PRACTICE PAPER 11

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

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

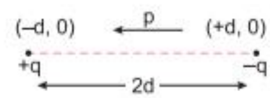
Choose the correct option in the following questions.

1. Charge Q is distributed to two different metallic spheres having radii R and $2R$ such that both spheres have equal surface charge density. Then charge on larger sphere is

(*a*) $\frac{4Q}{5}$ (*b*) $\frac{3Q}{5}$

(*c*) $\frac{5Q}{4}$ (*d*) $\frac{Q}{5}$

2. Two point charges $+q$ and $-q$ are held fixed at $(-d, 0)$ and $(+d, 0)$ respectively of a (x, y) coordinate system. Then



(*a*) the dipole moment is qd along positive X-axis

(*b*) the dipole moment is $q(2d)$ along positive X-axis

(*c*) the dipole moment is $q(2d)$ along positive Y-axis

(*d*) the dipole moment is $q(2d)$ along negative X-axis

3. An electric dipole of moment p is placed parallel to the uniform electric field. The amount of work done in rotating the dipole by 90^0 is

(*a*) $2pE$ (*b*) pE (*c*) $pE/2$ (*d*) zero

4. Three capacitors $2\mu F$, $3\mu F$ and $6\mu F$ are joined in series with each other. The equivalent capacitance is

(*a*) $1/2\ \mu F$ (*b*) $1\ \mu F$ (*c*) $2\ \mu F$ (*d*) $11\ \mu F$

5. Which of the following is NOT the property of equipotential surface?

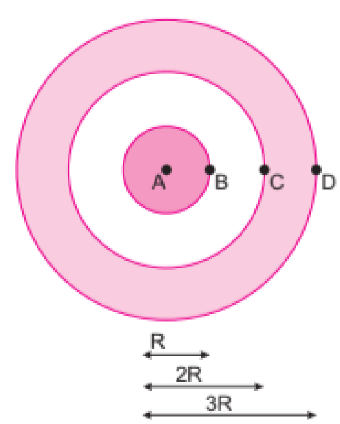
(*a*) They do not cross each other.

(*b*) The rate of change of potential with distance on them is zero.

(*c*) For a uniform electric field they are concentric spheres.

(*d*) They can be imaginary spheres.

6. A solid spherical conductor has charge $+Q$ and radius R. It is surrounded by a solid spherical shell with charge $-Q$, inner radius $2R$, and outer radius $3R$. Which of the following statements is true?



(*a*) The electric potential has a maximum magnitude at C and the electric field has a maximum magnitude at A.

(*b*) The electric potential has a maximum magnitude at D and the electric field has a maximum magnitude at B.

(*c*) The electric potential at A is zero and the electric field has a maximum magnitude at D.

(*d*) Both the electric potential and electric field achieve a maximum magnitude at B.

7. By increasing the temperature, the specific resistance of a conductor and a semiconductor

(*a*) increases for both

(*b*) decreases for both

(*c*) increases for a conductor and decreases for a semiconductor

(*d*) decreases for a conductor and increases for a semiconductor

8. We use alloys for making standard resistors because they have

(*a*) low temperature coefficient of resistivity and high specific resistance

(*b*) high temperature coefficient of resistivity and low specific resistance

(*c*) low temperature coefficient of resistivity and low specific resistance

(*d*) high temperature coefficient of resistivity and high specific resistance

9. If the potential difference V applied across a conductor is increased to $2V$ with its temperature kept constant, free electrons in a conductor

(*a*) remain the same

(*b*) become half of its previous value

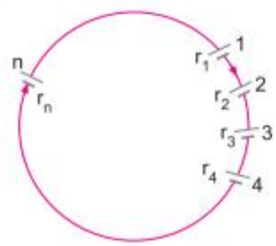
(*c*) be double of its initial value

(*d*) become zero

10. For a cell of emf 2 V, a balance is obtained for 50 cm of the potentiometer wire. If the cell is shunted by a 2 Ω resistor and the balance is obtained across 40 cm of the wire, then the internal resistance of the cell is

