLv}{2}$
(c) BLv (d) $2BLv$
- (viii) Solar cell operates on the principle of _____.
- (a) diffusion (b) recombination
(c) photovoltaic action (d) photoelectric effect
- (ix) A body performing linear S. H. M. experiences a force of 0.2 N when displaced through 4 cm from the mean position. Its force constant will be _____.
- (a) 2 N/m (b) 2.5 N/m
(c) 5 N/m (d) 8 N/m
- (x) If a current of 1A flows through a solenoid of length 25 cm and made up of 250 turns of copper wire then the magnitude of magnetic induction inside the solenoid will be _____.
- (a) 0.12568×10^{-3} T (b) 1.2568×10^{-3} T
(c) 1.2568×10^2 T (d) 1.2568×10^4 T

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Q.1. Select and write the correct answers for the following multiple choice type of questions:

- i. If 'n' is the number of molecules per unit volume and 'd' is the diameter of the molecules, the mean free path ' λ ' of molecules is
- (A) $\sqrt{\frac{2}{\pi nd}}$ (B) $\frac{1}{2 \pi nd^2}$ (C) $\frac{1}{\sqrt{2} \pi nd^2}$ (D) $\frac{1}{\sqrt{2} \pi nd}$
- ii. The first law of thermodynamics is consistent with the law of conservation of _____.
- (A) momentum (B) energy (C) mass (D) velocity
- iii. $Y = \overline{A + B}$ is the Boolean expression for _____.
- (A) OR - gate (B) AND - gate (C) NOR - gate (D) NAND - gate
- iv. The property of light which remains unchanged when it travels from one medium to another is _____.
- (A) velocity (B) wavelength (C) amplitude (D) frequency
- v. If a circular coil of 100 turns with a cross-sectional area of 1 m^2 is kept with its plane perpendicular to the magnetic field of 1 T, the magnetic flux linked with the coil will be _____.
- (A) 1 Wb (B) 50 Wb (C) 100 Wb (D) 200 Wb
- vi. If ' θ ' represents the angle of contact made by a liquid which completely wets the surface of the container then _____.
- (A) $\theta = 0$ (B) $0 < \theta < \frac{\pi}{2}$ (C) $\theta = \frac{\pi}{2}$ (D) $\frac{\pi}{2} < \theta < \pi$
- vii. The LED emits visible light when its _____.
- (A) junction is reverse biased (B) depletion region widens
(C) holes and electrons recombine (D) junction becomes hot
- viii. Soft iron is used to make the core of transformer because of its _____.
- (A) low coercivity and low retentivity (B) low coercivity and high retentivity
(C) high coercivity and high retentivity (D) high coercivity and low retentivity
- ix. If the maximum kinetic energy of emitted electrons in photoelectric effect is 2eV, the stopping potential will be _____.
- (A) 0.5 V (B) 1.0 V (C) 1.5 V (D) 2.0 V
- x. The radius of eighth orbit of electron in H-atom will be more than that of fourth orbit by a factor of _____.
- (A) 2 (B) 4 (C) 8 (D) 16

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Q.1. Select and write the correct answers for the following multiple choice type of questions:

- (i) Raindrops are spherical in shape because of _____.
- (a) surface tension (b) capillarity
(c) downward motion (d) acceleration due to gravity
- (ii) The average K.E. of a gas is _____.
- (a) directly proportional to absolute temperature of gas
(b) directly proportional to square of absolute temperature of gas
(c) directly proportional to square root of absolute temperature of gas
(d) inversely proportional to absolute temperature of gas
- (iii) A graph of pressure versus volume for an ideal gas for different processes is as shown. In the graph curve OA represents _____.
- (a) isochoric process
(b) isothermal process
(c) isobaric process
(d) adiabatic process
-
- (iv) Standing waves are produced on a string fixed at both ends. In this case _____.
- (a) all particles vibrate in phase
(b) all antinodes vibrate in phase
(c) all alternate antinodes vibrate in phase
(d) all particles between two consecutive antinodes vibrate in phase
- (v) What changes are observed in a diffraction pattern if the whole apparatus is immersed in water?
- (a) the wavelength of light increases
(b) width of central maximum increases
(c) width of central maximum decreases
(d) frequency of light decreases
- (vi) The magnitude of the magnetic field at the centre of a circular current carrying coil varies _____.
- (a) inversely with the square of the radius of the coil
(b) directly with the radius of the coil
(c) inversely with the radius of the coil
(d) directly with the square of the radius of the coil
- (vii) Balmer series is obtained when all transitions of electron terminate on _____.
- (a) 2nd orbit (b) 1st orbit
(c) 3rd orbit (d) 4th orbit
- (viii) A simple harmonic oscillator has amplitude 16 cm and period 4 seconds. The interval of time required by it to travel from $x = 16$ cm to $x = 8$ cm is _____.
- (a) $\frac{1}{2}$ second (b) $\frac{2}{3}$ second
(c) $\frac{5}{6}$ second (d) $\frac{4}{3}$ second
- (ix) In potentiometer experiment, the cell balances at a length of 240 cm. When the cell is shunted by a resistance of 2Ω , the balancing length becomes 120 cm. The internal resistance of the cell is _____.
- (a) 4Ω (b) 2Ω
(c) 1Ω (d) 0.5Ω
- (x) A small piece of metal wire is dragged across the gap between the pole pieces of magnet in 0.5 second. The magnetic flux between the pole pieces is 8×10^{-4} weber. The emf induced in the wire is _____.
- (a) 1.6 millivolt (b) 16 millivolt
(c) 1.6 volt (d) 16 volt

Q.1. Select and write the correct answers for the following multiple choice type of questions:

- (i) The first law of thermodynamics is concerned with the conservation of _____.
(a) momentum (b) energy
(c) temperature (d) mass
- (ii) The average value of alternating current over a full cycle is always _____.
[I_0 = Peak value of current]
(a) zero (b) $\frac{I_0}{2}$
(c) $\frac{I_0}{\sqrt{2}}$ (d) $2 I_0$
- (iii) The angle at which maximum torque is exerted by the external uniform electric field on the electric dipole is _____.
(a) 0° (b) 30°
(c) 45° (d) 90°
- (iv) The property of light which does not change, when it travels from one medium to another is _____.
(a) velocity (b) wavelength
(c) frequency (d) amplitude
- (v) The root mean square speed of the molecules of a gas is proportional to _____.
[T = Absolute temperature of gas]
(a) \sqrt{T} (b) $\frac{1}{\sqrt{T}}$
(c) T (d) $\frac{1}{T}$
- (vi) The unit Wbm^{-2} is equal to _____.
(a) henry (b) watt
(c) dyne (d) tesla
- (vii) When the bob performs a vertical circular motion and the string rotates in a vertical plane, the difference in the tension in the string at horizontal position and uppermost position is _____.
(a) mg (b) 2 mg
(c) 3 mg (d) 6 mg
- (viii) A liquid rises in glass capillary tube upto a height of 2.5 cm at room temperature. If another glass capillary tube having radius half that of the earlier tube is immersed in the same liquid, the rise of liquid in it will be _____.
(a) 1.25 cm (b) 2.5 cm
(c) 5 cm (d) 10 cm
- (ix) In young's double slit experiment the two coherent sources have different amplitudes. If the ratio of maximum intensity to minimum intensity is 16:1, then the ratio of amplitudes of the two source will be _____.
(a) 4 : 1 (b) 5 : 3
(c) 1 : 4 (d) 1 : 16

Q.1. Select and write correct answers of the following questions :

