PRACTICE PAPER 10

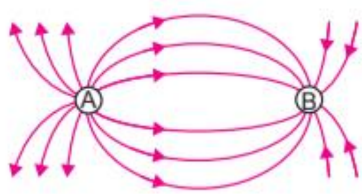
PHYSICS

Time allowed: 45 minutes **Maximum Marks: 200**

General Instructions: *Same as Practice Paper-1.*

Choose the correct option in the following questions.

1. **Gauss's law is valid for**
   (*a*) Any closed surface
   (*b*) Only regular closed surfaces
   (*c*) Any open surface
   (*d*) Only irregular open surfaces.
2. **Which of the following is not a property of field lines?**
   (*a*) Field lines are continuous curves without any breaks
   (*b*) Two field lines cannot cross each other
   (*c*) Field lines start at positive charges and end at negative charges
   (*d*) They form closed loops
3. **The spatial distribution of the electric field due to two charges (A, B) is shown in figure.**



   Which one of the following statements is correct?
   (*a*) A is + ve and B is – ve and $|A| > |B|$
   (*b*) A is – ve and B is + ve, $|A| = |B|$
   (*c*) Both are + ve but $A > B$
   (*d*) Both are – ve but $A > B$
4. **Given below are two statements labelled as Statement P and Statement Q:**
   Statement P : The coulomb field at a point is continuous if there is a charge at that point.
   Statement Q : Either positive or negative charges interact with electric field to make it discontinuous.
   Select the most appropriate option:
   (*a*) P is true, but Q is false
   (*b*) P is false, but Q is true
   (*c*) Both P and Q are true
   (*d*) Both P and Q are false
5. **The ratio of charge to potential of a body is known as**
   (*a*) capacitance
   (*b*) inductance
   (*c*) conductance
   (*d*) resistance
6. **In brining an electron towards another electron, the electrostatic potential energy of the system**
   (*a*) increases
   (*b*) decreases
   (*c*) remains unchanged
   (*d*) becomes zero

7. **Equipotential surface associated with an electric field, which is increasing in magnitude along the X-direction, are**

(*a*) planes parallel to YZ-plane.

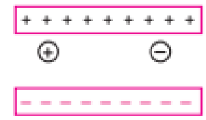
(*b*) planes parallel to XZ-plane.

(*c*) planes parallel to XY-plane.

(*d*) coaxial cylinder of increasing radii around the X-axis.

8. **A free electron and a free proton are placed between two oppositely charged parallel plates. Both are closer to the positive plate than the negative plate.**

Which of the following statements is true?



I. The force on the proton is greater than the force on the electron.

II. The potential energy of the proton is greater than that of the electron.

III. The potential energy of the proton and the electron is the same.

(*a*) I only (*b*) II only

(*c*) III and I only (*d*) II and I only

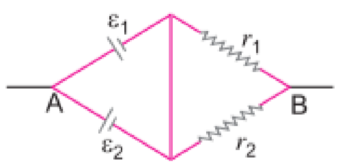
9. **The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in time Δt , then the total quantity of electric charge Q, passing during this time through any point of the circuit is given by**

(*a*) $\Delta Q = \frac{\Delta\phi}{\Delta t}$ (*b*) $\Delta Q = \frac{\Delta\phi}{\Delta t} \times R$ (*c*) $\Delta Q = -\frac{\Delta\phi}{\Delta t} + R$ (*d*) $\Delta Q = \frac{\Delta\phi}{R}$

10. **In a Wheatstone bridge, all the four arms have equal resistance R. If resistance of the galvanometer arm is also R, then equivalent resistance of the combination is**

(*a*) R (*b*) $2R$ (*c*) $\frac{R}{2}$ (*d*) $\frac{R}{4}$

11. **Two batteries of emf ε_1 and ε_2 ($\varepsilon_2 > \varepsilon_1$) and internal resistances r_1 and r_2 respectively are connected in parallel as shown in Figure.**



(*a*) The equivalent emf ε_{eq} of the two cells is between ε_1 and ε_2, *i.e.*, $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$

(*b*) The equivalent emf ε_{eq} is smaller than ε_1.

