Sample Paper- 04 **Class 12th NEET (2024)**

PHYSICS

SECTION-A

1. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is.

(1) infinite (2) five
(3) three (4) zero

2. Two plane mirrors are inclined at 70°. A ray incident on one mirror at incidence angle θ, after reflection falls on the second mirror and is reflected from there parallel to the first mirror. The value of θ is.

(1) 50° (2) 45°
(3) 30° (4) 25

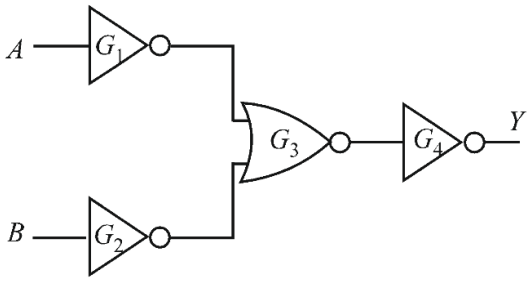
3. Two light waves superimposing at the mid-point of the screen are coming from coherent sources of light with phase difference 3π rad. Their amplitudes are 1 *cm* each. The resultant amplitude at the given point will be.

(1) 5 *cm* (2) 3 *cm*
(3) 2 *cm* (4) zero

4. In Young's double slit experiment with sodium vapour lamp of wavelength 589 *nm* and the slits 0.589 mm apart, the half angular width of the central maximum is;

(1) $\sin^{-1}(0.01)$
(2) $\sin^{-1}(0.0001)$
(3) $\sin^{-1}(0.001)$
(4) $\sin^{-1}(0.1)$

5. The combination of gates shown below produces



(1) AND gate
(2) XOR gate
(3) NOR gate
(4) NAND gate

6. 4-point charges each $+q$ is placed on the circumference of a circle of diameter $2d$ in such a way that they form a square. The potential at the centre is;

(1) 0 (2) $k\frac{4q}{d}$
(3) $k\frac{4d}{q}$ (4) $k\frac{q}{4d}$

7. The variation of drift velocity v_d with the intensity of electric field is given by:

(1) $v_d \propto E$ (2) $v_d \propto \frac{1}{E}$
(3) v_d = constant (4) $v_d \propto E^2$

8. A sphere of radius R carries charge such that its volume charge density is proportional to the square of the distance from the centre. What is the ratio of the magnitude of the electric field at distance $2R$ from the centre to the magnitude of the electric field at a distance of $R/2$ from the centre?

(1) 1 (2) 4
(3) 2 (4) 8

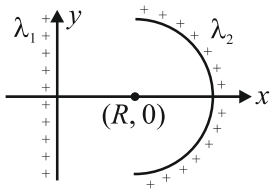
9. The electric potential at a point (x, y, z) is given by $V = -x^2y - xz^3 + 4$. The electric field $\vec{E}$ at that point is:

(1) $\vec{E} = \hat{i}2xy + \hat{j}(x^2 + y^2) + \hat{k}(3xz - y^2)$
(2) $\vec{E} = \hat{i}z^3 + \hat{j}xy + \hat{k}z^2$
(3) $\vec{E} = \hat{i}(2xy - z^3) + \hat{j}xy^2 + \hat{k}3z^2x$
(4) $\vec{E} = \hat{i}(2xy + z^3) + \hat{j}x^2 + \hat{k}3xz^2$

10. Two-point charges q and $-q$ are at positions $(0, 0, d)$ and $(0, 0, -d)$ respectively. What is the electric field at $(a, 0, 0)$?

(1) $\frac{2qd}{4\pi\varepsilon_0(d^2 + a^2)^{3/2}}\hat{k}$
(2) $\frac{qd}{4\pi\varepsilon_0(d^2 + a^2)^{3/2}}\hat{k}$
(3) $\frac{-2qd}{4\pi\varepsilon_0(d^2 + a^2)^{3/2}}\hat{k}$
(4) $\frac{-qd}{4\pi\varepsilon_0(d^2 + a^2)^{3/2}}\hat{k}$

11. A uniformly charged infinite wire is placed along 'y' axis having linear charge density 'λ_1'. A semicircle wire having linear charge density 'λ_2' centred at (R, 0) is placed as shown. Find the ratio of $\frac{\lambda_1}{\lambda_2}$. If electric field at ($R$, 0) is zero.