- i. If the length of a potentiometer wire is increased by keeping constant potential difference across the wire, then _____.
- (A) null point is obtained at larger distance (B) there is no change in the null point
(C) potential gradient is increased (D) null point is obtained at shorter distance
- ii. If a coil of metal wire is kept stationary in a uniform magnetic field, then _____.
- (A) an e.m.f. is induced in the coil (B) a current is induced in the coil
(C) neither e.m.f. nor current is induced (D) both current and e.m.f. are induced
- iii. In rotational motion of a rigid body, all particles move with _____.
- (A) same linear velocity and same angular velocity
(B) same linear velocity and different angular velocity
(C) different linear velocities and same angular velocities
(D) different linear velocities and different angular velocities
- iv. A standing wave is produced on a string fixed at one end and free at other. The length of string must be an _____.
- (A) odd integral multiple of $\frac{\lambda}{4}$ (B) integral multiple of $\frac{\lambda}{2}$
(C) integral multiple of λ (D) integral multiple of $\frac{\lambda}{4}$
- v. Herapathite (iodo sulphate of quinine) is used in the production of _____.
- (A) achromatic prism (B) polaroid (C) biprism (D) solar cell
- vi. A diffraction pattern is obtained by making blue light incident on a narrow slit. If blue light is replaced by red light, then the diffraction bands _____.
- (A) disappear (B) become broader (C) become narrower (D) remain same
- vii. Two droplets coalesce in a single drop. In this process _____.
- (A) energy is liberated (B) energy is absorbed
(C) energy does not change (D) some mass is converted into energy
- viii. In hydrogen atom, electron jumps from the 3rd orbit to the 1st orbit. The change in angular momentum is _____.
- (A) 1.05×10^{-34} Js (B) 2.11×10^{-34} Js (C) 3.16×10^{-34} Js (D) 4.22×10^{-34} Js
- ix. A fixed volume of iron is drawn into a wire of length 'L'. The extension 'x' produced in the wire by a constant force 'F' is proportional to _____.
- (A) $\frac{1}{L^2}$ (B) $\frac{1}{L}$ (C) L^2 (D) L
- x. Two tuning forks have frequencies 450 Hz and 454 Hz respectively. On sounding these forks together, the time interval between two successive maximum intensities will be _____.
- (A) $\frac{1}{4}$ s (B) $\frac{1}{2}$ s (C) 1s (D) 4s

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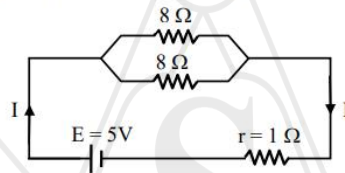
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Easy Notes By Sai Sir

- Q.1** If the kinetic energy of hydrogen is 151.91 J at the pressure of 1 atmosphere, then its volume is (1)
 (A) 3 litre (B) 2 litre
 (C) 1 litre (D) 0.5 litre
- Q.2** A wavelength in the middle of visible spectrum will be shifted towards red when the source and the observer move away from each other. This is due to (1)
 (A) interference of light (B) dispersion of light
 (C) polarisation of light (D) Doppler effect in light
- Q.3** If the longitudinal wave travelling in rarer medium is incident on the boundary of denser medium, then the phase of wave changes by (1)
 (A) 2π rad (B) π rad
 (C) $\frac{\pi}{2}$ rad (D) $\frac{\pi}{4}$ rad
- Q.4** In a step-up transformer, ratio of the turns is (1)
 (A) greater than 1 (B) less than 1
 (C) equal to 1 (D) never equal to 1
- Q.5** What happens if the rod of dia-magnetic material is placed in a nonuniform magnetic field? (1)
- Q.6** Find the total current 'I' flowing through the following circuit:



- (1)
- Q.7** What is the expression for minimum angular momentum of electron in hydrogen atom? (1)
- Q.8** A rod of length 4 cm is movable on a rectangular frame of wire. A film is formed in the frame. A force of 3.2×10^{-3} N is applied to the rod for its equilibrium. Find the surface tension of the liquid. (1)

- Q.1** When a sparingly soluble substance like alcohol is dissolved in water, surface tension of water (1)
 (A) increases (B) decreases
 (C) remains constant (D) becomes infinite
- Q.2** The specific heat capacity of water is (1)
 (A) 8R (B) $\frac{7}{8}$ R
 (C) 9R (D) $\frac{9}{7}$ R
- Q.3** The electric field intensity outside the charged conducting sphere of radius 'R', placed in a medium of permittivity ϵ at a distance 'r' from the centre of the sphere in terms of surface charge density σ is (1)
 (A) $\frac{\sigma}{\epsilon} \left(\frac{R}{r}\right)^2$ (B) $\frac{\sigma}{\epsilon} \left(\frac{r}{R}\right)^2$
 (C) $\frac{\sigma}{\epsilon} \left(\frac{R}{r^2}\right)^2$ (D) $\frac{\epsilon}{\sigma} \left(\frac{r}{R}\right)^2$
- Q.4** An electron of energy 150 eV has wavelength of 10^{-10} m. The wavelength of a 0.60 keV electron is (1)
 (A) 0.50 Å (B) 0.75 Å
 (C) 1.2 Å (D) 1.5 Å
- Q.5** What is the value of tangential acceleration in U.C.M. ? (1)
- Q.6** What happens to a ferromagnetic substance heated above Curie temperature? (1)
- Q.7** At which position of the plane of the rotating coil with the direction of magnetic field, the e.m.f. induced in the coil is maximum? (1)
- Q.8** Name the logic gate which generates high output when at least one input is high. (1)

Q.2. Answer the following questions:

[8]

- i. What is the velocity of a particle performing linear SHM, at extreme position?
- ii. What happens to the ferromagnetic substance when it is heated above Curie temperature?
- iii. What is the coefficient of transmission for athermanous materials?
- iv. In a photodiode, on which property the dark current depends?
- v. Define mutual inductance.
- vi. What is magnetization?
- vii. A metal ring of radius 20 cm is rotating about a transverse axis passing through its centre. What will be its radius of gyration about the same axis?
- viii. In a hydraulic lift, area of pistons are A_1 and A_2 respectively ($A_2 \gg A_1$). If force F_1 is applied on piston 1, then what is the force exerted on piston 2?

Feb 2025 | Q.2 Answer the following

Q.2. Answer the following questions:

[8]

- i. At what temperature the surface tension of a liquid becomes zero?
- ii. Define self inductance.
- iii. What is the work done by an external uniform magnetic field perpendicular to the velocity of a moving charge?
- iv. What do you mean by a thermodynamic system?
- v. What is value of B called, when $H = 0$ is in the hysteresis loop?
- vi. State the formula for angle of banking.
- vii. Calculate the electric fields intensity at a point just near the surface of a charged plane sheet, measured from its mid-point.
[$\sigma = 8.85 \mu\text{C}/\text{m}^2$]
- viii. Find kinetic energy of 1 litre of an ideal gas at S.T.P.

July 2024 | Q.2 Answer the following

Q.2. Answer the following questions:

[8]

- i. What is the radius of gyration of a solid sphere of radius R about its diameter?
- ii. Write the differential equation for liner S.H.M.
- iii. State any one method of polarization of light.
- iv. What is the resistance of an ideal voltmeter?
- v. What are eddy currents?
- vi. What do you mean by logic gate?
- vii. A body of mass 0.2 kg performs linear S.H.M. It experiences a restoring force of 0.4 N when its displacement from the mean position is 8 cm. Determine force constant.
- viii. Determine the work done in bringing a charge of $5 \mu\text{C}$ from infinity to the point A. The potential at point A is 400 kV.

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Q.2. Answer the following questions:

[8]

- i. Define centripetal force.
- ii. Why a detergent powder is mixed with water to wash clothes?
- iii. What is the resistance of an ideal voltmeter?
- iv. Write the formula for torque acting on rotating current carrying coil in terms of magnetic dipole moment, in vector form.
- v. What is binding energy of a hydrogen atom?
- vi. What is surroundings in thermodynamics?
- vii. In a photoelectric experiment, the stopping potential is 1.5V. What is the maximum kinetic energy of a photoelectron?
- viii. Two capacitors of capacities $5\mu\text{F}$ and $10\mu\text{F}$ respectively are connected in series. Calculate the resultant capacity of the combination.

July 2023 | Q.2 Answer the following**Q.2. Answer the following questions:**

[8]

- (i) State the formula for end correction in a resonance tube experiment.
- (ii) Categorize the following into polar and non-polar dielectrics:
(a) H_2O (b) CO_2
- (iii) Define potential gradient.
- (iv) Calculate the period of a particle performing linear S.H.M. with maximum speed of 0.08 m/s and maximum acceleration of 0.32 m/s^2 .
- (v) Define gyromagnetic ratio.
- (vi) State the conditions for current and impedance in parallel resonance circuit.
- (vii) Radius of the third Bohr orbit is 0.477 nm. Calculate the radius of the second Bohr orbit.
- (viii) Name the logic gate having single input- single output.