(*c*) The ε_{eq} is given by $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$ always.

(*d*) ε_{eq} is independent of internal resistances r_1 and r_2.

12. **Given below are two statements labelled as Statement P and Statement Q:**

Statement P : In a metre bridge experiment, null point for an unknown resistance is put inside an enclosure maintained at a higher temperature. The null point can be obtained at the same point as before by decreasing the value of standard resistance.

Statement Q : Resistance of metal increases with increase in temperature.

Select the most appropriate option:

(*a*) P is true, but Q is false (*b*) P is false, but Q is true

(*c*) Both P and Q are true (*d*) Both P and Q are false

13. **When a charged particle moving with velocity $\vec{v}$ is subjected to a magnetic field of induction $\vec{B}$, the force on it is non-zero.**

This implies that

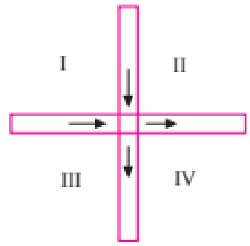
(*a*) angle between is either zero or 180°

(*b*) angle between is necessarily 90°

(*c*) angle between can have any value other than 90°

(*d*) angle between can have any value other than zero and 180°

14. Two thin metallic strips carrying currents in the direction shown, cross each other perpendicularly without touching but being close to each other, as shown in fig. The regions which contain some point of zero magnetic induction are:



(*a*) I and II (*b*) I and III

(*c*) II and III (*d*) I and IV

15. A magnetic needle is kept in a uniform magnetic field. It experiences

(*a*) a force and a torque (*b*) a force but not a torque

(*c*) a torque but not a force (*d*) neither a torque nor a force

16. A toroid of *n* turns, mean radius *R* and cross-sectional radius *a* carries current *I*. It is placed on a horizontal table taken as *X-Y* plane. Its magnetic moment $\vec{m}$

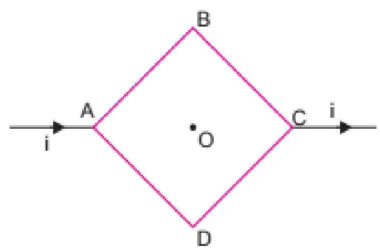
(*a*) is non-zero and points in the *Z*-direction by symmetry.

(*b*) points along the axis of the toroid ($\vec{m} = m\phi$).

(*c*) is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid.

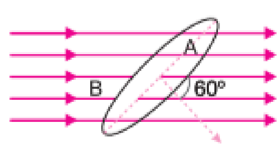
(*d*) is pointing radially outwards.

17. A square loop *ABCD* of each side is formed of wire *ABC* of resistance *r* and *ADC* of resistance 2*r*. The magnetic field *B* at the centre *O* of the loop is



(*a*) 0 (*b*) $\frac{\sqrt{2}\mu_0 i}{6\pi a}$ (*c*) $\frac{\sqrt{2}\mu_0 i}{3\pi a}$ (*d*) $\frac{2\sqrt{2}\mu_0 i}{3\pi a}$

18. An area $A = 0.5\ m^2$ shown in the figure is situated in a uniform magnetic field $B = 4.0\ Wb/m^2$ and its normal makes an angle of 60° with the field. The magnetic flux passing through the area *A* would be equal to



(*a*) 2.0 weber (*b*) 1.0 weber (*c*) $\sqrt{3}$ weber (*d*) 0.5 weber

19. An emf is produced in a coil, which is not connected to an external voltage source. This can be due to

(*a*) the coil being in a time varying magnetic field.

(*b*) the coil moving in a time varying magnetic field.

(*c*) the coil moving in a constant magnetic field.

(*d*) all of the above.