(1) $\frac{\lambda_1}{\lambda_2} = 1$ (2) $\frac{\lambda_2}{\lambda_1} = 2$

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

12. Which of the following is not due to total internal reflection?

(1) Working of optical fibre

(2) Difference between apparent and real depth of pond

(3) Mirage on hot summer days

(4) Brilliance of diamond

13. The masses of neutron and proton are 1.0087 a.m.u. and 1.0073 a.m.u. respectively. If the neutrons and protons combine to form a helium nucleus (alpha particles) of mass 4.0015 a.m.u the binding energy of the helium nucleus will be;

(1 a.m.u. = 931 MeV)

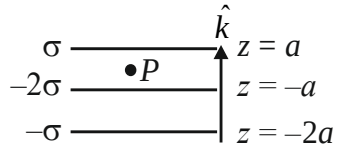
(1) 28.4 MeV

(2) 20.8 MeV

(3) 27.3 MeV

(4) 14.2 MeV

14. Three large parallel plane sheet of charge have uniform surface charge densities as shown in the figure. What is the electric field at P?



(1) $-\frac{4\sigma}{\epsilon_0}\hat{k}$ (2) $\frac{4\sigma}{\epsilon_0}\hat{k}$

(3) $-\frac{2\sigma}{\epsilon_0}\hat{k}$ (4) $\frac{2\sigma}{\epsilon_0}\hat{k}$

15. Choose the wrong statement about equipotential surfaces.

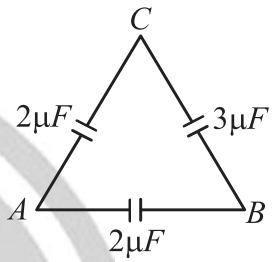
(1) It is a surface over which the potential is constant

(2) The electric field is parallel to the equipotential surface

(3) The electric field is perpendicular to the equipotential surface

(4) The electric field is in the direction of steepest decrease of potential

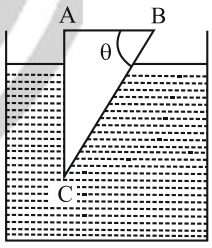
16. Three capacitors are connected in the arms of a triangle ABC as shown in figure $5V$ is applied between A and B. The voltage between B and C is;



(1) $2V$ (2) $1V$

(3) $3V$ (4) $1.5V$

17. A glass prism of refractive index 1.5 is immersed in water (refractive index 4/3). A light beam incident normally on the face AB is totally reflected to reach on the face BC if;



(1) $\sin\theta \geq \frac{8}{9}$ (2) $\frac{2}{3} < \sin\theta < \frac{8}{9}$

(3) $\sin\theta \leq \frac{2}{3}$ (4) None of these

18. What is the ratio of the shortest wavelength of the Balmer series to the shortest wavelength of the Lyman series?

(1) 4 : 1

(2) 4 : 3

(3) 4 : 9

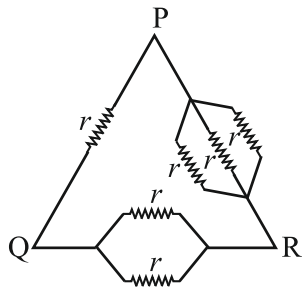
(4) 5 : 9

19. At the centre of a cubical box $+Q$ charge is placed. The value of total flux that is coming out a wall is;

(1) Q/ε_0 (2) $Q/3\varepsilon_0$

(3) $Q/4\varepsilon_0$ (4) $Q/6\varepsilon_0$

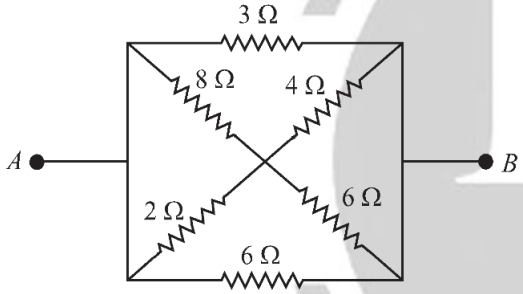
20. Six equal resistances are connected between points P, Q and R as shown in figure. Then net resistance will be maximum between:



(1) P and R (2) P and Q

(3) Q and R (4) Any two points

21. In the network shown, the equivalent resistance between A and B is;



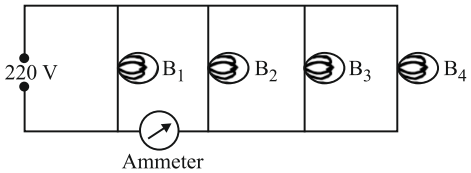
(1) $\frac{3}{4}\Omega$

(2) $\frac{4}{3}\Omega$

(3) $\frac{24}{17}\Omega$

(4) $\frac{17}{24}\Omega$

22. Four bulbs B_1, B_2, B_3 and B_4 of 100 W each are connected to 220 V main as shown in the figure.



The reading in an ideal ammeter will be:

(1) 0.45 A (2) 0.90 A

(3) 1.35 A (4) 1.80 A

23. A plane electromagnetic wave, has frequency of 2.0×10^{10} Hz and its energy density is 1.02×10^{-8} J/m^3 in vacuum. The amplitude of the magnetic field of the wave is close to ($\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \frac{Nm^2}{C^2}$ and speed of light = 3×10^8 ms^{-1}):

