JUPITER ACADEMY

NEET UG - PHYSICS SAMPLE PAPER - 12 - 04

NEET-UG - Physics

Time Allowed: 1 hour **Maximum Marks: 200**

Section A

1. The acceleration of an electron in an electric field of magnitude 50 V/cm, if $\frac{e}{m}$ value of the electron is 1.76 × 10^{11} C/kg, is: **[4]**

   a) Zero

   b) 8.8 × 10^{14} m/sec^2

   c) 5.4 × 10^{12} m/sec^2

   d) 6.2 × 10^{13} m/sec^2

2. The electric field intensity on the surface of a solid charged sphere of radius r and volume charge density ρ is given by: **[4]**

   a) $\frac{\rho r}{3\varepsilon_0}$

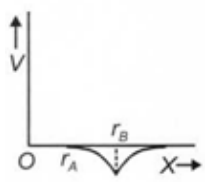
   b) zero

   c) $\frac{5\rho r}{6\varepsilon_0}$

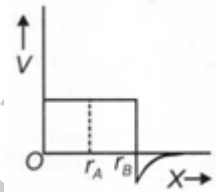
   d) $\frac{1}{4\pi\varepsilon_0}\frac{\rho}{r}$

3. Two concentric conducting thin spherical shells A and B having radii r_A and r_B ($r_B > r_A$) are charged to Q_A and $-Q_B$ ($|Q_B| > |Q_A|$). The electrostatic potential along a line, (passing through the centre is) **[4]**

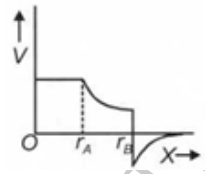
   a)

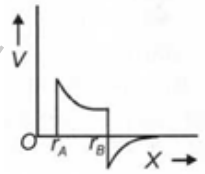
   b)

   c)

   d)

4. Two identical capacitors have the same capacitance C. One of them is charged to potential V_1 and the other to V_2. The negative ends of the capacitors are connected together. When the positive ends are also connected, the decrease in energy of the combined system is: **[4]**

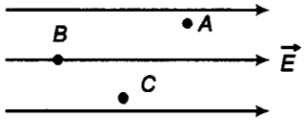
   a) $\frac{C}{4}\left(V_1^2 + V_2^2\right)$

   b) $\frac{C}{4}(V_1 + V_2)^2$

   c) $\frac{C}{4}(V_1 - V_2)^2$

   d) $\frac{C}{4}\left(V_1^2 - V_2^2\right)$

5. A, B and C are three points in a uniform electric field. The electric potential is: **[4]**

   a) same at all the three points A, B and C

   b) maximum at C

   c) maximum at A

   d) maximum at B

6. Two batteries of emfs 2V and 1V of internal resistances 1 Ω and 2 Ω respectively are connected in parallel. The **[4]**

effective emf of the combination is:

a) $\frac{3}{5}\mathbf{V}$ b) $\frac{5}{3}\mathbf{V}$

c) $\frac{3}{2}\mathbf{V}$ d) 2 V

7. An unknown resistance K_1 is connected in series with a resistance of 10Ω. This combination is connected to one gap of a metre bridge, while a resistance K_2 is connected in the other gap. The balance point is at 50 cm. Now when the 10Ω resistance is removed, the balance point shifts to 40 cm. The value of K_1 is: **[4]**

a) 10Ω b) 40Ω

c) 60Ω d) $20\ \Omega$

8. In a Wheatstone bridge, three resistance P, Q and R are connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be: **[4]**

a) $\frac{P}{Q} = \frac{R(S_1+S_2)}{S_1S_2}$ b) $\frac{P}{Q} = \frac{R}{S_1+S_2}$

c) $\frac{P}{Q} = \frac{R(S_1+S_2)}{2S_1S_2}$ d) $\frac{P}{Q} = \frac{2R}{S_1+S_2}$

9. A steady current is passing through a linear conductor of non-uniform cross-section. The net quantity of charge crossing any cross-section per second is: **[4]**