20. In Faraday's experiment of electromagnetic induction, more deflection will be shown by galvanometer, when

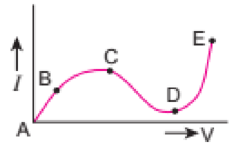
(*a*) magnet is in uniform motion towards the coil

(*b*) magnet is in accelerated motion towards the coil

(*c*) magnet is in uniform motion away from the coil

(*d*) magnet is at rest near the coil

21. From the graph between current *I* and voltage *V* shown below, identify the portion corresponding to negative resistance



(*a*) AB (*b*) BC (*c*) CD (*d*) DE

22. Column A represents power dissipated in a circuit mentioned in column B. Match columns A and B.

Column A		Column B	
(*i*)	A resistance carrying *AC/DC*	(*p*)	IR
(*ii*)	an inductor coil having resistance *R*	(*q*)	$\frac{V^2}{R}$
(*iii*)	a capacitor	(*r*)	$\frac{V^2 R}{Z^2}$
(*iv*)	*LCR* series circuit at resonance	(*s*)	Zero

	(*i*)	(*ii*)	(*iii*)	(*iv*)
(*a*)	(*p*), (*q*), (*r*)	(*p*)	(*r*)	(*p*), (*q*), (*r*)
(*b*)	(*s*)	(*r*)	(*p*), (*q*), (*r*)	(*p*), (*q*)
(*c*)	(*p*), (*q*), (*r*)	(*r*)	(*s*)	(*p*), (*q*), (*r*)
(*d*)	(*r*)	(*s*)	(*p*), (*q*)	(*q*), (*r*)

23. The output of a step-down transformer is measured to be 24 V when connected to a 12 watt light bulb. The value of the peak current is

(*a*) $1/\sqrt{2}$ A (*b*) $\sqrt{2}$ A

(*c*) 2 A (*d*) $2\sqrt{2}$ A

24. In R-L-C series *ac* circuit, impedance cannot be increased by

(*a*) increasing frequency of source

(*b*) decreasing frequency of source

(*c*) increasing the resistance

(*d*) increasing the voltage of the source

25. A plane electromagnetic wave is travelling along *Y*-axis. The electric field vector will not be in

(*a*) X–Y plane (*b*) X–Z plane

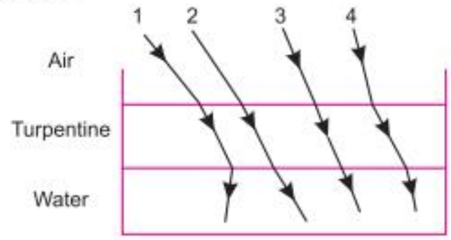
(*c*) Y–Z plane (*d*) None of these

26. For plane electromagnetic waves propagating in the *Z*-direction, which one of the following combinations gives the correct possible direction for $\vec{E}$ and $\vec{B}$ fields respectively?

(*a*) $(2\hat{i} + 3\hat{j})$ and $(\hat{i} + 2\hat{j})$ (*b*) $(-2\hat{i} - 3\hat{j})$ and $(3\hat{i} - 2\hat{j})$

(*c*) $(3\hat{i} + 4\hat{j})$ and $(4\hat{i} - 3\hat{j})$ (*d*) $(\hat{i} + 2\hat{j})$ and $(2\hat{i} - \hat{j})$

27. **The optical density of turpentine is higher than that of water while its mass density is lower. Figure shows a layer of turpentine floating over water in a container. For which one of the four rays incident on turpentine in the figure, the path shown is correct?**

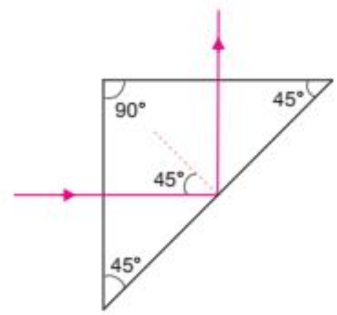


(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

28. **Transmission of light in optical fibre is due to**

(*a*) scattering
(*b*) diffraction
(*c*) refraction
(*d*) multiple total internal reflection

29. **A light ray is incident perpendicularly on one face of a 90°-prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index n is**



