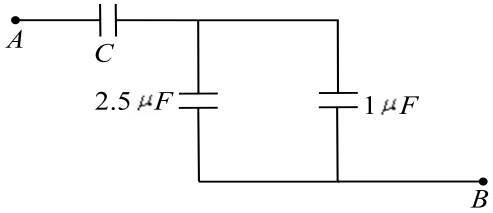
Sample Paper-02

Class 12th NEET (2024)

PHYSICS

SECTION-A

1. The equivalent capacitance between A and B in the figure is $1\mu F$. Then the value of capacitance C is;



(1) 1.4μF
(2) 2.5μF
(3) 3.5μF
(4) 1.2μF

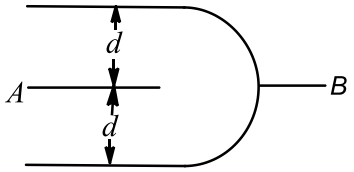
2. The electric potential V at any point O(x, y, z all in metres) in space is given by $V = 4x^2$ volt. The electric field at the point (1m, 0,2m) in volt/metre is;
(1) 8 along negative X-axis
(2) 8 along positive X-axis
(3) 16 along negative X-axis
(4) 16 along positive Z-axis

3. Two positive point charges of 12μC and 8μC are 10 cm apart. The work done in bringing them to 4 cm close is;
(1) 5.8 J (2) 5.8 eV
(3) 13 J (4) 13 eV

4. Charges $2q$, $-q$ and $-q$ lie at the vertices of an equilateral triangle. The value of E and V at the centroid of the triangle will be:
(1) $E \neq 0$ and $V \neq 0$
(2) $E = 0$ and $V = 0$
(3) $E \neq 0$ and $V = 0$
(4) $E = 0$ and $V \neq 0$

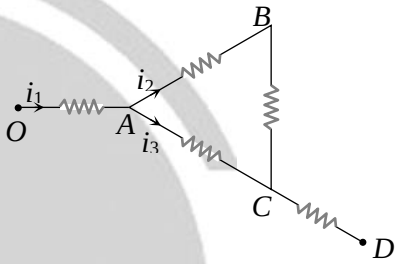
5. If a charged spherical conductor of radius 10 cm has potential V at a point distant 5cm from its centre, then the potential at a point distant 15 cm from the centre will be:
(1) $\frac{1}{3}V$ (2) $\frac{2}{3}V$
(3) $\frac{3}{2}V$ (4) 3V

6. Three plates of common surface area A are connected as shown. The effective capacitance will be:



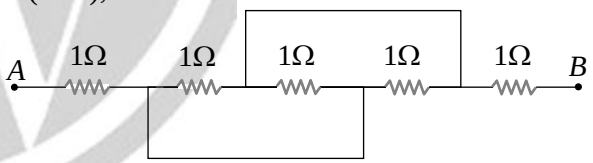
(1) $\frac{\varepsilon_0 A}{d}$ (2) $\frac{3\varepsilon_0 A}{d}$
(3) $\frac{3}{2}\frac{\varepsilon_0 A}{d}$ (4) $\frac{2\varepsilon_0 A}{d}$

7. The current in the arm CD of the circuit will be:



(1) $i_1 + i_2$ (2) $i_2 + i_3$
(3) $i_1 + i_3$ (4) $i_1 - i_2 + i_3$

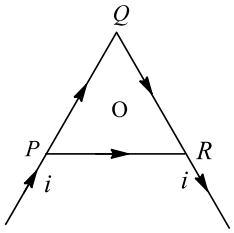
8. Equivalent resistance between the points A and B is (in Ω);



(1) $\frac{1}{5}$ (2) $1\frac{1}{4}$
(3) $2\frac{1}{3}$ (4) $3\frac{1}{2}$

9. A galvanometer of 25 Ω resistance can read a maximum current of 6mA. It can be used as a voltmeter to measure a maximum of 6V by connecting a resistance to the galvanometer. Identify the **correct** choice in the given answers:
(1) 1025 Ω in series
(2) 1025 Ω in parallel
(3) 975 Ω in series
(4) 975 Ω in parallel