(1) 150 nT

(2) 160 nT

(3) 180 nT

(4) 190 nT

24. The amplitude of magnetic field of an electromagnetic wave is 2×10^{-7} T. Its electric field amplitude if the wave is travelling in free space is;

(1) 6 Vm^{-1} (2) 60 Vm^{-1}

(3) 10/6 Vm^{-1} (4) None of these

25. Given, ${}_a\mu_g = \frac{3}{2}$, ${}_a\mu_w = \frac{4}{3}$, if a convex lens of focal length 10 cm is placed in water, then its focal length in water is;

(1) equal to 40 cm (2) equal to 20 cm

(3) equal to 10 cm (4) None of these

26. The **correct** match between the entries in **List-I** and **List-II** are:

List-I		**List-II**	
Radiation		**Wavelength**	
(A)	Microwave	(I)	100 m
(B)	Gamma rays	(II)	10^{-15} m
(C)	A.M. radio waves	(III)	10^{-10} m
(D)	X-rays	(IV)	10^{-3} m

(1) (A) – (II), (B) – (I), (C) – (IV), (D) – (III)

(2) (A) – (I), (B) – (III), (C) – (IV), (D) – (II)

(3) (A) – (III), (B) – (II), (C) – (I), (D) – (IV)

(4) (A) – (IV), (B) – (II), (C) – (I), (D) – (III)

27. A galvanometer can be changed into an ammeter by using;

(1) low resistance shunt in series

(2) low resistance shunt in parallel

(3) high resistance shunt in series

(4) high resistance shunt in parallel

28. If the critical angle for total internal reflection from a medium to vacuum is 30°. Then velocity of light in the medium is;

(1) 1.5×10^8 *m/s* (2) 2×10^8 *m/s*

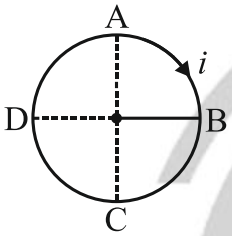
(3) 3×10^8 *m/s* (4) 0.75×10^8 *m/s*

29. A charge *q* is moving with a velocity *v* parallel to a magnetic field *B*. Force on the charge due to magnetic field is;

(1) *q v B* (2) *q B*/*v*

(3) zero (4) *B v*/*q*

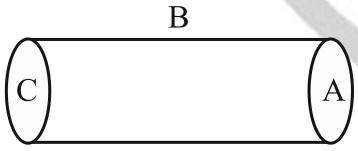
30. A circular coil *ABCD* carrying a current *i* is placed in a uniform magnetic field. If the magnetic force on the segment *AB* is $\vec{F}$, the force on the remaining segment *BCDA* is;



(1) $\vec{F}$ (2) $-\vec{F}$

(3) $3\vec{F}$ (4) $-3\vec{F}$

31. A hollow cylinder has a charge *q* coulomb within it. If ϕ is the electric flux in units of voltmeter associated with the curved surface *B*, the flux linked with the plane surface *A* in units of voltmeter will be;



(1) $\frac{q}{2\varepsilon_0}$ (2) $\frac{\phi}{3}$

(3) $\frac{q}{\varepsilon_0} - \phi$ (4) $\frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$

32. The energy of hydrogen atom in the n^{th} orbit is E_n, then the energy in the n^{th} orbit of single ionised helium atom is.

(1) $\frac{E_n}{2}$ (2) $2E_n$

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

33. The current in a coil of $L = 40$ *mH* is to be increased uniformly from 1*A* to 11*A* in 4 milli sec. The induced e.m.f. will be;

(1) 100 *V* (2) 0.4 *V*

(3) 440 *V* (4) 40 *V*

34. In an a.c. circuit V and I are given by

$V = 100 \sin (100\, t)$ volts

$I = 100 \sin (100\, t + \pi/3)$ mA

The power dissipated in the circuit is;

(1) 10^4 watt

(2) 10 watt

(3) 2.5 watt

(4) 5.0 watt

35. **Assertion (A):** When two semiconductors of *p* and *n* type arc brought in contact, they form *p*-*n* junction which act like a rectifier.

Reason (R): A rectifier is used to convert alternating current into direct current.

(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A).**

(2) Both **Assertion (A)** and **Reason (R)** are 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.