(*a*) $n < \frac{1}{\sqrt{2}}$
(*b*) $n > \sqrt{2}$
(*c*) $n > \frac{1}{\sqrt{2}}$
(*d*) $n < \sqrt{2}$

30. **The sky would appear red instead of blue if**

(*a*) atmospheric particles scatter blue light more than red light
(*b*) atmospheric particles scatter all colours equally
(*c*) atmospheric particles scatter red light more than blue light
(*d*) the sun was much hotter

31. **In a Young's double-slit experiment, the source *S* and two slits *A* and *B* are horizontal, with slit A above slit *B*. The fringes are observed on a vertical screen *K*. The optical path length from *S* to *B* is increased very slightly (by introducing a transparent material of higher refractive index) and optical path length from *S* to *A* is not changed. As a result, the fringe system on *K* moves**

(*a*) vertically downwards slightly
(*b*) vertically upwards slightly
(*c*) horizontally slightly to the left
(*d*) horizontally slightly to the right

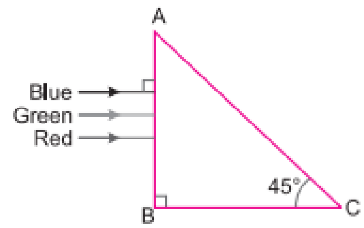
32. **How does the magnifying power of a telescope change on increasing the linear diameter of its objective?**

(*a*) Power increases on increasing the diameter.
(*b*) Power decreases on increasing the diameter.
(*c*) Power remains constant on increasing the diameter.
(*d*) Power doesn't depends on diameter.

33. **In Young's double-slit experiment, the intensity at a point, where the path difference is $\frac{\lambda}{6}$ (λ being the wavelength of light used) is I. If I_0 denotes the maximum intensity, then $\frac{I}{I_0}$ is equal to**

(*a*) $\frac{\sqrt{3}}{2}$
(*b*) $\frac{1}{2}$
(*c*) $\frac{3}{4}$
(*d*) $\frac{1}{\sqrt{2}}$

34. **A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively.**



The prism will

(*a*) not separate the three colours at all

(*b*) separate the red colour part from the green and blue colours

(*c*) separate the blue colour part from the red and green colours

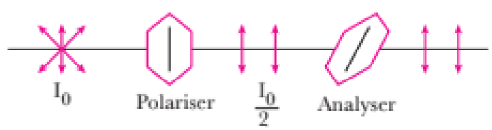
(*d*) separate all the three colours from one another

35. **Two waves having the intensities in the ratio of 9 : 1 produce interference. The ratio of maximum to minimum intensity is**

(*a*) 10 : 8 (*b*) 9 : 1

(*c*) 4 : 1 (*d*) 2 : 1

36. **The angle between pass axis of polariser and analyser is 45°, the percentage of polarised light passing through analyser is (relative to light incident on the polariser)**



(*a*) 25% (*b*) 50%

(*c*) 75% (*d*) 100%

37. **In the Young's double-slit experiment, the interference pattern is found to have an intensity ratio between bright and dark fringes as 9. This implies that**

(*a*) the intensities at the screen due to two slits are 5 units and 4 units respectively

(*b*) the intensities at the screen due to two slits are 4 units and 1 unit respectively

(*c*) the amplitude ratio is 3

(*d*) the amplitude ratio is 4

38. **According to Einstein's photoelectric equation, the plot of the kinetic energy of the emitted photoelectrons from a metal versus frequency, of incident radiation gives a straight line, whose slope**

(*a*) depends on the nature of metal

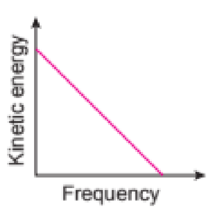
(*b*) depends on the intensity of radiation

(*c*) depends both on intensity of the radiation and the metal used

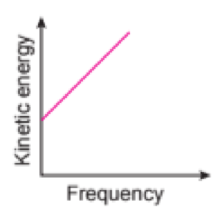
(*d*) is the same for all metals and is independent of the intensity of the radiation