10. An equilateral triangle of side l is formed from a piece of wire of uniform resistance. The current i is fed as shown in the figure. The magnitude of the magnetic field at its centre O is;



(1) $\frac{\sqrt{3}\mu_0 i}{2\pi l}$ (2) $\frac{3\sqrt{2}\mu_0 i}{2\pi l}$

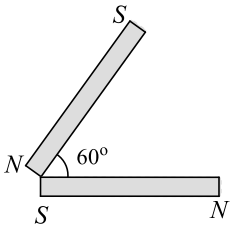
(3) $\frac{\mu_0 i}{2\pi l}$ (4) zero

11. A wire in the form of a circular loop of one turn carrying a current produces a magnetic field B at the centre. If the same wire is looped into a coil of two turns and carries the same current, the new value of magnetic induction at the centre is;

(1) $3B$ (2) $5B$

(3) $4B$ (4) $2B$

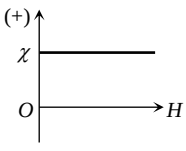
12. Two magnets of equal magnetic moments M each are placed as shown in figure. The resultant magnetic moment is;

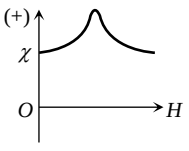


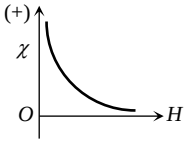
(1) M (2) $\sqrt{3}M$

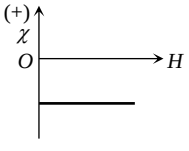
(3) $\sqrt{3}M$ (4) $\frac{M}{2}$

13. The variation of magnetic susceptibility (χ) with magnetising field for a paramagnetic substance is;

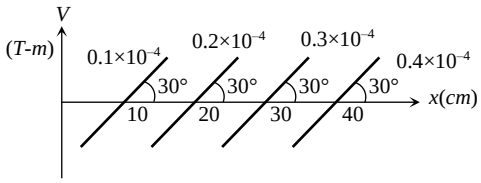
(1) 

(2) 

(3) 

(4) 

14. Some equipotential surfaces of the magnetic scalar potential are shown in the figure. Magnetic field at a point in the region is;



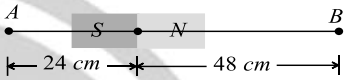
(1) 10^{-4} T

(2) 2×10^{-4} T

(3) 0.5×10^{-4} T

(4) None of these

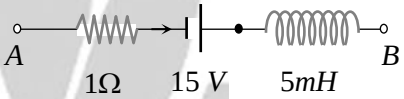
15. A bar magnet of length 3 cm has points A and B along its axis at distances of 24 cm and 48 cm on the opposite sides. Ratio of magnetic fields at these points will be:



(1) 8 : 1 (2) $1 : (2\sqrt{2})$

(3) 3 : 1 (4) 4 : 1

16. The network shown in the figure is a part of a complete circuit. If at a certain instant the current i is 5 A and is decreasing at the rate of 10^3 A/s then $V_A - V_B$ is;



(1) 5 V (2) 10 V

(3) 15 V (4) 20 V

17. In a magnetic field of 0.05 T, area of a coil changes from 101cm^2 to 100 cm^2 without changing the resistance which is 2Ω. The amount of charge that flow during this period is;

(1) 2.5×10^{-6} coulomb

(2) 2×10^{-6} coulomb

(3) 10^{-6} coulomb

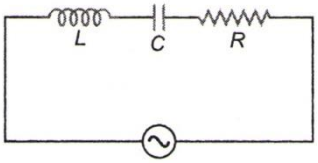
(4) 8×10^{-6} coulomb

18. A short solenoid of length 4 cm, radius 2 cm and 100 turns is placed inside and on the axis of a long solenoid of length 80 cm and 1500 turns. A current of 3 A flows through the short solenoid. The mutual inductance of two solenoids is;