(*a*) 1 Ω (*b*) 0.5 Ω (*c*) 1.2 Ω (*d*) 2.5 Ω

11. A group of n cells whose emf varies directly with the internal resistance as per equation $E_n = 1.5\ r_n$ are connected as shown in fig. The current I in the circuit is



(*a*) 1.5 A (*b*) 0.15 A (*c*) 5.1 A (*d*) 0.51 A

12. The coil of a moving coil galvanometer is wound over a metal frame in order to

(*a*) reduce hysteresis

(*b*) increase sensitivity

(*c*) increase moment of inertia

(*d*) provide electromagnetic damping

13. Two wires of the same length are shaped into a square of side 'a' and a circle with radius 'r'. If they carry same current, the ratio of their magnetic moment is

(*a*) 2 : π (*b*) π : 2 (*c*) π : 4 (*d*) 4 : π

14. Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon the

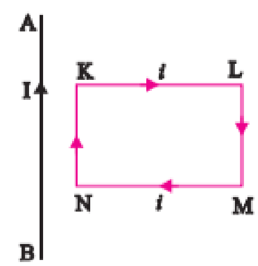
(*a*) rate at which current change in the two coils

(*b*) relative position and orientation of the coils

(*c*) rate at which voltage induced across two coils

(*d*) currents in the two coils

15. A rectangular loop carrying a current i is situated near a long straight wire such that the wire is parallel to one of the sides of the loop and is in the plane of the loop. If a steady current I is established in the wire, as shown in fig., the loop will



(*a*) rotate about an axis parallel to the wire

(*b*) move away from the wire

(*c*) move towards the wire

(*d*) remain stationary

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

Statement P : Magnetic field cannot change kinetic energy of a moving charge.

Statement Q : Magnetic field cannot change velocity vector.

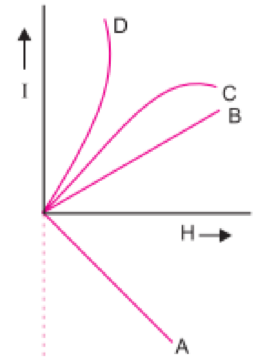
Select the most appropriate option:

(*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

17. When the current through a solenoid increases at a constant rate, the induced current

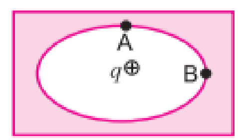
(*a*) is a constant and is in the direction of the inducing current
(*b*) is a constant and is opposite to the direction of the inducing current
(*c*) increases with time and is opposite to the direction of the inducing current
(*d*) zero

18. The most appropriate I-H curve for a paramagnetic substance is



(*a*) A
(*b*) B
(*c*) C
(*d*) D

19. An ellipsodial cavity is carved within a perfect → (c) conductor as shown in figure. A positive charge q is placed at the centre of the cavity. The points A and B are on the cavity surface.



Which of the following statements is true?

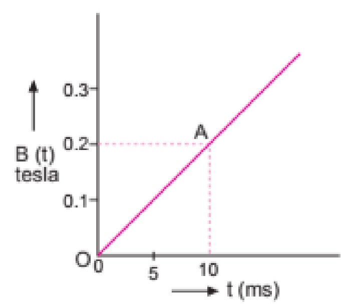
I. Electric field near A in the cavity = electric field near B in the cavity
II. Charge density at A = charge density at B
III. Potential at A = potential at B.
IV. Total electric field flux through the surface of the cavity is $\frac{q}{\varepsilon_0}$.

(*a*) I and II only
(*b*) I, II, and IV
(*c*) III and IV only
(*d*) none of these

20. If both the number of turns and core length of an inductor is doubled keeping other factors constant, then its self-inductance will be

(*a*) unaffected
(*b*) doubled
(*c*) halved
(*d*) quadrupled

21. A coil of area 5.0×10^{-3} m^2 is placed perpendicular to a time varying magnetic field shown in figure. The value of induced emf in coil in 10 ms is:



(*a*) 0·1 V
(*b*) 0·1 mV
(*c*) 0·5 V
(*d*) 0·5 mV

22. To reduce the resonant frequency in an *LCR* series circuit with a generator

(*a*) the generator frequency should be reduced.
(*b*) another capacitor should be added in parallel to the first.
(*c*) the iron core of the inductor should be removed.
(*d*) dielectric in the capacitor should be removed.