39. **According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is**

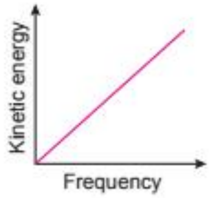
(*a*)



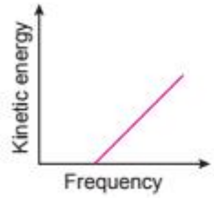
(*b*)



(c)



(d)



40. Which word equation represents β decay?

(a) proton → neutron + electron + electron antineutrino

(b) proton → neutron + electron + electron neutrino

(c) proton → neutron + positron + electron antineutrino

(d) proton → neutron + positron + electron neutrino

41. Work function of a metal is

(a) minimum energy required to free an electron from surface against Coulomb's forces

(b) minimum energy required to free a nucleon

(c) minimum energy required to eject an electron from electronic orbit

(d) minimum energy to ionise an atom

42. The ratio of energies of the hydrogen atom in its first to second excited state is

(a) 1 : 4

(b) 4 : 1

(c) – 4 : – 9

(d) $-\frac{1}{4} : -\frac{1}{9}$

43. The simple Bohr model cannot be directly applied to calculate the energy levels of an atom with many electrons. This is because

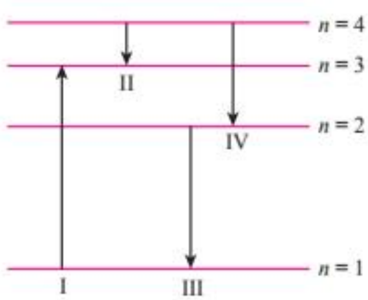
(a) of the electrons not being subject to a central force

(b) of the electrons colliding with each other

(c) of screening effects

(d) the force between the nucleus and an electron will no longer be given by Coulomb's law

44. The diagram shows the energy levels for an electron in a certain atom. The transition that represents the emission of a photon with the highest energy is



(a) I

(b) II

(c) III

(d) IV

45. If radius of the $^{27}_{13}Al$ nucleus is taken to be R_{Al}, then the radius of $^{125}_{53}Te$ nucleus is nearly

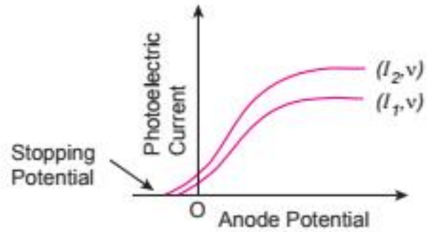
(a) $\frac{3}{5}R_{Al}$

(b) $\left(\frac{13}{53}\right)^{1/3} R_{Al}$

(c) $\left(\frac{53}{13}\right)^{1/3} R_{Al}$

(d) $\frac{5}{3}R_{Al}$

46. Following graph shows the variation of photoelectric current with anode potential for two light beam of same wavelength but different intensity. Find the correct relation:



(*a*) $I_1 > I_2$

(*b*) $I_1 = I_2$

(*c*) $I_1 < I_2$

(*d*) $I_1 \leq I_2$

47. Satellite communication is through:

(*a*) ground waves

(b) sky waves

(c) space waves

(d) microwaves

48. The relationship between the transistor parameters α and β is

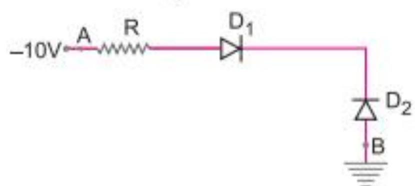
(*a*) $\alpha = 1 + \beta$

(*b*) $\alpha = \dfrac{1+\beta}{\beta}$

(*c*) $\beta = \dfrac{\alpha}{1-\alpha}$

(*d*) $\beta = \dfrac{\alpha}{1+\alpha}$

49. In given figure, assuming the diodes to be ideal,



(*a*) D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B.

(*b*) D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa.

(*c*) D_1 and D_2 are both forward biased and hence current flows from A to B.

(*d*) D_1 and D_2 are both reverse biased and hence no current flows from A to B and vice versa.