(1) 2.96×10^{-4} H (2) 5.3×10^{-5} H

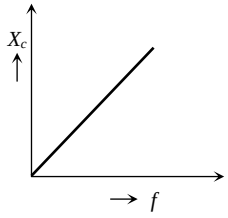
(3) 3.52×10^{-3} H (4) 8.3×10^{-5} H

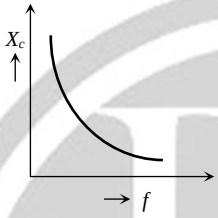
19. A 100 V, *AC* source of frequency 500 Hz is connected to an *L*-*C*-*R* circuit with L = 8.1 mH, C = 12.5 μF, R = 10 Ω all connected in series as shown in figure. What is the quality factor of circuit?

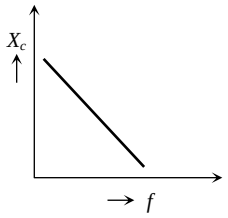


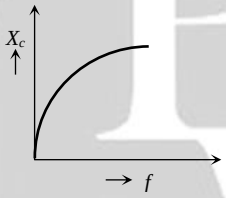
(1) 2.02 (2) 2.5434
(3) 20.54 (4) 200.54

20. Which of the following curves correctly represents the variation of capacitive reactance X_C with frequency f ?

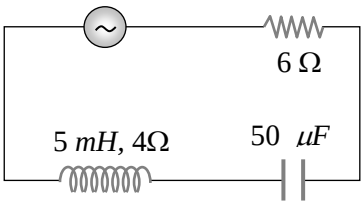
(1) 

(2) 

(3) 

(4) 

21. In the circuit shown below, the ac source has voltage V = 20 cos (ωt) volts with ω = 2000 rad/sec. The amplitude of the current will be nearest to;



(1) 2A (2) 3.3A
(3) $\frac{2}{\sqrt{5}}A$ (4) $\sqrt{5}A$

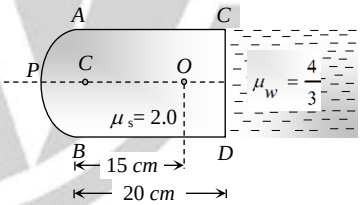
22. A plane Electromagnetic Wave of frequency 30 MHz travels in free space along the x-direction. The electric field component of the wave at a particular point of space and time E = 6 Vm^{-1} along y-direction. Its magnetic field component B at this point would be:
(1) 2×10^{-8} T along z-direction
(2) 6×10^{-8} T along x-direction
(3) 2×10^{-8} T along y-direction
(4) 6×10^{-8} T along z-direction

23. A point source of electromagnetic radiation has an average power output of 800 W. The maximum value of electric filed at a distance 4.0 m from the source is;
(1) 64.7 Vm^{-1} (2) 57.8 Vm^{-1}
(3) 56.72 Vm^{-1} (4) 54.77 Vm^{-1}

24. What is the time taken (in seconds) to cross a glass of thickness 4 mm and μ = 3 by light?
(1) 4×10^{-11} (2) 2×10^{-11}
(3) 16×10^{-11} (4) 8×10^{-10}

25. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is;
(1) $\frac{3}{2}$ (2) $\frac{4}{3}$
(3) $\frac{9}{8}$ (4) $\frac{5}{3}$

26. The slab of a material of refractive index 2 shown in figure has curved surface *APB* of radius of curvature 10 cm and a plane surface *CD*. On the left of *APB* is air and on the right of *CD* is water with refractive indices as given in figure. An object *O* is placed at a distance of 15 cm from pole *P* as shown. The distance of the final image of *O* from *P*, as viewed from the left is;



(1) 20 cm (2) 30 cm
(3) 40 cm (4) 50 cm

27. Two polaroids are kept crossed to each other. Now one of them is rotated through an angle of 45°. The percentage of incident light now transmitted through the system is;
(1) 15% (2) 25%
(3) 50% (4) 60%

28. Soap bubble appears coloured due to the phenomenon of;
(1) Interference (2) Diffraction
(3) Dispersion (4) Reflection

29. In Young's experiment, the distance between slits is 0.28 mm and distance between slits and screen is 1.4 m. Distance between central bright fringe and third bright fringe is 0.9 cm. What is the wavelength of used light?