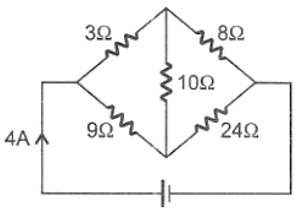
a) independent of area of cross-section

b) inversely proportional to the length of conductor

c) directly proportional to the area of cross-section

d) directly proportional to the length of conductor

10. In the following circuit, if the 10 Ω resistance is replaced by 20 Ω, then what is the amount of current drawn from the battery? **[4]**



a) 2 A b) 4 A

c) 10 A d) 8 A

11. In an ammeter 10% of main current is passing through the galvanometer. If the resistance of the galvanometer is G, then the shunt resistance, (in ohm) is: **[4]**

a) 90 G b) 9G

c) $\frac{G}{90}$ d) $\frac{G}{9}$

12. The magnetic moment (p) of a revolving electron around the nucleus varies with principal quantum number n as: **[4]**

a) $\mu \propto \frac{1}{n^2}$ b) $\mu \propto n$

c) $\mu \propto n^2$ d) $\mu \propto \frac{1}{n}$

13. Two moving coil galvanometers 1 and 2 are with identical field magnets and suspension torque constants but with coils of different number of turns N_1 and N_2, area per turn A_1 and A_2 and resistances R_1 and R_2. When they are connected in series in the same circuit, they show deflections θ_1 and θ_2. Then, $\left(\frac{\theta_1}{\theta_2}\right)$ is: **[4]**

a) $\left(\frac{A_1N_1}{A_2N_2}\right)$ b) $\left(\frac{A_1R_1N_1}{A_2R_2N_2}\right)$

c) $\left(\frac{A_1N_2}{A_2N_1}\right)$ d) $\left(\frac{A_1R_2N_1}{A_2R_1N_2}\right)$

14. Two short bar magnets of magnetic moments M each are arranged at the opposite corners of a square of side d such that their centres coincide with the corners and their axes are parallel. If the like poles are in the same direction, the magnetic induction at any of the other corners of the square is: **[4]**

a) $\frac{\mu_0}{4\pi}\frac{M}{2d^3}$ b) $\frac{\mu_0}{4\pi}\frac{2M}{d^3}$

c) $\frac{\mu_0}{4\pi}\frac{M}{d^3}$ d) $\frac{\mu_0}{4\pi}\frac{M^2}{2d^3}$

15. A rectangular coil of 100 turns and size 0.1 m $\times$ 0.05 m is placed perpendicular to a magnetic field of 0.1 T. If the field drops to 0.05 T in 0.05 s, the magnitude of the emf induced in the coil is: **[4]**

a) 3 b) 0.5

c) 2 d) 6

16. The magnetic flux (ϕ) linked with a coil due to its own magnetic field is related to the number (N) of turns of the coil as: **[4]**

a) $\phi \propto N^2$ b) $\phi \propto N$

c) $\phi \propto N^{-2}$ d) $\phi \propto N^{-1}$

17. A resistor R, an inductor L and a capacitor C are connected in series to an oscillator of frequency n. If the resonant frequency is n_r, then the current lags behind voltage, when: **[4]**

a) $n < n_r$ b) n = 0

c) $n > n_r$ d) $n = n_r$

18. An inductor 20 mH, a capacitor 100 μF and a resistor 50Ω ae connected in series across a source of emf, V = 10 sin 314 t. The power loss in the circuit is: **[4]**

a) 2.74 W b) 0.79 W

c) 1.13 W d) 0.43 W

19. The instantaneous values of alternating current and voltage in a circuit are given as $i = \frac{1}{\sqrt{2}}\sin(100\pi t)$ ampere **[4]**
$e = \frac{1}{\sqrt{2}}\sin(100\pi t + \frac{\pi}{3})$ volt
The average power in watts consumed in the circuit is:

a) $\frac{1}{2}$ b) $\frac{1}{4}$

c) $\frac{\sqrt{3}}{4}$ d) $\frac{1}{8}$

20. IF I_0 and I_a denote intensities of incident and absorbed X-ray, then: **[4]**

a) $I_a = I_0 (1 - e^{-\mu d})$ b) $I_a = I_0 (1 - e^{\mu d})$

c) $I_a = I_0 e^{-\mu d}$ d) $I_a = I_0 e^{\mu d}$

21. The frequencies of X-rays, γ-rays and ultraviolet rays are respectively a, b and c. Then: **[4]**

a) a < b, b < c b) a > b, b > c

c) a > b, b < c d) a < b, b > c

22. The amplitude of the electric field in a parallel light beam of intensity 4 Wm^{-2} is: **[4]**

a) 35.5 NC^{-1} b) 49.5 NC^{-1}

c) 55.5 NC^{-1} d) 45.5 NC^{-1}

23. A normal eye can form sharp images of objects as close as: **[4]**

a) 25 inches b) 25 cm

c) 25 mm d) 25 metres

24. In an experiment, a convex lens of focal length 15 cm is placed coaxially on an optical bench in front of a convex mirror at a distance of 5 cm from it. It is found that an object and its image coincide if the object is placed at a distance of 20 cm from the lens. The focal length of the convex mirror is: **[4]**

a) 25.0 cm b) 20.0 cm

c) 30.5 cm d) 27.5 cm

25. The central fringe of the interference pattern produced by light of wavelength 6000 Å is found to shift to the position of 4th bright fringe after a glass plate of refractive index 1.5 is introduced. The thickness of the glass plate would be: **[4]**

a) 3.78 μm b) 14.98 μm

c) 4.8 μm d) 8.23 μm

26. Two coherent point sources S_1 and S_2 vibrating in phase emit light of wavelength λ. The separation between the sources is 2λ. The smallest distance from S_2 on a line passing through S_2 and perpendicular to S_1S_2 where a minimum intensity occurs is: **[4]**

a) $\frac{15\lambda}{4}$ b) $\frac{3\lambda}{4}$

c) $\frac{\lambda}{2}$ d) $\frac{7\lambda}{12}$

27. For what kinetic energy of proton, will the associated de Broglie wavelength be 16.5 nm? (Given $m_p = 1.675 \times 10^{-27}$ kg, h = 6.63×10^{-34} J-s) **[4]**

a) 5.2×10^{-20} J b) 5.2×10^{-34} J

c) 4.8×10^{-25} J d) 4.8×10^{-30} J

28. The photoelectric threshold frequency of a metal is v. When the light of frequency 4 v is incident on the metal, the maximum kinetic energy of the emitted photoelectrons is: **[4]**

a) $\frac{5hv}{2}$ b) 5 hv

c) 3 hv d) 4 hv

29. If a surface has a work function of 3.00 eV, the longest wavelength of light which will cause the emission of electrons is: **[4]**

a) 6.84×10^{-7} m b) 4.13×10^{-7} m

c) 5.99×10^{-7} m d) 4.8×10^{-7} m

30. If the ionisation energy of a hydrogen-like Bohr atom is 4 Rydberg, then the wavelengths of radiation emitted when the electron jumps from first excited state to the ground state and the radius of the first orbit of this atom **[4]**

are:

a) 304 $\overset{o}{A}$, 0.265 $\overset{o}{A}$

b) 3.04 $\overset{o}{A}$, 0.53 $\overset{o}{A}$

c) 912 $\overset{o}{A}$, 0.53 $\overset{o}{A}$

d) 3.04 $\overset{o}{A}$, 0.265 $\overset{o}{A}$

31. A photon of energy 10.2 eV collides inelastically with a hydrogen atom in the ground state. After few microseconds, another photon of energy 15 eV collides inelastically with the same hydrogen atom. Finally by a suitable detector, we find: **[4]**

