B - 317892

This Question Paper contains 20 printed pages.
(Part - A & Part - B)
Sl.No. 0101771

054 (E)

(FEBRUARY-MARCH, 2026)
(SCIENCE STREAM)
(CLASS - XII)

પ્રશ્ન પેપરનો સેટ નંબર જેની સામેનું વર્તુળ **OMR** શીટમાં ઘટ્ટ કરવાનું રહે છે.

Set No. of Question Paper, circle against which is to be darken in OMR sheet.

01

Part - A : Time : 1 Hour / Marks : 50
Part - B : Time : 2 Hours / Marks : 50

(Part - A)

Time : 1 Hour] ***[Maximum Marks : 50***

Instructions :

1) **There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.**
2) **The questions are serially numbered from 1 to 50 and each carries 1 mark.**
3) **Read each question carefully, select proper alternative and answer in the OMR sheet.**
4) **The OMR sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O, (D) O. Darken the circle ● of the correct answer with ball-pen.**
5) **Rough work is to be done in the space provided for this purpose in the Test Booklet only.**
6) **Set No. of Question Paper printed on the upper-most right side of the Question Paper is to be written in the column provided in the OMR sheet.**
7) **Students may use a simple calculator and log-table, if necessary.**
8) **Notations used in this question paper have proper meaning.**
9) **If more than one circle is ● darkened for one answer, the answer will be considered invalid.**

1) Unit of linear charge density is _____.

(A) C/m

(B) C m

(C) C m^2

(D) C/m^2

Rough Work

2) If 10^{10} electrons move out of a body to another body every second, how much time is required to get a total charge of 1C on the other body?

(A) 6.25×10^{10}s

(B) 6.25×10^{9}s

(C) 6.25×10^{8}s

(D) 6.25×10^{-9}s

3) An electric dipole with dipole moment 4×10^{-9} C m is aligned at 30° with the direction of a uniform electric field of magnitude 5×10^{4} NC^{-1}. What is the magnitude of the torque acting on the dipole?

(A) 10^{-2} Nm

(B) 10^{4} Nm

(C) 10^{2} Nm

(D) 10^{-4} Nm

4) Dimensional formula of Electric field is _____.

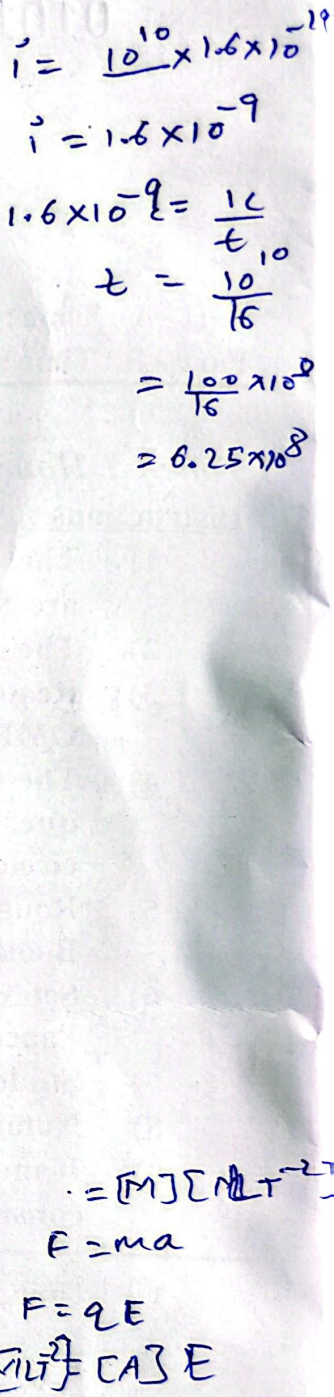
(A) $M^1L^{-1}T^{-3}A^1$

(B) $M^1L^1T^{-3}A^{-1}$

(C) $M^1L^1T^{-1}A^{-1}$

(D) $M^1L^1T^{-2}A^1$

Rough Work



5) A point charge of 2.0 μC is at the centre of a cubic Gaussian surface 9.0 cm on edge. The net electric flux through the surface is _____ Nm^2/C.