50. A zener diode has

(*a*) heavily doped *p*-side and lightly doped *n*-side.

(*b*) heavily doped *n*-side and lightly doped *p*-side.

(*c*) heavily doped *n*-side as well as *p*-side.

(*d*) lightly doped *n*-side as well as *p*-side.

ANSWERS

PRACTICE PAPER – 10

1. (*a*)	**2.** (*d*)	**3.** (*a*)	**4.** (*c*)	**5.** (*a*)	**6.** (*a*)	**7.** (*a*)
8. (*b*)	**9.** (*d*)	**10.** (*a*)	**11.** (*a*)	**12.** (*d*)	**13.** (*d*)	**14.** (*d*)
15. (*c*)	**16.** (*c*)	**17.** (*c*)	**18.** (*b*)	**19.** (*d*)	**20.** (*b*)	**21.** (*c*)
22. (*c*)	**23.** (*a*)	**24.** (*d*)	**25.** (*b*)	**26.** (*b*)	**27.** (*b*)	**28.** (*d*)
29. (*b*)	**30.** (*c*)	**31.** (*a*)	**32.** (*d*)	**33.** (*c*)	**34.** (*b*)	**35.** (*c*)
36. (*a*)	**37.** (*b*)	**38.** (*d*)	**39.** (*d*)	**40.** (*d*)	**41.** (*a*)	**42.** (*d*)
43. (*a*)	**44.** (*c*)	**45.** (*d*)	**46.** (*c*)	**47.** (*c*)	**48.** (*c*)	**49.** (*b*)
50. (*c*)						

SOLUTIONS

PRACTICE PAPER—10

1. (*a*) Gauss's law is valid for any closed surface.
2. (*d*) Electrostatic field lines do not form any closed loops.
3. (*a*) The electric field lines start from charge A and on charge B. So A is +ve and B is –ve.
5. (*a*) $C = \frac{Q}{V}$
6. (*a*) Due to repulsion between two electrons. The potential energy of the system increases.
7. (*a*) Electric field lines are always perpendicular to the equipotential surface.
8. (*b*) Force, $F = qE$

If, E = same, $|q|$ = same

So, $|F_p| = |F_e|$ where, p = proton

Now, potential energy,

$U = qV(r)$ e = electron

(It depends on sign of charge also)

then, $U_p > U_e$.

9. (*d*) We know that $e = \left|\frac{d\phi}{dt}\right|$

But $e = iR$ and $i = \frac{dq}{dt} \Rightarrow e = \frac{dq}{dt}R \Rightarrow \frac{d\phi}{dt}$

$= \frac{dqR}{dt} \Rightarrow \frac{d\phi}{R} = dq \Rightarrow \Delta q = \frac{\Delta\phi}{R}$

10. (*a*) $\frac{P}{Q} = \frac{R}{S}$, so resistance of the galvanometer can be omitted ($P + Q$ are in series = $2R$, R and S are also in series = $2R$). Now the equivalent resistance $= \frac{2R}{R} = R$.

11. (*a*) $E_{eq} = \frac{\varepsilon_2 r_1 + \varepsilon_1 + r_2}{r_1 + r_2}$, this gives $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$.

13. (*d*) $\vec{F} = q\vec{V} \times \vec{B} \Rightarrow F = qVB\sin\theta$

For $F \neq 0$, θ lies between 0 to 180°.

14. (*d*) In regions I and IV, the magnetic fields due to two currents are opposite.

16. (*c*) In toroid, the magnetic field is only confined inside the body of toroid in the form of concentric magnetic lines of force and these is no magnetic field outside the body. This is because the loop encloses no current. Thus, the magnetic moment is zero, otherwise, r as large distance outside the toroid, $m \propto \frac{1}{r^3}$.

17. (*c*) If i_1 and i_2 are currents in arms ABC and ADC respectively, then $\frac{i_1}{i_2} = \frac{2r}{r} = \frac{2}{1}$ and $i_1 + i_2 = i$.