a) photon of energy 10.2 eV and electron of energy 1.4 eV

b) two photons of energy 3.4 eV

c) photon of energy 3.4 eV and electron of energy 1.4 eV

d) two photons of energy 10.2 eV

32. Complete the following nuclear reaction: **[4]**

$_{92}\mathrm{Th}^{234} \rightarrow {}_{93}\mathrm{Pa}^{234} + \ldots$

a) α

b) neutrino

c) γ

d) β

33. A radioactive sample S_1 having the activity A_1 has twice the number of nuclei as another sample S_2 of activity A_2. If $A_2 = 2A_1$ then the ratio of the half-life of S_1 to the half-life of S_2 is: **[4]**

a) 2

b) 0.75

c) 0.25

d) 4

34. The energy of radiation emitted by LED is: **[4]**

a) equal to or less than the band gap of the semiconductor used

b) always less than the band gap of the semiconductor used

c) greater than the band gap of the semiconductor used

d) always equal to the band gap of the semiconductor used

35. Refracting angle of a glass prism is 60^o. The minimum deviation for light passing through the prism is 40^o. The refractive index of the prism material is: **[4]**

a) 1.532

b) 1.531

c) 1.534

d) 1.530

Section B

36. **Assertion (A):** In a cavity within a conductor, the electric field is zero. **[4]**
Reason (R): Charges in a conductor reside only at its surface.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

37. **Assertion (A):** If two protons are brought near one another, the potential energy of the system will increase. **[4]**
Reason (R): The charge on the proton is $+1.6 \times 10^{-19}$ C.

a) Both A and R are true and R is the correct

b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

38. **Assertion (A):** An electric bulb becomes dim, when the electric heater in parallel circuit is switched on. **[4]**

Reason (R): Dimness decreases after sometime.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

39. **Assertion (A):** Voltameter measures current more accurately than an ammeter. **[4]**

Reason (R): Relative error will be small if measured from voltameter.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

40. **Assertion:** The sensitivity of a moving coil galvanometer is increased by placing a suitable magnetic material as a core inside the coil. **[4]**

Reason: Soft iron has a high magnetic permeability and cannot be easily magnetized or demagnetized.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

41. **Assertion:** Torque experienced by the bar magnet is maximum when field is applied perpendicular to magnetic moment. **[4]**

Reason: Torque on a bar magnet depends on the angle between applied magnetic field and magnetic dipole moment.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

42. **Assertion (A):** Acceleration of a magnet falling through a long solenoid decrease. **[4]**

Reason (R): The induced current produced in a circuit always flows in such a direction that it opposes the change to the cause that produced it.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

43. **Assertion (A):** A bulb connected in series with a solenoid is connected to ac source. If a soft iron core is introduced in the solenoid, the bulb will glow brighter. **[4]**

Reason (R): On introducing soft iron core in the solenoid, the inductance increases.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

44. **Assertion (A):** Gamma rays are more energetic than X-rays. **[4]**
Reason (R): Gamma rays are of nuclear origin while X-rays originate from heavy atoms.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

45. **Assertion (A):** In astronomical telescope, the objective lens is of large aperture. **[4]**
Reason (R): Larger is the aperture, larger is the magnifying power.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

46. **Assertion (A):** Colours are seen in thin layers of oil on the surface of the water. **[4]**
Reason (R): White light is composed of several colours.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

47. **Assertion (A):** Radio waves can be polarised. **[4]**
Reason (R): Radio waves are transverse in nature.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

48. **Assertion (A):** In the process of photoelectric emission, all emitted electrons have the same kinetic energy. **[4]**
Reason (R): According to Einstein's equation $E_k = hv - \phi_0$.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

49. **Assertion (A):** Bohr had to postulate that the electrons in stationary orbits around the nucleus do not radiate. **[4]**
Reason (R): According to classical physics all moving electrons radiate.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

50. **Assertion (A):** The ratio of time taken for light emission from an atom to that for release of nuclear energy in fission is 1 : 100 **[4]**
Reason (R): Time taken of the light emission from an atom is of the order of 10^{-8} s.

a) Both A and R are true and R is the correct
b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.