Feb 2023 | Q.2 Answer the following**Q.2. Answer the following questions:**

[8]

- i. What is the value of resistance for an ideal voltmeter?
- ii. What is the value of force on a closed circuit in a magnetic field?
- iii. What is the average value of alternating current over a complete cycle?
- iv. An electron is accelerated through a potential difference of 100 volt. Calculate de-Broglie wavelength in nm.
- v. If friction is made zero for a road, can a vehicle move safely on this road?
- vi. State the formula giving relation between electric field intensity and potential gradient.
- vii. Calculate the velocity of a particle performing S.H.M. after 1 second, if its displacement is given by $x = 5 \sin\left(\frac{\pi t}{3}\right) \text{ m}$.
- viii. Write the mathematical formula for Bohr magneton for an electron revolving in n^{th} orbit.

Q.2. Answer the following questions:

[8]

- (i) In which thermodynamic process the total internal energy of system remains constant?
- (ii) State the law of conservation of angular momentum.
- (iii) What is shunt?
- (iv) What happens to the fringe width in diffraction pattern if the diameter of wire is increased?
- (v) What is perfectly black body?
- (vi) State the formula for electric field intensity at a point outside an infinitely long charged cylindrical conductor.
- (vii) The half-life of a nuclear species is 1.386 years. Calculate its decay constant per year.
- (viii) An automobile engine develops 62.84 kW while rotating at a speed of 1200 rpm. What torque does it deliver?

March 2022 | Q.2 Answer the following**Q.2. Answer the following questions:**

[8]

- (i) Define potential gradient of the potentiometer wire.
- (ii) State the formula for critical velocity in terms of Reynold's number for a flow of a fluid.
- (iii) Is it always necessary to use red light to get photoelectric effect?
- (iv) Write the Boolean expression for Exclusive – OR (X – OR) gate.
- (v) Write the differential equation for angular S.H.M.
- (vi) What is the mathematical formula for third postulate of Bohr's atomic model?
- (vii) Two inductor coils with inductance 10 mH and 20 mH are connected in series. What is the resultant inductance of the combination of the two coils?
- (viii) Calculate the moment of inertia of a uniform disc of mass 10 kg and radius 60 cm about an axis perpendicular to its length and passing through its centre.

Feb 2020 | Q.2 Answer the following**Q.2. Answer the following questions :**

[8]

- i. What is attenuation in communication system?
- ii. What is isothermal process?
- iii. What does the negative sign indicate in Lenz's law?
- iv. Define uniform circular motion.
- v. At which position, the total energy of a particle executing linear S.H.M. is purely potential?
- vi. State the name of the visible series in hydrogen spectrum.
- vii. At what height the acceleration due to gravity is 25% of that at the surface of the Earth, in terms of radius of the Earth.
- viii. Capacity of a parallel capacitor with dielectric constant 5 is 40 μF . Calculate the capacity of the same capacitor when dielectric material is removed.

July 2019
No Question
March 2019
No Question

Attempt any EIGHT questions of the following:

[16]

- Q.3. Obtain an expression for moment of inertia of a uniform disc of mass 'M' and radius 'R' rotating about an axis passing through its centre and perpendicular to its plane.
- Q.4. What is the effect of impurities on surface tension of a liquid?
- Q.5. Explain the thermodynamics of adiabatic process to obtain adiabatic constant for rigid diatomic molecule of a gas?
- Q.6. Draw a neat labelled diagram of variation of kinetic energy and potential energy with displacement in S.H.M.
- Q.7. Assuming an equation of magnetic force due to arbitrarily shaped wire, obtain an expression for force on a closed circuit in a uniform magnetic field.
- Q.8. Distinguish between diamagnetic and paramagnetic substances.
- Q.9. State Faraday's laws in electromagnetic induction.
- Q.10. In a purely resistive circuit a source of e.m.f. having $e = 140\sin(3142t)$ is connected across a pure resistor. If value of rms current is 1.98A, calculate the value of resistance.
- Q.11. The differential equation of linear S.H.M. in SI units is $\frac{d^2x}{dt^2} = -36x$. Calculate its frequency and periodic time.
- Q.12. 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 ms^{-1} . Calculate the difference between wavelengths of these waves.
- Q.13. What must be the ratio of the slit width to the wavelength for a single slit to have the first diffraction minimum at 45° ?
- Q.14. A potential gradient of a wire is 0.5V/m. If the e.m.f. of a cell balances against 216 cm of this potentiometer wire, calculate e.m.f. of the cell.

Attempt any EIGHT questions of the following:

[16]

- Q.3. Explain harmonics and overtones.
- Q.4. Using Newton's law of viscosity for streamline flow, derive an expression for coefficient of viscosity.
- Q.5. State the formula for magnetic induction produced by a current in a circular arc of a wire. Hence find the magnetic induction at the centre of a current carrying circular loop.
- Q.6. State and prove the law of conservation of angular momentum.
- Q.7. State any four advantages of light emitting diode (LED).
- Q.8. Calculate the energy radiated in one minute by a perfectly black body of surface area 200 cm^2 when it is maintained at 127°C .
- Q.9. Two coils having self inductances 60 mH each, are coupled with each other. If the coefficient of coupling is 0.75, calculate the mutual inductance between them.
- Q.10. In a series LCR circuit, if resistance, inductive reactance and capacitive reactance are 3Ω , 8Ω and 4Ω respectively, calculate phase difference between voltage and current.
- Q.11. State the advantages of a potentiometer over a voltmeter.
- Q.12. Draw a neat and labelled circuit diagram for a full wave rectifier.
- Q.13. A body of mass 0.8 kg performs linear S.H.M. It experiences a restoring force of 0.4 N, when its displacement from mean position is 4 cm. Determine Force constant and Period of S.H.M.
- Q.14. A gas of 0.5 mole at 300 K expands isothermally from an initial volume of 2.0 litre to a final volume of 6.0 litre. What is the work done by gas?

Attempt any EIGHT questions of the following:

[16]

- Q.3. Show that average energy per molecule is directly proportional to the absolute temperature 'T' of the gas.
- Q.4. Explain cyclic process with the help of neat and labelled p-V diagram.
- Q.5. Distinguish between progressive waves and stationary waves.
- Q.6. Explain Biot and Savart's law with suitable diagram.
- Q.7. Draw a neat and labelled diagram of van de Graaf generator.
- Q.8. State the formula for the following:
 (i) Average power in LCR circuit
 (ii) Q-factor
- Q.9. Explain the working of a transformer with a neat, labelled diagram.
- Q.10. A galvanometer has a resistance of 100Ω and its full scale deflection current is 0.2 mA , what resistance should be added to it to have a range of $0-10 \text{ V}$?
- Q.11. An electron in hydrogen atom-stays in its second orbit for 10^{-8} s . How many revolutions will it make around the nucleus in that time?
 [Velocity of electron in second orbit = $1.07 \times 10^6 \text{ m/s}$, radius of electron in second orbit = $2.14 \times 10^{-10} \text{ m}$]
- Q.12. A torque of magnitude 400 Nm acting on a body of mass 40 kg produces an angular acceleration of 20 rad/s^2 . Calculate the moment of inertia of the body.
- Q.13. A bar magnet of moment of inertia of 500 gcm^2 oscillates with a time period of 3.142 seconds in a horizontal plane. What is its magnetic moment if the horizontal component of earth's magnetic field is $4 \times 10^{-5} \text{ T}$?
- Q.14. A telescope has an objective of diameter 2.5 m . What is its angular resolution when observed at 7500 \AA ?

Attempt any EIGHT questions of the following:

[16]

- Q.3. Explain the change in internal energy of a thermodynamic system (the gas) by heating it.
- Q.4. Explain the construction of a spherical wavefront by using Huygens' principle.
- Q.5. Define magnetization. State its SI unit and dimensions.
- Q.6. Obtain the differential equation of linear simple harmonic motion.
- Q.7. A galvanometer has a resistance of 30Ω and its full scale deflection current is $20 \text{ microampere } (\mu\text{A})$. What resistance should be added to it to have a range $0-10 \text{ volt}$?
- Q.8. Explain Biot-Savart law.
- Q.9. What is a Light Emitting Diode? Draw its circuit symbol.
- Q.10. An aircraft of wing span of 60 m flies horizontally in earth's magnetic field of $6 \times 10^{-5} \text{ T}$ at a speed of 500 m/s . Calculate the e.m.f. induced between the tips of wings of aircraft.
- Q.11. Derive an expression for maximum speed of a vehicle moving along a horizontal circular track.
- Q.12. A horizontal force of 0.5 N is required to move a metal plate of area 10^{-2} m^2 with a velocity of $3 \times 10^{-2} \text{ m/s}$, when it rests on $0.5 \times 10^{-3} \text{ m}$ thick layer of glycerin. Find the coefficient of viscosity of glycerin.
- Q.13. Two tuning forks having frequencies 320 Hz and 340 Hz are sounded together to produce sound waves. The velocity of sound in air is 340 m/s . Find the difference in wavelength of these waves.
- Q.14. Calculate the change in angular momentum of electron when it jumps from third orbit to first orbit in hydrogen atom.