23. If the secondary coil has a greater number of turns than the primary,

(*a*) the voltage is stepped-up ($V_s > V_p$) and arrangement is called a step-up transformer
(*b*) the voltage is stepped-down ($V_s < V_p$) and arrangement is called a step-down transformer
(*c*) the current is stepped-up ($I_s > I_p$) and arrangement is called a step-up transformer
(*d*) the current is stepped-down ($I_s < I_p$) and arrangement is called a step-down transformer

24. **An alternating voltage of frequency ω is induced in electric circuit consisting of an inductance L and capacitance C, connected in series. Then across the inductance coil**

(*a*) current is maximum when $\omega^2 = 1/LC$

(*b*) current is minimum when $\omega^2 = 1/LC$

(*c*) voltage is minimum when $\omega^2 = 1/LC$

(*d*) voltage is zero when $\omega^2 = 1/LC$

25. **The speed of electromagnetic wave in a medium of dielectric constant 2.25 and relative permeability 4 is**

(*a*) 1×10^8 m/s

(*b*) 2.5×10^8 m/s

(*c*) 2×10^8 m/s

(*d*) 3×10^8 m/s

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

Statement P : In an electromagnetic wave electric and magnetic field vectors are mutually perpendicular and have a phase of $\frac{\pi}{2}$.

Statement Q : Phase difference refers to time difference. There is a time difference between the peaks of electric and magnetic oscillations in EM waves.

Select the most appropriate option:

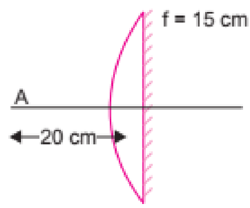
(*a*) P is true, but Q is false

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

(*c*) Both P and Q are true

(*d*) Both P and Q are false

27. **A point object is placed at a distance of 20 cm from a thin plane convex lens of focal length 15 cm. If the plane surface is silvered, the image will be formed at**



(*a*) 60 cm to the left of lens

(*b*) 30 cm to the left of lens

(*c*) 12 cm to the left of lens

(*d*) 60 cm to the right of lens

28. **White light is incident on one face of a dispersing equilateral prism kept in air and emerges out at another face. The deviation produced by the prism is**

(*a*) the greatest for the violet colour and least for the red colour

(*b*) the greatest for the red colour and least for the violet colour

(*c*) the same for all constituent colour

(*d*) less for the green colour than that for the yellow colour

29. **A myopic patient uses**

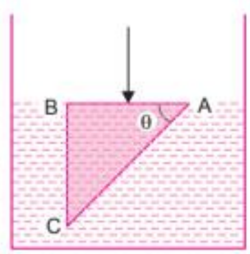
(*a*) convex lens

(*b*) concave lens

(*c*) cylindrical lens

(*d*) bifocal lens

30. **A glass prism of refractive index 1·5 is immersed in water (refractive index $\frac{4}{3}$). A light beam incident normally on the face *AB* (fig. shown) is totally reflected to reach the face *BC* if**



(*a*) $\sin\theta > \frac{8}{9}$

(*b*) $\frac{2}{3} < \sin\theta < \frac{8}{9}$

(*c*) $\sin\theta \le \frac{2}{3}$

(*d*) none of the above

31. The focal length of the objective of a compound microscope is

(*a*) greater than the focal length of eyepiece
(*b*) lesser than the focal length of eyepiece
(*c*) equal to the focal length of eyepiece
(*d*) equal to the length of its tube

32. Light wave enters from medium 1 to medium 2. Its velocity in 2nd medium is double from Ist. For total internal reflection the angle of incidence must be greater than

(*a*) 30° (*b*) 60° (*c*) 45° (*d*) 90°

33. As the beam enters the medium, it will

(*a*) travel as a cylindrical beam
(*b*) diverge
(*c*) converge
(*d*) diverge near the axis and converge near the periphery

34. For destructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be

(*a*) $(2n - 1)(\lambda/4)$ (*b*) $(2n - 1)(\lambda/2)$
(*c*) $n\lambda$ (*d*) $(2n + 1)\lambda$

35. Double slit interference experiment is carried out with monochromatic light and interference fringes are observed. If now monochromatic light is replaced by white light; what change is expected in interference pattern?

