| 2024 | II | 27 | | 1100 | **J-837** | **(E)** |

PHYSICS (54)
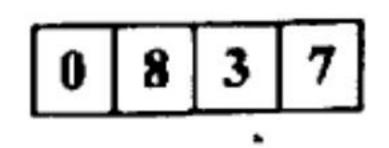
Time : 3 Hrs. (8 Pages) Max. Marks : 70

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 multiple choice type questions, only the first attempt will be considered for evaluation.

(8) *Physical Constants :*

(i) Mass of electron m = 9.1 × 10^{31} kg

(ii) ε_0 = 8.85 × 10^{12} C^2 / Nm^2

(iii) π = 3.142

(iv) Charge on electron e = 1.6×10^{-19}C

(v) $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am

(vi) Planck's constant h = 6.63×10^{-34} J.s.

(vii) Speed of light c = 3 × 10^8 m/s

(viii) g = 9.8 m/s^2

(ix) Rydberg's constant $R_H = 1.097 \times 10^7$ m^{-1}

(x) Stefan's constant $\sigma = 5.67 \times 10^{-8}$ J m^{-2} s^{-1}K^{-4}
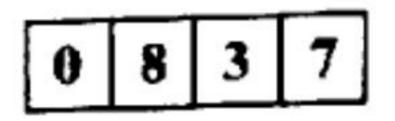
SECTION – A

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

(i) The moment of inertia (MI) of a disc of radius R and mass M about its central axis is _____.

(a) $\dfrac{MR^2}{4}$

(b) $\dfrac{MR^2}{2}$

(c) MR^2

(d) $\dfrac{3MR^2}{2}$

(ii) The dimensional formula of surface tension is _____.

(a) $[L^{-1}M^1T^{-2}]$

(b) $[L^2M^1T^{-2}]$
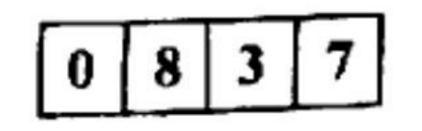
(c) $[L^1M^1T^{-1}]$

(d) $[L^0M^1T^{-2}]$

(iii) Phase difference between a node and an adjacent antinode in a stationary wave is _____ .

(a) $\dfrac{\pi}{4}$ rad   (b) $\dfrac{\pi}{2}$ rad

(c) $\dfrac{3\pi}{4}$ 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) $W = Q$

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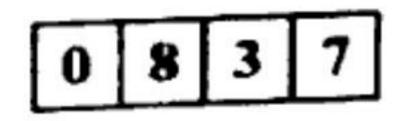
0 8 3 7

(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

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 1.5 V. What is the maximum kinetic energy of a photoelectron?

(viii) Two capacitors of capacities 5μF and 10μF respectively are connected in series. Calculate the resultant capacity of the combination.
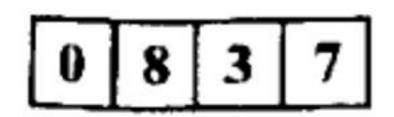
SECTION – B

Attempt any EIGHT questions of the following :   [1€

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 microampere (μA). What resistance should be added to it to have a range 0-10 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 6×10^{-5}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 0.5N is required to move a metal plate of area 10^{-2}m^2 with a velocity of 3×10^{-2}m/s, when it rests on 0.5×10^{-3}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. https://www.maharashtrastudy.com

Q. 14. Calculate the change in angular momentum of electron when it jumps from third orbit to first orbit in hydrogen atom.

SECTION – C

Attempt any EIGHT questions of the following :   [24]

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.

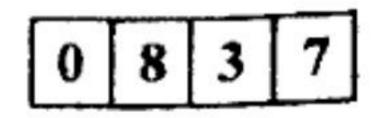**Q. 18.** Define surface energy of the liquid. Obtain the relation between the surface energy and surface tension.

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 : $C_p - C_v = \dfrac{R}{J}$

Q. 26. An alternating voltage is given by $e = 8\sin 628.4\,t$. Find

   (i)   peak value of e.m.f.

   (ii) frequency of e.m.f.

   (iii) instantaneous value of e.m.f. at time $t = 10$ ms.