$\therefore\ i_1 = \frac{2}{3}i$ and $i_2 = \frac{1}{3}i$

Magnetic field due to ABC,

$$B_1 = 2\left[\frac{\mu_0 i_1}{4\pi\left(\frac{a}{2}\right)}(\sin 45° + \sin 45°)\right]$$

$$= \frac{\sqrt{2}\mu_0 i_1}{\pi a}, \text{ downward}$$

Magnetic field due to ADC,

$$B_2 = \frac{\sqrt{2}\mu_0 i_2}{\pi a}, \text{ upward}$$

Net Magnetic field,

$$B = \frac{\sqrt{2}\mu_0}{\pi a}(i_1 - i_2) = \frac{\sqrt{2}\mu_0(i/3)}{\pi a} = \frac{\sqrt{2}\mu_0 i}{3\pi a}$$

18. (*b*) $\phi = BA\cos\theta = 4 \times 0.5 \times \cos 60° = 1$ Wb

19. (*d*) Magnetic flux linked with the isolated coil change the coil being in a time varying magnetic field, the coil moving in a constant magnetic field or in time varying magnetic field.

21. (*c*) CD because slope of this portion is negative.

23. (*a*) $P_s = V_S I_S \Rightarrow I_s = \frac{124}{24} = \frac{1}{2}\text{A}$

$$I_0 = I_S\sqrt{2} = \frac{1}{2}\times\sqrt{2} = \frac{1}{\sqrt{2}}\text{A}$$

25. (*b*) Electric field is perpendicular to the axis of propagation.

26. (*b*) As given, $\vec{E}\cdot\vec{B} = (-2\hat{i} - 3\hat{j})\cdot(3\hat{i} - 2\hat{j})$

$$= -6 + 6 = 0$$

Hence, $\vec{E} \perp \vec{B}$.

Also, $\vec{E}\times\vec{B} = (-2\hat{i} - 3\hat{j})\times(3\hat{i} - 2\hat{j})$

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & -3 & 0 \\ 3 & -2 & 0 \end{vmatrix} = \hat{k}\begin{vmatrix} -2 & -3 \\ 3 & -2 \end{vmatrix} = 13\hat{k}$$

This wave propagates along +ve Z-direction.

27. (*b*) According to shown figure, light ray goes from (optically) rarer medium (air) to optically denser medium (turpentine); then it bends towards the normal. While when light ray goes from turpentine to air medium, then it bends away the normal.

28. (*d*) An optical fibre is a device based on total internal reflection by which a light signal may be transmitted from one place to another with a negligible loss of energy.

29. (*b*) Here, $C < 45° \Rightarrow \sin C < 1/\sqrt{2}$

$\therefore \quad n = \frac{1}{\sin C} > \sqrt{2} \quad \Rightarrow \quad n > \sqrt{2}$

30. (*c*) The colour of sky is blue due to scattering of light by fine tiny particles in sky. If atmospheric particles scatter red colour more than blue then sky would appears red instead of blue.

31. (*a*) Due to refraction index of introducing transparent material, the fringes are moving slightly vertically downward.

32. (*d*) Power doesn't depends on diameter but upon the focal length of objective and eye piece.

33. (*c*) Phase difference, $\phi = \frac{2\pi}{\lambda}\times$ Path difference

$$= \frac{2\pi}{\lambda}\times\frac{\lambda}{6} = \frac{\pi}{3} = 60°$$

Now, $I = I_0\cos^2\frac{\phi}{2}$

$$\frac{I}{I_0} = \cos^2\frac{60°}{2} = \cos^2 30°$$

$$\frac{I}{I_0} = \frac{3}{4}$$

34. (*b*) $\left(\sin^{-1}\frac{1}{1\cdot 39} = 46°, \quad \sin^{-1}\frac{1}{1\cdot 44} = 44°, \quad \sin^{-1}\frac{1}{1\cdot 47} = 43°\right)$

Angle of incidence at second face, $i = 45°$

As from, $C = \sin^{-1}\left(\frac{1}{n}\right)$, $C = 46°$ for red colour, 44° for green and 43° for blue and for total internal reflection $i > C$.