Attempt any EIGHT questions of the following:

- Q.3. State the conditions for a steady interference pattern.
- Q.4. Derive an expression for electric field intensity due to an infinitely long straight charged wire.
- Q.5. What are eddy currents? Write two applications of eddy currents.
- Q.6. Define and state formulae for:
(a) Inductive reactance (b) Capacitive reactance
- Q.7. Draw a $p-V$ diagram and explain the concept of positive work done and negative work done.
- Q.8. State the law of length and the law of linear density for a vibrating string.
- Q.9. For a moving coil galvanometer, show that $S = \frac{G}{n-1}$,
where S is shunt resistance.
G is galvanometer resistance
n is ratio of total current to the full scale deflection current.
- Q.10. The de - Broglie wavelengths associated with an electron and a proton are same. Calculate the ratio of their kinetic energies.
[Given: $m_p = 1836 m_e$]
- Q.11. Derive an expression for 'Half Life Time' of a radioactive material using the 'Law of Radioactive Decay'.
- Q.12. A motorcyclist performs stunt along the cylindrical wall of a 'Well of Death' of inner radius 4 m. Coefficient of static friction between the tyres and the wall is 0.4. Calculate the maximum period of revolution.
[Use $g = 10 \text{ m/s}^2$]
- Q.13. Calculate the diameter of a water drop, if the excess pressure inside the drop is 80 N/m^2 .
[Surface Tension of water = $7.2 \times 10^{-2} \text{ N/m}$]
- Q.14. Calculate the current through a long straight wire at a distance of 2.4 cm, where the magnetic field intensity is $16 \mu \text{ T}$.

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Attempt any EIGHT questions of the following:

[16]

- Q.3. Define coefficient of viscosity. State its formula and S.I. units.
- Q.4. Obtain an expression for magnetic induction of a toroid of 'N' turns about an axis passing through its centre and perpendicular to its plane.
- Q.5. State and prove principle of conservation of angular momentum.
- Q.6. Obtain an expression for equivalent capacitance of two capacitors C_1 and C_2 connected in series.
- Q.7. Explain, why the equivalent inductance of two coils connected in parallel is less than the inductance of either of the coils.
- Q.8. How will you convert a moving coil galvanometer into an ammeter?
- Q.9. A 100Ω resistor is connected to a 220 V, 50 Hz supply.
Calculate:
i. r.m.s. value of current and
ii. net power consumed over the full cycle
- Q.10. A bar magnet of mass 120 g in the form of a rectangular parallelepiped, has dimensions $l = 40$ mm, $b = 100$ mm and $h = 80$ mm, with its dimension 'h' vertical, the magnet performs angular oscillations in the plane of the magnetic field with period π seconds. If the magnetic moment is 3.4 Am^2 , determine the influencing magnetic field.
- Q.11. Distinguish between free vibrations and forced vibrations (Two points).
- Q.12. Compare the rate of loss of heat from a metal sphere at 827°C with rate of loss of heat from the same at 427°C , if the temperature of surrounding is 27°C .
- Q.13. An ideal mono-atomic gas is adiabatically compressed so that its final temperature is twice its initial temperature. Calculate the ratio of final pressure to its initial pressure.
- Q.14. 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.

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Attempt any EIGHT questions of the following:

- Q.3. What is capillarity? State any two uses of capillarity.
- Q.4. Define: (i) Emissive power
(ii) Co-efficient of emission
- Q.5. State any two characteristics of progressive waves.
- Q.6. Draw neat, labelled diagram of a parallel plate capacitor with a dielectric slab between the plates.
- Q.7. State the formula for magnetic potential energy of a dipole and hence obtain the minimum and maximum magnetic potential energy.
- Q.8. What is gyromagnetic ratio? Write the necessary expression.
- Q.9. How does the wave theory of light fail to explain the observations from experiment on photoelectric effect.
[Give any two points]
- Q.10. A system releases 125 kJ of heat while 104 kJ of work is done on the system. Calculate the change in internal energy of the gas.
- Q.11. A plane wavefront of light of wavelength 4000 \AA is incident on two slits on a screen perpendicular to the direction of light ray. If the total separation of 10 bright fringes on a screen 2 m away is 2 cm, find the distance between the slits.
- Q.12. 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?
- Q.13. An aircraft of wing span of 50 m flies horizontally in earth's magnetic field of $6 \times 10^{-5} \text{ T}$. Calculate the velocity required to generate an e.m.f. of 1.2 V between the tips of the wings of the aircraft.
- Q.14. The surface density of a uniform disc of radius 10 cm is 2 kg/m^2 . Find its MI about an axis passing through its centre and perpendicular to its plane.

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Attempt any EIGHT questions of the following:

[16]

- Q.3. Define moment of inertia of a rotating rigid body. State its SI unit and dimensions.
- Q.4. What are polar dielectrics and non polar dielectrics?
- Q.5. What is a thermodynamic process? Give any two types of it.
- Q.6. Derive an expression for the radius of the n^{th} Bohr orbit of the electron in hydrogen atom.
- Q.7. What are harmonics and overtones (Two points)?
- Q.8. Distinguish between potentiometer and voltmeter.
- Q.9. What are mechanical equilibrium and thermal equilibrium?
- Q.10. An electron in an atom is revolving round the nucleus in a circular orbit of radius 5.3×10^{-11} m with a speed of 3×10^6 m/s. Find the angular momentum of electron.
- Q.11. Plane wavefront of light of wavelength 6000 \AA is incident on two slits on a screen perpendicular to the direction of light rays. If the total separation of 10 bright fringes on a screen 2 m away is 2 cm, find the distance between the slits.
- Q.12. Eight droplets of water each of radius 0.2 mm coalesce into a single drop. Find the decrease in the surface area.
- Q.13. A 0.1 H inductor, a 25×10^{-6} F capacitor and a 15Ω resistor are connected in series to a 120 V, 50 Hz AC source. Calculate the resonant frequency.
- Q.14. The difference between the two molar specific heats of a gas is 9000 J/kg K. If the ratio of the two specific heats is 1.5, calculate the two molar specific heats.

Feb 2020 | Section B

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Attempt any EIGHT questions of the following :

[16]

- Q.3. Define ;
(a) Threshold frequency (b) Photoelectric work function
- Q.4. Distinguish between step-up and step-down transformer.
- Q.5. Write a short note on sky wave propagation.
- Q.6. Obtain the relation between the magnitude of linear acceleration and angular acceleration in circular motion.
- Q.7. Deduce Boyle's law using the expression for pressure exerted by the gas.
- Q.8. State any two postulates of Bohr's theory of hydrogen atom.
- Q.9. State the factors on which resolving power of microscope depends. How can it be increased?
- Q.10. The photoelectric work function for a metal surface is 3.84×10^{-19} J. If the light of wavelength 5000 \AA is incident on the surface of the metal, will there be photoelectric emission?
- Q.11. A parallel L-C circuit comprises of a 5H inductor and $5\mu\text{F}$ capacitor. Calculate the resonant frequency of the circuit.
- Q.12. A wire length 1 m and mass 2 g is in unison with a tuning fork of frequency 300 Hz. Calculate the tension produced in the wire.
- Q.13. Energy of 1000 J is spent to increase the angular speed of a wheel from 20 rad/s to 30 rad/s. Calculate the moment of inertia of the wheel.
- Q.14. Energy of an electron in the second Bohr orbit is -3.4 eV . Calculate the energy of an electron in the third Bohr orbit.