SECTION – D

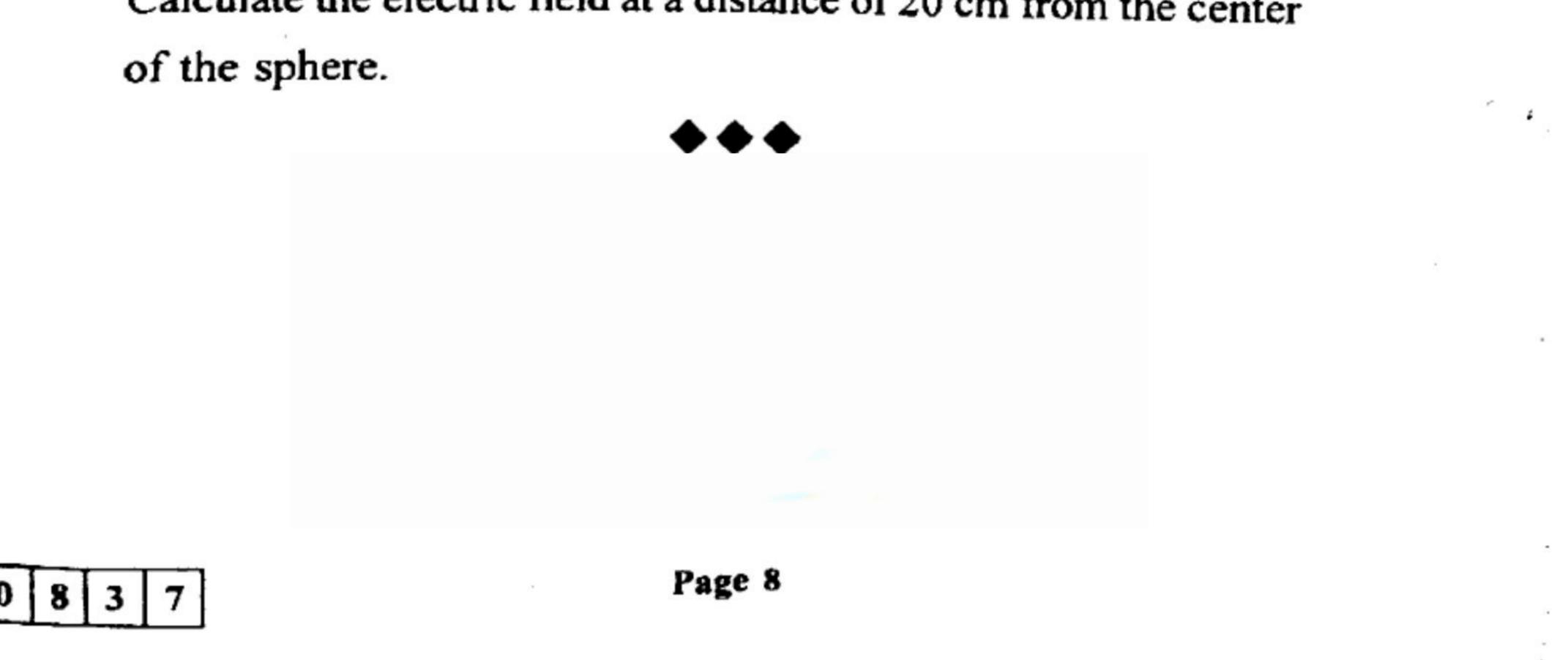**Attempt any THREE questions of the following :**

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 $2\mu C$. Calculate the electric field at a distance of 20 cm from the center of the sphere.

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Maharashtra HSC BOARD QUESTION PAPER 2023
Physics

Time: 3 Hrs.	Max. Marks: 70

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(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.*

(8) *Physical Constants:*

  (i) $h = 6.63 \times 10^{-34}$ Js

  (ii) $c = 3 \times 10^8$ m/s

  (iii) $\pi = 3.142$

  (iv) $g = 9.8$ m/s^2

  (v) $\epsilon_0 = 8.85 \times 10^{-12}$ C^2 / Nm^2

  (vi) $\mu_0 = 4\pi \times 10^{-7}$ Wb / A–m

SECTION – A

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

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) $\sqrt{\dfrac{2}{\pi\, nd}}$ 　　(B) $\dfrac{1}{2\,\pi nd^2}$ 　　(C) $\dfrac{1}{\sqrt{2}\,\pi nd^2}$ 　　(D) $\dfrac{1}{\sqrt{2}\,\pi nd}$

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) $0 < \theta < \dfrac{\pi}{2}$ 　　(C) $\theta = \dfrac{\pi}{2}$ 　　(D) $\dfrac{\pi}{2} < \theta < \pi$

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

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 $x = 5 \sin \left(\dfrac{\pi t}{3} \right)$ m.

viii. Write the mathematical formula for Bohr magneton for an electron revolving in n^{th} orbit.

<center>SECTION – B</center>

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 100 Ω 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.

SECTION – C

Attempt any EIGHT questions of the following: [24]

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 :
i. Magnetization
ii. 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 :
i. acceleration
ii. 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 :
i. the frequency of the source
ii. 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 :
i. maximum torque experienced by the dipole and
ii. work done by the external field to turn the dipole through 180°.

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.

i. Derive an expression for energy stored in the magnetic field in terms of induced current.

ii. 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.

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

ii. 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.

i. Obtain the relation between surface energy and surface tension.

ii. Calculate the work done in blowing a soap bubble to a radius of 1 cm. The surface tension of soap solution is 2.5×10^{-2} 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.

BOARD QUESTION PAPER: MARCH 2022
PHYSICS

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(8) Physical Constants:

(i) mass of electron $m = 9.1 \times 10^{-31}$ kg

(ii) $\varepsilon_0 = 8.85 \times 10^{-12} \dfrac{C^2}{Nm^2}$

(iii) $\pi = 3.142$

(iv) charge on electron $e = 1.6 \times 10^{-19}$ C

(v) $\mu_0 = 4\pi \times 10^{-7}$ Wb / Am

(vi) $h = 6.63 \times 10^{-34}$ Js

(vii) $C = 3 \times 10^8$ m/s

SECTION – A

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

(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 valve of current]
    (a) zero   (b) $\dfrac{I_0}{2}$

    (c) $\dfrac{I_0}{\sqrt{2}}$ (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) $\dfrac{1}{\sqrt{T}}$

(c) T

(d) $\dfrac{1}{T}$

(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

(x)   The equation of a simple harmonic progressive wave travelling on a string is $y = 8 \sin (0.02 \, x - 4t)$ cm. The speed of the wave is _____ .
   (a)   10 cm/s   (b)   20 cm/s
   (c)   100 cm/s   (d)   200 cm/s

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.

SECTION – B

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 nth 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 Å 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 15 Ω 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.

SECTION – C

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:
- (a)　　Inductive reactance
- (b)　　Capacitive reactance
- (c)　　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 (e) 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 Å.

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 1 Ω and 2 Ω are connected in parallel, so as to send current in the same direction through an external resistance of 5 Ω. Find the current through the external resistance.

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/m^2 and 6×10^{-3} m^3 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/s^2. 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.