(1) 5000 Å (2) 6000 Å
(3) 7000 Å (4) 9000 Å

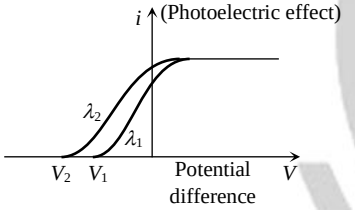
30. Sodium and copper have work functions 2.3 eV and 4.5 eV respectively. Then the ratio of their threshold wavelengths is nearest to;

(1) 1 :2 (2) 4 :1
(3) 2 :1 (4) 1 :4

31. A charged oil drop of mass 2.5×10^{-7} kg is in space between the two plates, each of area 2×10^{-2} m^2 of a parallel plate capacitor. When the upper plate has a charge of 5×10^{-7} C and the lower plate has an equal negative charge, the oil remains stationary. The charge of the oil drop is; [Take g = 10 m/s^2]

(1) 9×10^{-1} C (2) 9×10^{-6} C
(3) 8.85×10^{-13} C (4) 1.8×10^{-14} C

32. In the following diagrams if $V_2 > V_1$ then;



(1) $\lambda_1 = \sqrt{\lambda_2}$ (2) $\lambda_1 < \lambda_2$
(3) $\lambda_1 = \lambda_2$ (4) $\lambda_1 > \lambda_2$

33. A light whose frequency is equal to 6×10^{14} Hz is incident on a metal whose work function is 2eV. [$h = 6.63 \times 10^{-34}$ Js, 1eV = 1.6×10^{-19} J].
The maximum energy of the electrons emitted will be:

(1) 2.47 eV (2) 4.47 eV
(3) 0.47 eV (4) 5.47 eV

34. An electron of mass m and charge q is accelerated from rest in a uniform electric field of strength E. The velocity acquired by it as it travels a distance l is;

(1) $\sqrt{\frac{2Eql}{m}}$ (2) $\sqrt{\frac{2Eq}{ml}}$
(3) $\sqrt{\frac{2Em}{ql}}$ (4) $\sqrt{\frac{Eq}{ml}}$

35. For hydrogen atom electron in nth Bohr orbit, the ratio of radius of orbit to its de-Broglie wavelength is;

(1) $\frac{n}{2\pi}$ (2) $\frac{n^2}{2\pi}$
(3) $\frac{1}{2\pi n}$ (4) $\frac{1}{2\pi n^2}$

36. Given that in a hydrogen atom, the energy of nth orbit $E_n = -\frac{13.6}{n^2}$eV. The amount of energy required to send electron from first orbit to second orbit is;

(1) 10.2 eV (2) 12.1 eV
(3) 13.6 eV (4) 3.4 eV

SECTION-B

37. In hydrogen atom, the electron is moving round the nucleus with velocity 2.18×10^6 m/s in an orbit of radius 0.528Å. The acceleration of the electron is;

(1) 9×10^{18} m/s^2 (2) 9×10^{22} m/s^2
(3) 9×10^{-22} m/s^2 (4) 9×10^{12} m/s^2

38. In a radioactive substance at $t = 0$, the number of atoms is 8×10^4. Its half life period is 3 years. The number of atoms 1×10^4 will remain after interval;

(1) 9 years (2) 8 years
(3) 6 years (4) 24 years

39. What will be the angular momentum of an electron, if energy of this electron in H-atom is –1.5eV (in J-s)?

(1) 1.05×10^{-34} (2) 2.1×10^{-34}
(3) 3.15×10^{-34} (4) -2.1×10^{-34}

40. Which one of the series of hydrogen spectrum is in the visible region?

(1) Lyman series (2) Balmer series
(3) Paschen series (4) Bracket series

41. A series circuit with resistance, capacitance and inductance having values 1000 Ω, 1 μF and 2.0 H, respectively is connected to a supply $V = 100\sqrt{2}$ sin 1000t volt. Match quantities in **List-I** with their values in **List-II**.