(A) 2.2×10^{-5}

(B) 2.2×10^{5}

(C) 2.2×10^{6}

(D) 2.2×10^{-6}

6) Distance between two charges q_1 and q_2 is r, the force between them is F. The distance between them increase and it becomes $3r$, the electrostatic force will be _____.

(A) 9F

(B) F/3

(C) F/9

(D) 3F

7) A 12 pF capacitor is connected to a 50V battery. Electrostatic energy stored in the capacitor is _____.

(A) 1.5×10^{-8} J

(B) 1.5×10^{-10} J

(C) 1.5×10^{4} J

(D) 1.5×10^{8} J

8) Which following physical quantity has same unit as energy density?

(A) Work

(B) Angular momentum

(C) Pressure

(D) Current density

Rough Work

9) Three capacitors of capacitances 2pF, 3pF and 4pF are connected in series. What is the equivalent capacitance of this combination?

(A) $\frac{13}{12}$ pF

(B) 13 pF

(C) 9 pF

(D) $\frac{12}{13}$ pF

10) At _____ distance electric potential due to a electric charge 4×10^{-7}C will be 4×10^{4}V.

(A) 9 mm

(B) 9 μm

(C) 9 cm

(D) 9 m

11) Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately _____.

(A) planes

(B) spheres

(C) paraboloids

(D) ellipsoids

12) Use of wheatstone bridge is _____.

(A) to find unknown resistance

(B) to find unknown current

(C) to find unknown emf

(D) all of above

Rough Work

$\frac{1}{C} = \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$

$= \frac{5}{6} + \frac{1}{4}$

$\frac{1}{C} = \frac{20+6}{24}$

$C = \frac{24}{26}$ $\frac{2|12}{13}$

$\frac{1}{r} \times 4\times10^{4} = \frac{9\times10^{9}\times4\times10^{-7}}{r}$

$r = 9 \times 10^{9} \times 10^{-11}$

$= 9 \times 10^{-2}$

13) Metals have resistivities in the range of _____.

(A) $10^{22}\Omega m$ to $10^{24}\Omega m$

(B) $10^{-8}\Omega m$ to $10^{-6}\Omega m$

(C) $10^{-8}\Omega m$ to $10^{6}\Omega m$

(D) $10^{8}\Omega m$ to $10^{6}\Omega m$

14) The storage battery of a car has an emf of 12V. If the internal resistance of the battery is 0.8Ω, what is the maximum current that can be drawn from the battery?

(A) 30 A

(B) 1.5 A

(C) 0.15 A

(D) 15 A

15) A circular coil of wire consisting of 100 turns, each of radius 8.0 cm carries a current of 0.40 A. What is the magnitude of the magnetic field B at the centre of the coil?

(A) $\pi \times 10^{-6}$ T

(B) $\pi \times 10^{-4}$ T

(C) $4\pi \times 10^{-6}$ T

(D) $4\pi \times 10^{-4}$ T

16) A solenoid of length 0.5 m has a radius of 1cm and is made up of 1000 turns. It carries a current of 5A. What is the magnitude of the magnetic field inside the solenoid?

(A) $4\pi \times 10^{-3}$ T

(B) $2\pi \times 10^{-3}$ T

(C) $\pi \times 10^{-3}$ T

(D) $3\pi \times 10^{-3}$ T

Rough Work

$B = N\left(\frac{\mu_0}{4\pi}\right)\frac{I}{r} \times 2\pi$

$= 100 \times 10^{-7} \times \frac{0.1}{8 \times 10^{-2}} \times 2\pi$

$= \frac{\pi}{10^{-2}} \times 10^{-7} \times 10$

$= \pi \times 10^{-4}$

$B = \mu_0 \frac{N}{L} \times i$

$= 4\pi \times 10^{-7} \times 1000 \times 5 \times \frac{1}{\frac{1}{2}}$

$= 4\pi \times 10^{-7} \times 10^{4}$

$= 4\pi \times 10^{-3}$

Rough Work

17) By increasing number of turns of coil in Galvanometer its current sensitivity _____ and voltage sensitivity _____.