(*a*) no change
(*b*) pattern disappears
(*c*) white and dark fringes are observed throughout the pattern
(*d*) a few coloured fringes are observed on either side of central white fringe

36. Resolving power of microscope depends upon

(*a*) focal length (*b*) wavelength
(*c*) diameter (*d*) wavelength and diameter of lens

37. Bending of light phenomena is shown by

(*a*) polarization (*b*) diffraction
(*c*) interference (*d*) dispersion

38. Match List-I (Fundamental Experiment) with List-II (its conclusion) and select the correct option from the choice given below the lists:

	List-I		List-II
(*A*)	Frank-Hertz experiment	(*p*)	Particle nature of light
(*B*)	Photo-electric experiment	(*q*)	Discrete energy levels of atom
(*C*)	Davisson-German experiment	(*r*)	Wave nature of electron
		(*s*)	Structure of atoms

(*a*) (*A*)–(*p*), (*B*)–(*s*), (*C*)–(*r*) (*b*) (*A*)–(*q*), (*B*)–(*s*), (*C*)–(*r*)
(*c*) (*A*)–(*q*), (*B*)–(*p*), (*C*)–(*r*) (*d*) (*A*)–(*s*), (*B*)–(*r*), (*C*)–(*q*)

39. In a photoelectric experiment, the wavelength of the incident radiation is reduced from 6000 Å to 4000 Å, while the intensity of radiation remains the same; then

(*a*) the cut-off potential will decrease
(*b*) the cut-off potential will increase
(*c*) the photoelectric current will increase
(*d*) the kinetic energy of the emitted electrons will decrease

40. Photoelectrons are being obtained by irradiating zinc by a radiation of 3100 Å. In order to increase the kinetic energy of ejected photoelectrons:

(*a*) the intensity of radiation should be increased
(*b*) the wavelength of radiation should be increased
(*c*) the wavelength of radiation should be decreased
(*d*) both wavelength and intensity of radiation should be increased

41. Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively, successively illuminate a metallic surface whose work function is 0.5 eV. Ratio of maximum speeds of emitted electrons will be

(*a*) 1:4 (*b*) 1:1 (*c*) 1:5 (*d*) 1:2

42. Sodium surface is illuminated by ultraviolet and visible radiation successively and the stopping potential is determined. This stopping potential is

(*a*) equal in both cases (*b*) more with ultraviolet light
(*c*) more with visible light (*d*) varies randomly

43. When alpha particles are sent through a thin gold foil, most of them go straight through the foil, because

(*a*) alpha particles are positively charged
(*b*) mass of alpha particle is more than mass of electron
(*c*) most of the part of an atom is empty space
(*d*) alpha particles moves with high velocity

44. In equation $E_n = -\frac{13.6}{n^2}$, the negative sign indicates that

(*a*) electrons are free to move (*b*) kinetic energy is equal to potential energy
(*c*) electron is bound with nucleus (*d*) atom is radiating energy

45. α-particles, β-particles and γ-rays are all having same energy. Their penetrating power in a given medium in increasing order will be

(*a*) γ, α, β (*b*) α, β, γ (*c*) β, α, γ (*d*) β, γ, α

46. Pulse modulation is specially suitable for

(*a*) analog communication (*b*) digital communication
(*c*) neither analog nor digital communication (*d*) analog and digital communication both