Q.9 A coil has 'n' turns, each of cross-sectional area 1.6 cm^2 . The axis of the coil is kept inclined at 30° with the direction of uniform magnetic field of induction 2 N/Am . The torque of 0.02 Nm is experienced by the coil, when a current of 1.25 A flows through each turn. Calculate n.

OR

The susceptibility of magnesium at 300 K is 1.2×10^{-5} . At what temperature the susceptibility will decrease by 0.4×10^{-5} ? (2)

Q.10 State Kirchoff's second law for a closed circuit. How will you minimize the errors in Kelvin's method? (2)

Q.11 Define U.C.M.
Name the forces acting on a body executing nonuniform circular motion. (2)

Q.12 Explain the principle of conservation of angular momentum with the help of two appropriate examples. (2)

Q.13 Define bandwidth of signal and frequency modulation. (2)

Q.14 Define epoch of S.H.M. State the factors on which the total energy of a particle performing S.H.M. depends. (2)

Q.15 A driver in a stationary bus blows horn with frequency 1024 Hz . Another bus directly behind the stationary bus is approaching it at the speed of 54 km/hr . Find the frequency of sound heard by the driver in the moving bus.
[Speed of sound in air is 340 m/s .] (2)

Q.9 In Young's experiment interference bands were produced on a screen placed at 150 cm from two slits, 0.15 mm apart and illuminated by the light of wavelength 6500 \AA . Calculate the fringe width. (2)

Q.10 The susceptibility of magnetism at 300 K is 1.2×10^{-15} . What will be its susceptibility at 200 K ? (2)

Q.11 The length of the second's pendulum in a clock is increased to 4 times its initial length. Calculate the number of oscillations completed by the new pendulum in one minute.

OR

A body of mass 1 kg is made to oscillate on a spring of force constant 15 N/m . Calculate (i) angular frequency (ii) frequency of vibrations. (2)

Q.12 Define capacitance of a capacitor and its S.I. unit. (2)

Q.13 Define radius of gyration. Write its physical significance. (2)

Q.14 Distinguish between p - type and n - type semiconductors. (2)

Q.15 Explain the terms (i) Transducer and (ii) Attenuation in communication system. (2)

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Attempt any EIGHT questions of the following:

- Q.15. Obtain an expression for torque acting on a rigid body rotating with constant angular acceleration.
- Q.16. Define the terms –
- Cohesive force
 - Range of molecular force
 - Sphere of influence
- Q.17. Show that only odd harmonics are present in the vibrations of air column in a pipe closed at one end.
- Q.18. Obtain an expression for the electric intensity at a point outside a uniformly charged spherical shell.
- Q.19. With the help of neat labelled circuit diagram explain the use of metre bridge to determine unknown resistance
- Q.20. Derive an expression for the magnetic field produced at the centre of a circular arc of a wire carrying current I .
- Q.21. Derive the decay law of radioactivity and state SI unit of 'activity.'
- Q.22. Find the shortest and longest wavelengths in the Lyman series of hydrogen atom.
- Q.23. The de-Broglie wavelengths associated with an electron and proton are same. Calculate the ratio of their momentum and kinetic energies
- Q.24. A parallel plate capacitor is maintained at potential of 400V. If area of plates is 40 cm^2 and separation between plates is 40 mm, calculate displacement current in μs .
- Q.25. A 120 watt filament lamp loses all its energy by radiation from its surface. The emissivity of the surface is 0.6. The area of the surface is $3.53 \times 10^{-3} \text{ m}^2$. Calculate the temperature of the filament
- Q.26. A Carnot engine receives 4000J of heat from a reservoir at 500K, does some work, rejects 2000J heat to reservoir at 200K
- How much work does it do?
 - What is its efficiency?

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Attempt any EIGHT questions of the following:

[24]

- Q.15. Obtain an expression for the period of a bar magnet vibrating in a uniform magnetic field, performing S.H.M.
- Q.16. In a thermodynamic system, define –
(a) Mechanical equilibrium
(b) Chemical equilibrium and
(c) Thermal equilibrium
- Q.17. What is Brewster's law? Derive the formula for Brewster's angle.
- Q.18. Derive an expression for law of radioactive decay. Define one becquerel (Bq).
- Q.19. State and prove Kirchoff's law of heat radiation.
- Q.20. Obtain an expression for practical determination of end correction –
(i) for a pipe open at both ends and
(ii) for a pipe closed at one end.
- Q.21. A conducting bar is rotating with constant angular speed around a pivot at one end in a uniform magnetic field perpendicular to its plane of rotation. Obtain an expression for the rotational e.m.f. induced between the ends of the bar.
- Q.22. An electron in hydrogen atom stays in its second orbit for 10^{-8} s. How many revolutions will it make around the nucleus in that time?
[Given: $e = 1.6 \times 10^{-19}$ C, $m = 9.1 \times 10^{-31}$ kg]
- Q.23. A flywheel of a motor has mass 100 kg and radius 1.5 m. The motor develops a constant torque of 2000 Nm. The flywheel starts rotating from rest. Calculate the work done during the first 4 revolutions.
- Q.24. A galvanometer has a resistance of 50Ω and a current of 2 mA is needed for its full scale deflection. Calculate resistance required to convert it,
(i) into an ammeter of 0.5 A range.
(ii) into a voltmeter of 10 V range.
- Q.25. Diameter of a water drop is 0.6 mm. Calculate the pressure inside a liquid drop.
($T = 72$ dyne/cm, atmospheric pressure = 1.013×10^5 N/m²)
- Q.26. A solenoid of length π m and 5 cm in diameter has a winding of 1000 turns and carries a current of 5A. Calculate the magnetic field at its centre along the axis.

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Attempt any EIGHT questions of the following:

- Q.15. Define surface tension. Obtain the relation between surface tension and surface energy.
- Q.16. Show that all harmonics are present in case of a stretched string.
- Q.17. Derive an expression for the impedance of a series LCR circuit connected to an AC power supply.
- Q.18. What is Curie temperature? Distinguish between diamagnetic and paramagnetic substances.
- Q.19. Obtain the balancing conditions in case of Wheatstone's bridge.
- Q.20. What is ionization energy? Assuming expression for energy of electron, derive an expression for wavelength of spectral lines in hydrogen atom.
- Q.21. What is voltage regulation? Explain the working of Zener diode as a voltage regulator.
- Q.22. A spherical drop of oil falls at a constant speed of 9.8 cm/s in steady air. Calculate the radius of the drop. The density of oil is 0.9013 g/cm^3 , density of air is 0.0013 g/cm^3 and the coefficient of viscosity of air is 1.8×10^{-4} poise.
- Q.23. A search coil having 2000 turns with area 1.5 cm^2 is placed in a magnetic field of 0.6 T. The coil is moved rapidly out of the field in a time of 0.2 second. Calculate the induced emf across the search coil.
- Q.24. At what distance from the mean position is the kinetic energy of a particle performing S.H.M. of amplitude 10 cm, three times its potential energy?
- Q.25. When 2×10^{10} electrons are transferred from one conductor to another, a potential difference of 20 V appears between the conductors. Find the capacitance of the two conductors.
- Q.26. The magnetic field at the centre of a circular current carrying loop of radius 12 cm is 6×10^{-6} T. What will be the magnetic moment of the loop?

Feb 2024 | Section C

Attempt any EIGHT questions of the following:

- Q.15. A circular coil of wire is made up of 200 turns, each of radius 10 cm. If a current of 0.5A passes through it, what will be the magnetic field at the centre of the coil?
- Q.16. Define photoelectric effect and explain the experimental set-up of photoelectric effect.
- Q.17. Define the current gain α_{DC} and β_{DC} for a transistor. Obtain the relation between them.
- Q.18. Define surface energy of the liquid. Obtain the relation between the surface energy and surface tension.
- Q.19. What is an isothermal process? Obtain an expression for work done by a gas in an isothermal process.
- Q.20. Derive an expression for equation of stationary wave on a stretched string. Show that the distance between two successive nodes or antinodes is $\lambda/2$.
- Q.21. Derive an expression for the impedance of an LCR circuit connected to an AC power supply. Draw phasor diagram.
- Q.22. Calculate the wavelength of the first two lines in Balmer series of hydrogen atom.
- Q.23. A current carrying toroid winding is internally filled with lithium having susceptibility $\chi = 2.1 \times 10^{-5}$. What is the percentage increase in the magnetic field in the presence of lithium over that without it?
- Q.24. The radius of a circular track is 200 m. Find the angle of banking of the track, if the maximum speed at which a car can be driven safely along it is 25 m/sec.
- Q.25. Prove the Mayer's relation: $C_p - C_v = \frac{R}{J}$
- Q.26. An alternating voltage is given by $e = 8 \sin 628.4t$. Find
- peak value of e.m.f.
 - frequency of e.m.f.
 - instantaneous value of e.m.f. at time $t = 10 \text{ ms}$.