(A) increases, remains constant

(B) decreases, remains constant

(C) increases, increases

(D) decreases, decreases

18) Unit of Torsional constant is _____.

(A) J. rad

(B) rad / J

(C) J / rad

(D) $\frac{N}{m}$. rad

19) For a short Bar magnet $\frac{\text{B-axial}}{\text{B-equatorial}} =$ _____.

(A) 1 : 2

(B) 1 : 1

(C) 3 : 2

(D) 2 : 1

20) Force exerted on a charge particle of a conducting wire of length l moving with velocity $\vec{v}$ in magnetic field $\vec{B}$ [perpendicular to $\vec{B}$] is _____.

(A) $\vec{F} = q\,(\vec{v} + \vec{E} \times \vec{B})$

(B) $\vec{F} = q\,(\vec{E} + \vec{v} \times \vec{B})$

(C) $\vec{F} = q\,(\vec{B} + \vec{v} \times \vec{E})$

(D) $\vec{F} = q\,(\vec{E} + \vec{v} \cdot \vec{B})$

Rough Work

21) The direction of induced emf during electromagnetic induction is given by _____.

(A) Faraday's law

(B) Gauss's law

(C) Maxwell's law

(D) Lenz's law

22) A wheel with 10 metallic spokes each 0.5 m long is rotated with a speed of 120 rev/min in a plane normal to the horizontal component of earth's magnetic field H_E at a place. If $H_E = 0.4$ G at the place, what is the induced emf between the axle and the rim of the wheel? [1G = 10^{-4} T]

$e = \frac{B\omega l^2}{2}$

$= 0.4 \times 10^{-4} \times \frac{120 \times 2\pi}{60} \times \frac{1}{4}$

$= 10^{-5} \times 4\pi$

$= 12.56 \times 10^{-5}$

(A) 6.28×10^{-5}V

(B) 12.56×10^{-5}V

(C) 6.28×10^{-4}V

(D) 12.56×10^{-4}V

23) A.C. generator converts _____.

(A) electrical energy into mechanical energy

(B) mechanical energy into heat energy

(C) mechanical energy into light energy

(D) mechanical energy into electrical energy

Rough Work

24) For an AC given by

$i = 100 \cos (200t + 45°)$ A, then value of I_{rms} = _____.

(A) $50\sqrt{2}$ A

(B) $100\sqrt{2}$ A

(C) 50 A

(D) 100 A

25) In LCR series AC circuit, $R=\sqrt{7}\Omega$, $X_L = 11\Omega$ and $X_C = 8\Omega$, then the value of impedance Z is _____.

(A) 16 Ω

(B) 8 Ω

(C) 4 Ω

(D) 2 Ω

26) Wavelength of X-rays, Infrared rays and Ultraviolet rays are λ_1, λ_2 and λ_3 respectively. Then _____.

(A) $\lambda_1 > \lambda_2 > \lambda_3$

(B) $\lambda_1 < \lambda_2 < \lambda_3$

(C) $\lambda_1 < \lambda_3 < \lambda_2$

(D) $\lambda_1 > \lambda_3 > \lambda_2$

27) The amplitude of the magnetic field of Electromagnetic wave is $B_0 = 510\ nT$, then amplitude of electric field of Electromagnetic wave is E_0 = _____.

(A) 170 V/m

(B) 153 V/m

(C) 135 V/m

(D) 143 V/m

Rough Work

28) The refractive index of medium 3 with respect to medium 2 is n_{32} = _____.

(A) $n_{13} \times n_{12}$

(B) $n_{31} \times n_{21}$

(C) $n_{13} \times n_{21}$

(D) $n_{31} \times n_{12}$

29) From the following which one is the lens maker's formula?

(A) $\frac{1}{f} = (n_{21} + 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

(B) $\frac{1}{f} = (n_{12} - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

(C) $\frac{1}{f} = (n_{21} - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

(D) $\frac{1}{f} = (n_{12} + 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

30) If path difference between two waves is 3λ then phase difference related with them is _____.