$\therefore$ Green and blue rays will be totally reflected while red ray will be transmitted, hence red colour will be separated from green and blue colours.

35. (*c*) As we know, $\frac{I_{max}}{I_{min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2}$

$$= \frac{(\sqrt{9} + \sqrt{1})^2}{(\sqrt{9} - \sqrt{1})^2} = \frac{(3+1)^2}{(3-1)^2} = \left(\frac{4}{2}\right)^2 = \frac{4}{1}$$

36. (*a*) As we know,

$I = I_0\cos^2\theta$

$I = \frac{I_0}{2}\cos^2 45° = \frac{I_0}{4}$

i.e., 25% of initial intensity

37. (*b*) As we know, $\frac{I_{max}}{I_{min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{9}{1}$

$$I_1 + I_2 + 2\sqrt{I_1 I_2} = 9I_1 + 9I_2 - 18\sqrt{I_1 I_2}$$

$$8I_1 + 8I_2 - 20\sqrt{I_1 I_2} = 0$$

$$2I_1 - 5\sqrt{I_1 I_2} - + 2I_2 = 0$$

$$2I_1 - 4\sqrt{I_1 I_2} - \sqrt{I_1 I_2} + 2I_2 = 0$$

$$2\sqrt{I_1}(\sqrt{I_1} - 2\sqrt{I_2}) - \sqrt{I_2}(\sqrt{I_1} - 2\sqrt{I_2}) = 0$$

$$(2\sqrt{I_1} - \sqrt{I_2})(\sqrt{I_1} - 2\sqrt{I_2}) = 0$$

$$2\sqrt{I_1} = \sqrt{I_2}$$

$$4I_1 = I_2$$

$$\frac{I_2}{I_1} = \frac{4}{1}$$

38. (*d*) As we know,

$E_k = h\nu - W$, slope of $E_k - \nu$ graph $= h$ (constant)

39. (*d*) From Einstein photoelectric emission equation, $E_k = h\nu - \phi$

40. (*d*) In basic nuclear process for β^+ decay,

$p \longrightarrow n + {}_1e^0 + \nu$

42. (*d*) $E_n = \frac{-13.6}{n^2} \Rightarrow E_1 = \frac{-13.6}{(2)^2} = \frac{-13.6}{4}$

$$\Rightarrow E_2 = \frac{-13.6}{(3)^2} = \frac{-13.6}{4}$$

$$E_1 : E_2 = \frac{-1}{4} : \frac{1}{9}$$

43. (*a*) Bohr's model cannot be directly applied to calculate energy levels of an atom with many electrons because of the electrons not being subjected to a central force.

44. (*c*) In emission line I, energy is absorbed and not emitted. While in the emission lines II, III and IV, energy is emitted. The line having maximum energy is III, because energy difference between successive levels decreases rapidly with increase of n.

45. (*d*) $\frac{R_{Al}}{R_{Te}} = \left(\frac{A_{Al}}{A_{Te}}\right)^{\frac{1}{3}}$

$$\Rightarrow R_{Te} = \left(\frac{125}{27}\right)^{\frac{1}{3}} R_{Al} = \frac{5}{3} R_{Al}.$$

46. (*c*) Because more no. of photoelectrons are emitted in a unit time of I_2 than I_1.

48. (*c*) $\beta = \frac{I_C}{I_B}$; $\alpha = \frac{I_C}{I_E}$

Also, $I_E = I_C + I_B$

Divide both sides by I_C

$$\frac{I_E}{I_C} = 1 + \frac{I_B}{I_C}$$

$$\frac{I}{\alpha} = 1 + \frac{1}{\beta} \text{ or } \beta = \frac{\alpha}{1-\alpha}$$

49. (*b*) In the given circuit, A is at –10V and B is at 0 V. So, B is positive than A, which means that D_2 is forward baised while D_1 is reverse biased and hence no current flows from A to B or vice-versa.

50. (*c*) Zener diode has heavily doped both p and n sides of the junction.