Attempt any EIGHT questions of the following:

- Q.15. Explain construction and working of Ferry's Black Body.
- Q.16. Show that the deflection produced in a moving coil galvanometer is directly proportional to the current flowing through its coil or vice-versa.
- Q.17. With the help of a neat circuit diagram, explain the working of a half wave rectifier. Draw input-output waveforms.
- Q.18. Obtain the expression for the period of simple pendulum performing S.H.M.
- Q.19. Show that the beat frequency of two interfering sound waves is the difference between the individual frequencies of the two sound waves.
- Q.20. Obtain an expression for orbital magnetic moment of an electron revolving around the nucleus of an atom.
- Q.21. State Einstein's photoelectric equation. Hence, explain any two characteristics of photoelectric effect.
- Q.22. Calculate the shortest wavelength of Paschen series and longest wavelength of Balmer series for H – atom.
- Q.23. A 60 W filament lamp loses all its energy by radiation from its surface. The emissivity of the filament surface is 0.5 and the surface area is $5 \times 10^{-5} \text{ m}^2$. Calculate the temperature of the filament.
[Given : $\sigma = 5.67 \times 10^{-8} \text{ Jm}^{-2} \text{ s}^{-1} \text{ K}^{-4}$]
- Q.24. Two capacitors of capacities C_1 and C_2 are connected in parallel and this combination is connected in series with a capacitor of capacity C_3 . Calculate the equivalent capacity of the combination of capacitors.
- Q.25. With an unknown resistance X in the left gap and a resistance of 30Ω in the right gap of a meter-bridge, the null point is obtained at 40 cm from the left end of the wire. Calculate the unknown resistance and shift in the position of the null point, when resistance in each gap is increased by 15Ω .
- Q.26. An inductor of inductance 200 mH is connected to an A.C. source of peak e.m.f. 210 V and frequency 50 Hz. Calculate the peak current and instantaneous voltage of the source when the current is at its peak value.

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Attempt any EIGHT questions of the following:

- Q.15. Derive laws of reflection of light using Huygens' principle.
- Q.16. State postulates of Bohr's atomic model.
- Q.17. Define and state unit and dimensions of :
- Magnetization
 - Magnetic susceptibility
- Q.18. With neat labelled circuit diagram, describe an experiment to study the characteristics of photoelectric effect.
- Q.19. Explain the use of potentiometer to determine internal resistance of a cell.
- Q.20. Explain the working of n-p-n transistor in common base configuration.
- Q.21. State the differential equation of linear S.H.M. Hence, obtain expression for :
- acceleration
 - velocity
- Q.22. Two tuning forks of frequencies 320 Hz and 340 Hz are sounded together to produce sound wave. The velocity of sound in air is 326.4 m/s. Calculate the difference in wavelengths of these waves.
- Q.23. In a biprism experiment, the fringes are observed in the focal plane of the eye-piece at a distance of 1.2 m from the slit. The distance between the central bright band and the 20th bright band is 0.4 cm. When a convex lens is placed between the biprism and the eye-piece, 90 cm from the eye-piece, the distance between the two virtual magnified images is found to be 0.9 cm. Determine the wavelength of light used.
- Q.24. Calculate the current flowing through two long parallel wires carrying equal currents and separated by a distance of 1.35 cm experiencing a force per unit length of 4.76×10^{-2} N/m.
- Q.25. An alternating voltage given by $e = 140 \sin (314.2 t)$ is connected across a pure resistor of 50 Ω . Calculate :
- the frequency of the source
 - the r.m.s current through the resistor
- Q.26. An electric dipole consists of two opposite charges each of magnitude 1 μC , separated by 2 cm. The dipole is placed in an external electric field of 10^5 N/C. Calculate the :
- maximum torque experienced by the dipole and
 - work done by the external field to turn the dipole through 180° .

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Attempt any EIGHT questions of the following:

[24]

- Q.15. State zeroth law of thermodynamics. What are the limitations of first law of thermodynamics?
- Q.16. What is de-Broglie hypothesis? Obtain the relation for de-Broglie wavelength.
- Q.17. Derive an expression for kinetic energy of a rotating body.
- Q.18. Derive the laws of reflection of light using Huygens' theory.
- Q.19. Derive an expression for orbital magnetic moment of an electron revolving around the nucleus in an atom. State the formula for the Bohr magneton.
- Q.20. Explain the terms:
(a) Capacitive reactance
(b) Inductive reactance
(c) Impedance
- Q.21. Define α_{dc} and β_{dc} . Obtain the relation between them.
- Q.22. A pipe at both the ends has a fundamental frequency of 600 Hz. The first overtone of a pipe closed at one end has the same frequency as the first overtone of the open pipe. How long are the two pipes?
[Velocity of sound in air = 330 m/s]
- Q.23. A small particle carrying a negative charge of 1.6×10^{-19} C is suspended in equilibrium between two horizontal metal plates 10 cm apart, having a potential difference of 4000 volts across them. Find the mass of the particle.
- Q.24. A 1000 mH inductor, 36 μ F capacitor and 12 Ω resistor are connected in series to 120 V, 50 Hz AC source. Calculate:
(i) impedance of the circuit at resonance
(ii) current at resonance
(iii) resonant frequency
- Q.25. A current of equal magnitude flows through two long parallel wires separated by 2 cm. If force per unit length of 4×10^{-2} N/m acts on both the wires respectively, calculate the current through each wire.
- Q.26. Calculate the energy radiated in half a minute by a black body of surface area 200 cm² at 127° C.

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Attempt any EIGHT questions of the following:

[24]

- Q.15. With the help of a neat diagram, explain the reflection of light on a plane reflecting surface.
- Q.16. What is magnetization, magnetic intensity and magnetic susceptibility?
- Q.17. Prove that the frequency of beats is equal to the difference between the frequencies of the two sound notes giving rise to beats.
- Q.18. Define:
- Inductive reactance
 - Capacitive reactance
 - Impedance
- Q.19. Derive an expression for the kinetic energy of a body rotating with a uniform angular speed.
- Q.20. Derive an expression for emf (ϵ) generated in a conductor of length (l) moving in uniform magnetic field (B) with uniform velocity (v) along x -axis.
- Q.21. Derive an expression for terminal velocity of a spherical object falling under gravity through a viscous medium.
- Q.22. Determine the shortest wavelengths of Balmer and Paschen series. Given the limit for Lyman series is 912 \AA .
- Q.23. Calculate the value of magnetic field at a distance of 3 cm from a very long, straight wire carrying a current of 6A.
- Q.24. A parallel plate capacitor filled with air has an area of 6 cm^2 and plate separation of a 3 mm. Calculate its capacitance.
- Q.25. An emf of 91 mV is induced in the windings of a coil, when the current in a nearby coil is increasing at the rate of 1.3 A/s, what is the mutual inductance (M) of the two coils in mH?
- Q.26. Two cells of emf 4V and 2V having respective internal resistance of 1Ω and 2Ω are connected in parallel, so as to send current in the same direction through an external resistance of 5Ω . Find the current through the external resistance.