List-I		**List-II**	
A	The rms current (in A)	I	100
B	The rms voltage (in V)	II	0.0707
C	PD across inductor (in V)	III	70.7
D	PD across capacitor (in V)	IV	141.4

(1) A → II, B → I, C → IV, D → III
(2) A → IV, B → I, C → II, D → III
(3) A → II, B → I, C → III, D → IV
(4) A → IV, B → II, C → III, D → I

42. Match the **List-I** showing the type of *EM* wave with **List-II**.

List-I EM Wave		List-II Frequency	
A	Visible	I	10^{19} Hz
B	Microwave	II	10^{14} Hz
C	X-rays	III	10^{11} Hz
D	Radio waves	IV	10^{5} Hz

(1) A $\rightarrow$ II, B $\rightarrow$ III, C $\rightarrow$ I, D $\rightarrow$ IV
(2) A $\rightarrow$ II, B $\rightarrow$ III, C $\rightarrow$ IV, D $\rightarrow$ I
(3) A $\rightarrow$ III, B $\rightarrow$ I, C $\rightarrow$ I, D $\rightarrow$ IV
(4) A $\rightarrow$ III, B $\rightarrow$ I, C $\rightarrow$ IV, D $\rightarrow$ I

43. **Statement I:** The phase difference between electric and magnetic field in an *EM* wave is $\frac{\pi}{2}$.

Statement II: The oscillation of electric and magnetic field vectors are perpendicular to the direction of propagation of *EM* wave.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

44. **Statement I:** The resistivity of semiconductors decreases with increase of temperature.

Statement II: In a conducting solid, the rate of collisions between free electrons and ions increases with increase of temperature.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

45. **Statement I:** When radius of a circular wire carrying current is doubled, its magnetic moment becomes four times.

Statement II: Magnetic moment is directly proportional to area of the loop. Which of the following statement(s) is/are correct?

(1) Only I (2) Only II
(3) Both I and II (4) None of these

46. **Assertion (A):** NAND or NOR gates are called digital building blocks.

Reason (R): The repeated use of NAND (or NOR) gates can produce all the basic or complicated gates.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

47. **Assertion (A):** Two different radioactive substances have initially same number of nuclei. Their decay constants are λ_1 and λ_2 ($< \lambda_1$), then initially first radioactive substance decays at faster rate.

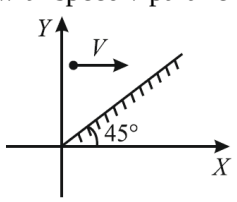
Reason (R): Half-life of first radioactive substance is more.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

48. The current in a wire varies with time according to the relation $i = (3 + 2.0\ t^2)$, where i is in amperes and t is in seconds. How many coulombs of charge pass a cross-section of the wire in the time interval between $t = 0$ and $t = 3.0$ s?

(1) 18 C (2) 25 C
(3) 27 C (4) 36 C

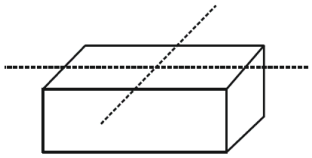
49. A plane mirror is inclined at an angle 45° in xy plane as shown in figure. A point object moves with speed v parallel to x-axis;



Find relative velocity of image *wrt* velocity of object.

(1) $v\hat{i} + v\hat{j}$ (2) $v\hat{i} - v\hat{j}$
(3) $-v\hat{i} + v\hat{j}$ (4) $-v\hat{i} - v\hat{j}$

50. A bar magnet of length L and area of cross-section A is cut into four identical parts as shown in figure. If initially magnetic moment was M, find magnetic moment of each piece after cutting;



(1) $\frac{M}{4}$ (2) $\frac{M}{2}$

(3) $\frac{M}{8}$ (4) 2 M

PW Web/App - https://smart.link/7wwosivoicgd4

Library- https://smart.link/sdfez8ejd80if