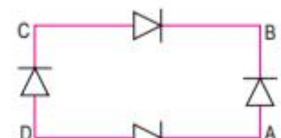
47. A radioactive nucleus (initial mass number *A* and atomic number *Z*) emits 3 α-particles and 2 positrons. The ratio of number of neutrons to that of protons in the final nucleus will be

(*a*) $\frac{A-Z-4}{Z-2}$ (*b*) $\frac{A-Z-8}{Z-4}$
(*c*) $\frac{A-Z-4}{Z-8}$ (*d*) $\frac{A-Z-12}{Z-4}$

48. When *p-n* junction diode is forward biased, then

(*a*) the depletion region is reduced and barrier height is increased
(*b*) the depletion region is widened and barrier height is reduced
(*c*) both the depletion region and barrier height are reduced
(*d*) both the depletion region and barrier height are increased

49. In figure shown, the input is across the terminals *A* and *C* and the output is across *B* and *D* then the output is



(*a*) same as the input (*b*) full wave rectified
(*c*) half wave rectified (*d*) zero

50. LEDs have advantages over conventional incandescent low power lamps, because it operates at

(*a*) low operational voltage and less power
(*b*) high operational voltage and less power
(*c*) low operational voltage and high power
(*d*) high operational voltage and high power

ANSWERS

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

SOLUTIONS

PRACTICE PAPER—11

1. (*a*) If q, and q' are charges on sphere of radii R and $2R$, then surface charge density will be same.

i.e., $\sigma = \sigma'$

$$\frac{q}{4\pi R^2} = \frac{q'}{4\pi(2R)^2} \quad \Rightarrow \quad q' = 4q \left[\because \ \sigma = \frac{Q}{A}\right]$$

As $q + q' = Q \ \Rightarrow \ q + 4q = Q$

$$\Rightarrow \qquad q = \frac{Q}{5} \qquad \therefore \qquad q' = \frac{4Q}{5}$$

2. (*d*) The direction of dipole moment from $-q$ to $+q$.

3. (*b*) The amount of work done in rotating the dipole from θ_0 to θ_1.

i.e., $W = pE(\cos\theta_0 - \cos\theta_1)$

Given, $\theta_0 = 0°$, $\theta_1 = 90°$,

So, $W = pE(\cos 0° - \cos 90°)$

$W = pE(1 - 0) = pE$

4. (*b*) In series combination of capacitors,

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

$$\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{3+2+1}{6} = \frac{6}{6} = 1$$

$C_{eq} = 1\ \mu F$

5. (*c*) In uniform electric field, equipotential surfaces are never concentric spheres but electric field lines always pass perpendicular to the planes of equipotential surface.

6. (*d*) We know that, for metallic spherical shell or metallic solid sphere,

$E = 0 \qquad (r < R)$

$E = \frac{KQ}{r^2} \Rightarrow E \propto \frac{1}{r^2}$

$V = \frac{KQ}{r}$

i.e., $V \propto \frac{1}{r}$

From the given fig., on increasing distance from the centre,

$E_A < E_D < E_C < E_B$ *i.e.*, E_B is maximum.

also, $V_D < V_C < V_A = V_B$ *i.e.*, V_B is maximum.

So, at B, E and V are maximum as compared to other points.

7. (*c*) In case of conductor with increase in temperature, relaxation time decreases, so resistivity increases. But in case of semiconductor, number density (n) of free electrons increases, hence resistivity decreases.

8. (*a*) Alloys have low value of temperature coefficient and high value of specific resistance because the resistance of alloy does not vary much with rise in temperature due to low temperature coefficient also even a smaller length of the material is sufficient to design standard resistance.

9. (*c*) We known that $v_d = -\frac{eE}{m_e}\tau$

or $v_d = \frac{-e\tau}{m_e}\left(\frac{V}{l}\right)$ $\left[\text{where, } E = \frac{V}{l}\right]$

If temperature is kept constant, then relaxation time, τ will remain constant, and e, and m_e are also constant.

or, $v_d \propto V$

If, $V \to 2V$ then, v_d becomes $2v_d$.