Feb 2020 | Section C

Attempt any EIGHT questions of the following :

[24]

- Q.15. State Newton's law of gravitation. Obtain the relation between universal gravitational constant and gravitational acceleration on the surface of the earth.
- Q.16. Define linear S.H.M. Obtain differential equation of linear S.H.M.
- Q.17. Explain Doppler effect in sound. State any two applications of Doppler effect.
- Q.18. State and prove the principle of parallel axes in rotational motion.
- Q.19. Explain the concept of a parallel plate capacitor. State its any 'two' applications.
- Q.20. Define :
- Young's modulus
 - Bulk modulus
 - Poisson's ratio
- Q.21. Explain energy distribution spectrum of a black body radiation in terms of wavelength.
- Q.22. In a biprism experiment, light of wavelength 5200 \AA is used to obtain an interference pattern on the screen. The fringewidth changes by 1.3 mm when the screen is moved towards the biprism by 50 cm. Calculate the distance between the two virtual images of the slit.
- Q.23. A simple pendulum of length 1 m has mass 10 g and oscillates freely with amplitude of 5 cm. Calculate its potential energy at extreme position.
- Q.24. If the difference in the velocities of light in glass and water is $0.25 \times 10^8 \text{ m/s}$, calculate the velocity of light in air. Given that refractive index of glass and water with respect to air are 1.5 and $\frac{4}{3}$ respectively.
- Q.25. In a Circus, a motor-cyclist having mass of 50 kg moves in a spherical cage of radius 3 m. Calculate the least velocity with which he must pass the highest point without losing contact. Also calculate his angular speed at the highest point.
- Q.26. Two resistances X and Y in the two gaps of a meter-bridge gives a null point dividing the wire in the ratio 2:3. If each resistance is increased by 30Ω , the null point divides the wire in the ratio 5:6, calculate the value of X and Y.

- Q.16** Obtain an expression for average power dissipated in series LCR A.C. circuit. Hence obtain an expression for power factor of the circuit. (3)
- Q.17** When does the p-n junction diode act as a closed switch and as an open switch? State any four advantages of semiconductor devices. (3)
- Q.18** Calculate the wavelength of H_γ line and series limit for Brackett series. (3)
- Q.19** On the basis of molecular theory explain the phenomenon of surface tension. (3)
- Q.20** Describe an experiment for the study of characteristics of photoelectric effect. (3)
- Q.21** Define the term 'damped oscillations'.
A body of mass 1 kg is made to oscillate on a spring of force constant 25×10^3 dyne/cm. Calculate the magnitude of angular velocity and frequency of vibrations of the body. (3)
- Q.22** State Ampere's circuital law.
Using Ampere's circuital law, obtain an expression for magnetic induction at any point due to a straight conductor carrying current. (3)
- Q.23** Obtain an expression for energy of a charged capacitor and express it in different forms. (3)
- Q.24** State the principle of superposition of waves.
Distinguish between forced vibrations and resonance. (3)
- Q.25** State and prove the Kirchhoff's law of radiation theoretically. (3)

OR

State Boyle's law.

On the basis of kinetic theory of gases, obtain an expression for kinetic energy per unit volume of gas. (3)

- Q.26** In Melde's experiments, when a tuning fork is arranged in perpendicular position and a wire is stretched by an empty pan, 6 loops are obtained. When 1 gram of weight is added to the pan, number of loops becomes 4. Find the mass of pan.
Without disturbing the experimental setup, the position of the fork is changed to parallel position, how many loops will be formed with and without mass in pan? (3)

- Q.16** Obtain expressions of energy of a particle at different positions in the vertical circular motion. (3)
- Q.17** Define binding energy and obtain an expression for binding energy of a satellite revolving in a circular orbit round the earth. (3)
- Q.18** State Hooke's law. Define elastic limit and modulus of elasticity. (3)
- Q.19** Obtain an expression for the rise of a liquid in a capillary tube. (3)
- Q.20** Explain the reflection of transverse and longitudinal waves from a denser medium and rarer medium. (3)
- Q.21** What is photoelectric effect?
Define: (i) Stopping potential (ii) Photoelectric work function (3)
- Q.22** What is perfectly black body? Explain Ferry's black body. (3)
- Q.23** When a resistor of 5Ω is connected across the cell, its terminal potential difference is balanced by 150 cm of potentiometer wire and when a resistance of 10Ω is connected across the cell, the terminal potential difference is balanced by 175 cm of the same potentiometer wire. Find the balancing length when the cell is in open circuit and the internal resistance of the cell. (3)
- Q.24** A cyclotron is used to accelerate protons to a kinetic energy of 5 MeV. If the strength of magnetic field in the cyclotron is 2T, find the radius and the frequency needed for the applied alternating voltage of the cyclotron. (Given: Velocity of proton = 3×10^7 m/s) (3)
- Q.25** Assuming expression for impedance in a parallel resonant circuit, state the conditions for parallel resonance. Define resonant frequency and obtain an expression for it. (3)
- Q.26** Using an expression for energy of electron, obtain the Bohr's formula for hydrogen spectral lines. (3)

OR

State the law of radioactive decay. Hence derive the relation $N = N_0 e^{-\lambda t}$. Represent it graphically. (3)

Attempt any THREE questions of the following:

[12]

- Q.27. Define isothermal process. Obtain an expression for work done during isothermal process. Draw P–V diagram.
- Q.28. Using phasor diagram for a series LCR circuit, obtain an expression for impedance. Define admittance.
- Q.29. Obtain an expression for motional e.m.f. in a rotating bar with constant angular velocity ' ω ' in uniform magnetic field perpendicular to plane of rotation.
The mutual inductance (M) of the two coils is 1.5H. The self inductances of the coils are 5H and 4H. Calculate the coefficient of coupling between the coils
- Q.30. Define logic gate and explain why NOT gate is called an inverter.
The transistor is in the common emitter configuration. Its DC current gain is 50. If collector current is 3mA, calculate the base current.
- Q.31. State the four conditions for obtaining well defined and steady interference pattern.
Light incident at angle 52.5° on a bucket filled with water be completely polarised after reflection. Calculate the refractive index of the water.

Feb 2025 | Section D

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Attempt any THREE questions of the following:

[12]

- Q.27. What is Ferromagnetism? Explain it on the basis of domain theory.
- Q.28. Obtain an expression for average power dissipated in a series LCR circuit.
- Q.29. Distinguish between interference and diffraction of light.
A double slit arrangement produces interference fringes for sodium light of wavelength 589 nm, that are 0.20 degree apart. What is the angular fringe separation if the entire arrangement is immersed in water?
(R.I. of water = 1.33)
- Q.30. State Einstein's photoelectric equation and mention physical significance of each term involved in it.
The wavelength of incident light is 4000Å . Calculate the energy of incident photon.
- Q.31. State any four uses of Van de Graaff generator.
In a parallel plate air capacitor, intensity of electric field is changing at the rate of 2×10^{11} V/ms. If area of each plate is 20 cm^2 , calculate the displacement current.

July 2024 | Section D

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Attempt any THREE questions of the following:

[12]

- Q.27. Derive an expression for minimum speed to perform stunts in well of death.
Part of a racing track is to be designed for a radius of curvature of 288 m. We are not recommending the vehicles to drive faster than 216 km/hr. With what angle should the road be tilted?
- Q.28. Explain the concept of positive and negative work with varying pressure. Draw corresponding p-V diagrams.
- Q.29. Deduce an expression for molar specific heat of a monoatomic gas at constant volume.
Find kinetic energy of 4000 cc of a gas at S.T.P.
[Given: Standard pressure is $1.013 \times 10^5\text{ N/m}^2$]
- Q.30. What is photoelectric effect?
Describe with neat circuit diagrams an experimental setup of photoelectric effect.
- Q.31. Derive the formula for Brewster's angle.
Green light of wavelength 5100Å from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 2 m away is 2 cm. Find the slit separation.

Attempt any THREE questions of the following:

[12]

Q.27. What is a transformer? Explain construction and working of a transformer. Derive the equation for a transformer.

Q.28. Using the geometry of the double slit experiment, derive the expression for fringe width of interference bands.

Q.29. Distinguish between an ammeter and a voltmeter. (Two points each).

The displacement of a particle performing simple harmonic motion is $\frac{1}{3}$ rd of its amplitude. What fraction of total energy will be its kinetic energy?

Q.30. Draw a neat labelled diagram of Ferry's perfectly black body. Compare the rms speed of hydrogen molecules at 227°C with rms speed of oxygen molecule at 127°C. Given that molecular masses of hydrogen and oxygen are 2 and 32 respectively.

Q.31. Derive an expression for energy stored in a charged capacitor. A spherical metal ball of radius 15 cm carries a charge of $2\mu\text{C}$. Calculate the electric field at a distance of 20 cm from the center of the sphere.

July 2023 | Section D

Attempt any THREE questions of the following:

[12]

Q.27. State and prove theorem of parallel axes.