SECTION-B

36. The transformer voltage induced in the secondary coil of a transformer is mainly due to;

(1) a varying electric field

(2) a varying magnetic field

(3) the vibrations of the primary coil

(4) the iron core of the transformer

37. A long solenoid has 500 turns. When a current of 2 ampere is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is:

(1) 1.0 henry

(2) 4.0 henry

(3) 2.5 henry

(4) 2.0 henry

38. The electrostatic potential inside a charged spherical ball is given by $\phi = ar^2 + b$ where r is the distance from the centre and a, b are constants. Then the charge density inside the ball is:

(1) $-6a\varepsilon_0 r$ (2) $-24\pi a\varepsilon_0$

(3) $-6a\varepsilon_0$ (4) $-24\pi a\varepsilon_0 r$

39. Monochromatic light of frequency 6.0×10^{14} *Hz* is produced by a laser. The power emitted is 2×10^{-3} *W*. The number of photons emitted, on the average, by the source per second is;

(1) 5×10^{16} (2) 5×10^{17}

(3) 5×10^{14} (4) 5×10^{15}

40. Two radiations of photon energies 2 *eV* and 5 *eV*, successively illuminate a photosensitive metallic surface of work function 1 *eV*. The ratio of the maximum speeds of the emitted electrons is:

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

(3) 1 : 1 (4) 1 : 5

41. **Assertion (A):** The Bohr model is not applicable to atoms having many electrons.

Reason (R): In atoms having many electrons, each electron interacts not only with positively charged nucleus but also with all the other remaining electrons.

(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A).**

(2) Both **Assertion (A)** and **Reason (R)** are true but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion (A)** is true and **Reason (R)** is false.

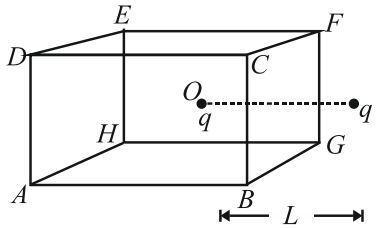
(4) **Assertion (A)** is false and **Reason (R)** is true.

42. A metal sample carrying a current along X-axis with density J_x is subjected to a magnetic field B_z (along z-axis). The electric field E_y developed along Y-axis is directly proportional to J_x as well as B_z. The constant of proportionality has SI unit.

(1) $\frac{m^2}{A}$ (2) $\frac{m^3}{As}$

(3) $\frac{m^2}{As}$ (4) $\frac{As}{m^3}$

43. A charged particle q is placed at the centre O of cube of length L ($A\ B\ C\ D\ E\ F\ G\ H$). Another same charge q is placed at a distance L from O. Then the electric flux through $ABCD$ is;



(1) $q/4\pi\epsilon_0 L$ (2) zero

(3) $q/2\pi\epsilon_0 L$ (4) $q/3\pi\epsilon_0 L$

44. A fully charged capacitor C with initial charge Q_0 is connected to a coil of self-inductance L at $t = 0$. The time at which the energy is stored equally between the electric and the magnetic field is;

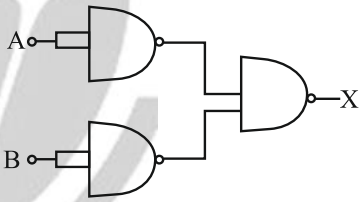
(1) $\frac{\pi}{4}\sqrt{LC}$

(2) $2\pi\sqrt{LC}$

(3) $\sqrt{LC}$

(4) $\pi\sqrt{LC}$

45. The combination of gates shown below yields;



(1) OR gate (2) NOT gate

(3) AND gate (4) NAND gate

46. Two coherent plane light waves of equal amplitude makes a small angle α (<<1) with each other. They fall almost normally on a screen. If λ is the wavelength of light waves, the fringe width Δx of interference patterns of the two sets of waves on the screen is;

(1) $\frac{2\lambda}{\alpha}$

(2) $\frac{\lambda}{\alpha}$

(3) $\frac{\lambda}{(2\alpha)}$

(4) $\frac{\lambda}{\sqrt{\alpha}}$

47. A primary cell has an e.m.f. of 1.5 volt. When short-circuited it gives a current of 3 ampere. The internal resistance of the cell is;

(1) 4.5 *ohm*

(2) 2 *ohm*

(3) 0.5 *ohm*

(4) 1.5 *ohm*

48. The magnetic lines of force inside a bar magnet;

(1) are from *N*-pole to *S*-pole of magnet

(2) do not exist

(3) depend upon the area of cross-section of bar magnet

(4) are from *S*-pole to *N*-pole of magnet

49. A shunt of resistance 1Ω is connected across a galvanometer of 120Ω resistance. A current of 5.5 ampere gives full scale deflection in the galvanometer. The current that will give full scale deflection in the absence of the shunt is nearly:

(1) 5.5 ampere (2) 0.5 ampere

(3) 0.004 ampere (4) 0.045 ampere

50. A particle is moving 5 times as fast as an electron. The ratio of the de-Broglie wavelength of the particle to that of the electron is 1.878×10^{-4}. The mass of the particle is close to:

(1) $4.8 \times 10^{-27}\ kg$ (2) $9.1 \times 10^{-31}\ kg$

(3) $1.2 \times 10^{-28}\ kg$ (4) $9.7 \times 10^{-28}\ kg$