(A) 6π rad

(B) 3π rad

(C) 2π rad

(D) 4π rad

Rough Work

31) Consider sunlight incident on a slit a width 10^4 Å. The image seen through the slit shall _____.

(A) only be a diffused slit white in colour

(B) be a fine sharp slit white in colour at the center

(C) a bright slit white at the center diffusing to zero intensities at the edges

(D) a bright slit white at the center diffusing to regions of different colours

32) The de Broglie wavelength of proton and α- particle is same. The ratio of their velocities is _____.

(A) 1 : 4

(B) 1 : 2

(C) 2 : 1

(D) 4 : 1

33) Slope of the graph of stopping potential (V_0) → frequency (ν) is _____.

(A) ϕ_0

(B) ϕ_0/e

(C) h/e

(D) zero

34) Monochromatic light of frequency 6.0×10^{14} Hz is produced by a laser. The power emitted is 2.0×10^{-3} W. How many photons per second on an average, are emitted by the source?

(A) 5×10^{15}

(B) 0.5×10^{17}

(C) 5×10^{17}

(D) 0.5×10^{15}

35) A proton, a neutron, an electron and an α- particle have same energy. Then their de - Broglie wavelengths compare as

(A) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$

(B) $\lambda_e < \lambda_p = \lambda_n > \lambda_\alpha$

(C) $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_e$

(D) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$

Rough Work

$\lambda = \frac{h}{mv}$

$\lambda = \frac{h}{\sqrt{2mK}}$

$\lambda_p = \frac{h}{\sqrt{2m_p K}}$

$\lambda_n = \frac{h}{\sqrt{2m_n K}}$

$\lambda_e = \frac{h}{}$

36) The photoelectric cut-off voltage in a certain experiment is 1.5V. The maximum kinetic energy of emitted photoelectrons is _____.

(A) 2.4×10^{-18} J

(B) 1.5 eV

(C) 15 eV

(D) 2.4×10^{-20} J

$K = qV_0$

$=$

37) The size of the atom in Thomson's model is _____ the atomic size in Rutherford's model.

(A) much greater than

(B) no different from

(C) much less than

(D) none of the above

38) In Hydrogen atom energy of electron in first excited state is _____.

(A) – 13.6 eV

(B) – 1.51 eV

(C) – 0.85 eV

(D) – 3.40 eV

$E = -13.6 \text{ eV} \times \frac{1}{4}$

$=$

Rough Work

39) α - particle scattering experiment is done _____.

(A) to investigate atomic structure

(B) to investigate nucleus structure

(C) to investigate electronic configuration

(D) to investigate α-particle emission

40) If impact parameter is very small, then scattering angle θ is _____ rad.

(Where, θ is the scattering angle of α - particle)

(A) $\pi/2$

(B) 0

(C) π

(D) $\pi/4$

41) $^{198}_{80}Hg$ and $^{197}_{79}Au$ are _____ of each other.

(A) isobar

(B) isotone

(C) isotopes

(D) isomer

Rough Work

42) Complete the Nuclear fission equation given below.

$${}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{133}_{51}Sb + \_\_\_\_\_ + 4\,{}^{1}_{0}n$$

(A) ${}^{94}_{38}Sr$

(B) ${}^{89}_{36}Kr$

(C) ${}^{99}_{41}Nb$

(D) ${}^{144}_{56}Ba$

43) Nuclear Binding Energy (Eb) is _____.

(A) Energy required to separate nucleus from its atoms

(B) Energy required to break a nucleus into its nucleons

(C) Energy required to remove all electrons of the atom

(D) Energy required to break an atom into electrons, protons and neutrons

44) Radius of nucleus of ${}^{27}_{13}Al$ and ${}^{64}_{30}Zn$ is R_1 and R_2 respectively.

Then $\frac{R_1}{R_2} =$ _____.

(A) $\frac{3}{4}$

(B) $\frac{27}{64}$

(C) $\frac{9}{16}$

(D) $\frac{13}{30}$

Rough Work

45) Equivalent energy of 2 g of substance is _____.