Q.28. Define:

- (i) Isothermal process (ii) Adiabatic process

One mole of an ideal gas is enclosed in an ideal cylinder at 1.0 mPa and 27°C. The gas is allowed to expand till its volume is doubled. Calculate the work done if the expansion is isobaric.

Q.29. Distinguish between streamline flow and turbulent flow. (Any Two points).

Calculate the terminal velocity with which an air bubble of diameter 0.4 mm rise through a liquid of viscosity 0.1 N s/m^2 and density 900 kg/m^3 . Density of air is 1.29 kg/m^3 .

Q.30. What are Fraunhofer diffraction and Fresnel diffraction?

A plane wavefront of light of wavelength 5500\AA is incident onto a slit perpendicular to the direction of light rays. If the total separation of 10 bright fringes on a screen 2 m away is 2 cm, calculate the distance between the slits.

Q.31. What is a transformer? State the working principle of transformer. Hence, distinguish between Step up and Step down transformer. (Any Two points).

Feb 2023 | Section D

Attempt any THREE questions of the following:

[12]

Q.27. On the basis of kinetic theory of gases obtain an expression for pressure exerted by gas molecules enclosed in a container on its walls.

Q.28.

- Derive an expression for energy stored in the magnetic field in terms of induced current.
- A wire 5 m long is supported horizontally at a height of 15 m along east-west direction. When it is about to hit the ground, calculate the average e.m.f. induced in it. ($g = 10 \text{ m/s}^2$)

Q.29.

- Derive an expression for the work done during an isothermal process.
- 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.

Q.30.

- Obtain the relation between surface energy and surface tension.
- Calculate the work done in blowing a soap bubble to a radius of 1 cm. The surface tension of soap solution is $2.5 \times 10^{-2} \text{ N/m}$.

Q.31. Derive expressions for linear velocity at lowest position, mid-way position and the top-most position for a particle revolving in a vertical circle, if it has to just complete circular motion without string slackening at top.

Attempt any THREE questions of the following:

[12]

Q.27. Discuss analytically the composition of two linear SHMs having same period and along the same path. Obtain the expression for resultant amplitude.
Find the resultant amplitude when the phase difference is

- (i) zero radians (ii) $\frac{\pi}{2}$ radians.

Q.28. What is a transformer? With the help of a suitable diagram describe working of transformer.

Q.29. Define angle of contact. State any two properties of angle of contact.

Find the difference of pressure between inside and outside of a spherical water drop of radius 2 mm, if surface tension of water is 73×10^{-3} N/m.

Q.30. State Kirchhoff's laws of electrical network.

When two cells of emfs E_1 and E_2 are connected in series so as to assist each other, their balancing length on potentiometer wire is found to be 3.2 m. When two cells are connected in series so as to oppose each other, the balancing length is found to be 0.7 m. Compare the emfs of two cells.

Q.31. State the first and second postulate of Bohr's atomic model. Compute the ratio of longest wavelengths of Lyman and Balmer series in hydrogen atom.

March 2022 | Section D

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Attempt any THREE questions of the following:

[12]

Q.27. Derive an expression for a pressure exerted by a gas on the basis of kinetic theory of gases.

Q.28. What is a rectifier? With the help of a neat circuit diagram, explain the working of a half wave rectifier.

Q.29. Draw a neat, labelled diagram of a suspended coil type moving coil galvanometer.

The initial pressure and volume of a gas enclosed in a cylinder are 2×10^5 N/m² and 6×10^{-3} m³ respectively. If the work done in compressing the gas at constant pressure is 150 J, find the final volume of the gas.

Q.30. Define second's pendulum. Derive a formula for the length of second's pendulum.

A particle performing linear S.H.M. has maximum velocity 25 cm/s and maximum acceleration 100 cm/s². Find period of oscillations.

Q.31. Explain de Broglie wavelength. Obtain an expression for de Broglie wavelength of wave associated with material particles.

The photoelectric work function for a metal is 4.2 eV. Find the threshold wavelength.

Feb 2020 | Section D

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Attempt any THREE questions of the following :

[12]

Q.27. Show that all harmonics are present in case of an air column vibrating in a pipe open at both ends.

Q.28. What is a rectifier? With the help of a neat circuit diagram explain the working of a full wave rectifier.

Q.29. What is capillarity? Give any two applications of capillarity. Calculate the work done in blowing a soap bubble of radius 0.1 m. (Surface tension of soap solution = $30 \frac{\text{dyne}}{\text{cm}}$)

Q.30. State the advantages and disadvantages of a moving coil galvanometer.

A moving coil galvanometer (M.C.G.) has 10 turns each of length 12 cm and breadth 8 cm. The coil of M.C.G. carries a current of 125 μ A and is kept perpendicular to the uniform magnetic field of induction 10^{-2} T. The twist constant of phosphor bronze fibre is 12×10^{-9} Nm/degree. Calculate the deflection produced.

Q.31. Derive an expression for magnitude of magnetic dipole moment of a revolving electron.

A circular coil of 300 turns and diameter 14 cm carries a current of 15 A. Calculate the magnitude of the magnetic dipole moment associated with the coil.

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- Q.27** A. Obtain an expression for binding energy of a satellite revolving around the earth close to its surface. (3)
- B. A car rounds a curve of radius 625 m with a speed of 45 m/s. What is the minimum value of coefficient of friction which prevents the car from sliding? (2)
- OR**
- A. Discuss the variation of acceleration due to gravity with latitude. (3)
- B. Find the frequency of revolution of a round disco stage revolving with an angular speed of 300 degree/second. (2)
- Q.28** A. Explain the behaviour of a metal wire under increasing load. (3)
- B. Find the radius of gyration of a rod of length 3 m about its transverse axis passing through its one end. (2)
- OR**
- A. Describe an experiment to determine Young's modulus of the material of wire. (3)
- B. The M.I. of solid sphere about an axis passing through its centre is 2 kg-m^2 . Calculate its M.I. about a tangent passing through any point on its surface. (2)
- Q.29** A. Explain Rayleigh's criterion for the resolution of two close point objects, when their images are
i. just resolved, ii. well resolved and iii. unresolved. (3)
- B. A parallel beam of monochromatic light is incident on a glass slab at an angle of incidence 30° , gets refracted through an angle of $19^\circ 28'$. Find the ratio of width of parallel beam in air to that in glass. (2)
- OR**
- A. Give the analytical treatment for interference bands. Hence obtain an expression for path difference between the interfering waves. (3)
- B. Find the polarising angle for the material of refractive index $\frac{9}{5}$. (2)

- Q.27** Show that even as well as odd harmonics are present as overtones in the case of an air column vibrating in a pipe open at both the ends. (3)
- A wheel of moment of inertia 1 kg m^2 is rotating at a speed of 30 rad/s. Due to friction on the axis, it comes to rest in 10 minutes. Calculate the average torque of the friction. (2)
- OR**
- Explain the formation of stationary waves by the analytical method. Show that nodes and antinodes are equally spaced in stationary waves. (3)
- The radius of gyration of a body about an axis, at a distance of 0.4 m from its centre of mass is 0.5 m. Find its radius of gyration about a parallel axis passing through its centre of mass. (2)
- Q.28** Obtain an expression for potential energy of a particle performing S.H.M. What is the value of potential energy at (i) Mean position and (ii) Extreme position. (3)
- A stretched sonometer wire is in unison with a tuning fork. When the length of the wire is increased by 5%, the number of beats heard per second is 10. Find the frequency of the tuning fork. (2)
- OR**
- From differential equation of linear S.H.M., obtain an expression for acceleration, velocity and displacement of a particle performing S.H.M. (3)
- A sonometer wire 1 metre long weighing 2 g is in resonance with a tuning fork of frequency 300 Hz. Find tension in the sonometer wire. (2)
- Q.29** Explain refraction of light on the basis of wave theory. Hence prove the laws of refraction. (3)
- Two coherent sources of light having intensity 81:1 produce interference fringes. Calculate the ratio of intensities at the maxima and minima in the interference pattern. (2)
- OR**
- State Brewster's law and show that when light is incident at polarizing angle, the reflected and refracted rays are mutually perpendicular to each other. (3)
- Monochromatic light of wavelength 4300 \AA falls on a slit of width 'a'. For what value of 'a' the first maximum falls at 30° ? (2)