(A) 6×10^8 J

(B) 9×10^{13} J

(C) 6×10^{11} J

(D) 18×10^{13} J

$E = \Delta M c^2$

$= 2 \times 10^{-3} \times 9 \times 10^{16}$

$= 18 \times 10^{13}$

46) When a forward bias is applied to a p-n junction, it

(A) raises the potential barrier

(B) reduces the majority carrier current to zero

(C) lowers the potential barrier

(D) none of the above

47) Dynamic resistance of a diode is given by _____.

(A) $r_d = \frac{\Delta V}{\Delta I}$

(B) $r_d = \frac{\Delta I}{\Delta V}$

(C) $r_d = -\frac{\Delta V}{\Delta I}$

(D) $r_d = -\frac{\Delta I}{\Delta V}$

Rough Work

48) From the following which is not appropriate statement to reduce the ripples in a rectifier circuit with capacitor filter _____.

(A) R_L should be increased

(B) input frequency should be decreased

(C) input frequency should be increased

(D) capacitors with high capacitance should be used

49) In half-wave rectification, what is the output frequency if the input frequency is 60 Hz?

(A) 120 Hz

(B) 30 Hz

(C) 60 Hz

(D) 90 Hz

50) In an unbiased p-n junction, holes diffuse from the p-region to n-region because

(A) free electrons in the n-region attract them

(B) hole concentration in p-region is more as compared to n-region

(C) they move across the junction by the potential difference

(D) all the above

054 (E)

(FEBRUARY-MARCH, 2026)
(SCIENCE STREAM)
(CLASS - XII)

(Part - B)

Time : 2 Hours] *[Maximum Marks : 50*

Instructions :

1) **Write in a clear legible handwriting.**
2) **There are three sections in Part - B (A, B & C) of the question paper and total 1 to 27 questions are there.**
3) **All sections are compulsory. General options are given.**
4) **The numbers at right side represent the marks of the question.**
5) **Start new section on new page.**
6) **Maintain sequence.**
7) **Students may use a simple calculator and log-table, if necessary.**
8) **Question nos. 2(B), 13(B), 18(B) & 27(B) are only for Blind students in this question paper.**

SECTION - A

■ **Answer any eight questions from the question nos. 1 to 12 given below. (Each question carries 2 marks.)** **[16]**

1) Two insulated charged copper spheres A and B have their centres separated by a distance of 50 cm. What is the mutual force of electrostatic repulsion if the charge on each is 6.5×10^{-7}C? The radii of A and B are negligible compared to the distance of separation. **[2]**

2) (A) **For General Students.** **[2]**

Derive equation of Electric field due to a uniformly charged infinite plane sheet by using Gauss's Law.

2) (B) **Only for Blind Students.** **[2]**

Write any four important points regarding Gauss's Law.

3) Define Mobility. Write its unit. Derive equation for Mobility. **[2]**

4) Give two differences between Diamagnetic substance and paramagnetic substance. **[2]**

5) A circular coil of radius 10 cm, 500 turns and resistance 2Ω is placed with its plane perpendicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through 180° in 0.25 s. Estimate the magnitudes of the emf and current induced in the coil. Horizontal component of the earth's magnetic field at the place is 3.0×10^{-5}T. [2]

6) Explain resonance for LCR series AC circuit & derive equation for angular resonant frequency. [2]

7) Give the construction and uses of optical fibre. [2]

8) In a Young's double - slit experiment, the slits are separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm. Determine the wavelength of light used in the experiment. [2]

$y = \frac{n \cdot \lambda D}{d}$

9) Write any four characteristics of photon. [2]

10) In accordance with the Bohr's model, find the quantum number that characteristics the earth's revolution around the sun in an orbit of radius 1.5×10^{11} m with orbital speed 3×10^4 m/s. [mass of the earth = 6.0×10^{24} kg] [2]

$\frac{mv^2}{r} =$

11) Write a short note about Radioactivity. [2]

12) Suppose a pure Si crystal has 5×10^{28} atoms m^{-3}. It is doped by 1 ppm concentration of pentavalent As. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16}\ m^{-3}$. [2]

$dW = F d\theta$
$= qE \times 2\sin\theta$
$dW = PE\sin\theta$ $\quad W = -PE\cos\theta$

SECTION - B

From the question nos. 13 to 21 given below, answer any 6 questions.
(Each question carries 3 marks.) [18]

13) (A) **For General Students.** [3]
Derive equation for a potential energy of a dipole in an external electric field.

13) (B) **Only for Blind Students.** [3]
A molecule of a substance has a permanent electric dipole moment of magnitude 10^{-29} C m. A mole of this substance is polarised [at low temperature] by applying a strong electrostatic field of magnitude 10^6 Vm^{-1}. The direction of the field is suddenly changed by an angle of 60°. Estimate the heat released by the substance in aligning its dipoles along the new direction of the field. For simplicity, assume 100% polarisation of the sample. $N_A = 6 \times 10^{23}$/mol

14) A heating element using nichrome connected to a 230V supply draws an initial current of 3.2A which settles after a few seconds to a steady value of 2.8 A. What is the steady temperature of the heating element if the room temperature is 27.0°C? Temperature co-efficient of resistance of nichrome averaged over the temperature range involved is $1.70 \times 10^{-4}\ °C^{-1}$. [3]

15) Derive an equation for magnetic force on a current carrying conductor, $\vec{F} = I \cdot \vec{l} \times \vec{B}$. [3]

16) Define self inductance. On which factor does it depend? Derive equations for back emf and energy stored in circuit? [3]

17) What is transformer? Explain working procedure of transformer. For an ideal transformer prove that [3]

$$\frac{I_p}{I_s} = \frac{V_s}{V_p} = \frac{N_s}{N_p}$$

18) (A) **For General Students.** [3]

Derive equation for effective focal length for combination of thin convex lenses in contact & derive equation for net power.

18) (B) **Only for Blind Students.** [3]

i) If $f = 0.5$ m for a glass lens, what is the power of lens?

ii) The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. Its focal length is 12 cm. What is the refractive index of glass?

iii) A convex lens has 20 cm focal length in air. What is focal length in water? [Refractive index of air - water = 1.33, refractive index for air - glass = 1.5]

19) Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected and (b) refracted light? Refractive index of water is 1.33. [3]

20) Explain three physical processes for the emission of electron from the surface of a metal. [3]

21) Derive equation for total energy of an electron in Hydrogen atom. [3]

SECTION - C

■ **Answer any four questions from the following question nos. 22 to 27 as directed. (Each question carries 4 marks.)** **[16]**

22) Explain effect of dielectric in case of parallel plate capacitor & obtain formula for capacitance in presence of dielectric. **[4]**

23) State Ohm's law and obtain resistance $R = \rho\frac{l}{A}$. By using Ohm's law obtain the relation between current density $(\vec{j})$ and electric field $(\vec{E})$. **[4]**

24) A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R = 3Ω, L = 25.48 mH and C = 796 μF. Find **[4]**

a) impedance of the circuit

b) the phase difference between the voltage across the source and the current

c) the power dissipated in the circuit

d) the power factor

25) A person with a normal near point (25 cm) using a compound microscope with objective of focal length 8.0 mm and an eyepiece of focal length 2.5 cm can bring an object placed at 9.0 mm from the objective in sharp focus. What is the separation between the two lenses? Calculate the magnifying power of the microscope. **[4]**

26) How long can an electric lamp of 100 W be kept glowing by fusion of 2.0 kg deuterium? Take the fusion reaction as **[4]**

$$^{2}_{1}H + ^{2}_{1}H \rightarrow ^{3}_{2}He + n + 3.27\,MeV$$

27) (A) **For General Students.** **[4]**

Explain full wave rectification with the help of proper circuit diagram and draw the waveform of input AC and output voltage.

27) (B) **Only for Blind Students.** **[4]**

Give any four points of difference between p-type and n-type semiconductors.