10. (*b*) $r = R\left(\frac{l_1 - l_2}{l_2}\right) = 2\times\left(\frac{50-40}{40}\right) = 0.5\,\Omega$

11. (*a*) Current, $I = \frac{\sum E}{\sum r}$

$$= \frac{1.5\,r_1 + 1.5\,r_2 + \ldots + 1.5\,r_n}{r_1 + r_2 + \ldots + r_n} = 1.5\text{ A}$$

12. (*d*) The coil of a moving coil galvanometer is wound over metallic frame to provide electromagnetic damping so it becomes dead beat galvanometer.

13. (*c*) The length of wire is same for square and circle.

i.e., $4a = 2\pi r$ where, a = side of square

$\Rightarrow \frac{a}{r} = \frac{\pi}{2}$ r = radius of circle

Now, magnetic moment, $M = IA$ where, I = same

$$\frac{M_1}{M_2} = \frac{A_1}{A_2} = \frac{a^2}{\pi r^2} = \frac{1}{\pi}\left(\frac{\pi}{2}\right)^2$$

$$= \frac{\pi}{4} \;\; i.e., \;\; M_1 : M_2 = \pi : 4$$

14. (*b*) Mutual inductance of a pair of two coils depends on the relative position and orientation of two coils.

15. (*c*) Move towards the wire as force on *KL* & *MN* are equal & opposite so cancel each other while force on *KN* is more than *LM* towards the wire from Fleming left hand rule.

18. For a paramagnetic substance I $\propto$ H

20. (*b*) Self inductance of solenoid, $L = \frac{\mu_0 N^2 A}{l}$

Now, $L' = \frac{\mu_0 (2N)^2 A}{2l} = \frac{2\mu_0 N^2}{l}A$

$\therefore L' = 2L$

21. (*a*) $E = \left|-\frac{d\phi}{dt}\right| = \left|A\frac{dB}{dt}\right| = A \times$ slope of line OA

$$= 5\cdot 0\times 10^{-3} \times \frac{0\cdot 2}{10\times 10^{-3}} = 0\cdot 1\text{ V}$$

22. (*b*) Resonant frequency,

$$\upsilon_r = \frac{1}{2\pi\sqrt{LC}}, \upsilon_r \propto \frac{1}{\sqrt{LC}}$$

Now, to reduce ν_r either we can increase L or C.

So, to increase C, we must connected another capacitor parallel to the first.

23. (*a*) In step up transformer,

$V_S > V_P$ and $I_P > I_S$

and, $\frac{N_S}{N_P} = \frac{V_S}{V_P} = \frac{I_P}{I_S} > 1$

i.e., if number of turns in secondary coil are more than the number of turns in primary coil, then voltage is increased, and hence they are called step-up transformers.

24. (*a*) i_{max} when $\omega = \frac{1}{\sqrt{LC}}$ or $\omega^2 = \frac{1}{LC}$

25. (*a*) Speed of EM wave, $v = \frac{c}{\sqrt{\mu_r \varepsilon_r}}$

Given, $\mu_r = 4$, $\varepsilon_r = 2.25$,

So, $v = \frac{3\times 10^8}{\sqrt{4\times 2.25}} = \frac{3\times 10^8}{3} = 1\times 10^8$ m/s

27. (*c*) The silvered lens behaves as a concave mirror of equivalent focal length,

$$\frac{1}{F} = \frac{2}{f_1} + \frac{1}{f_m} = \frac{2}{15} + \frac{1}{\infty}$$

$\Rightarrow F = \frac{15}{2}$ cm

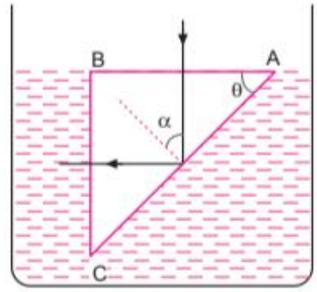
Now, $\frac{1}{F} = \frac{1}{v} + \frac{1}{u}$

Gives $\frac{1}{v} = \frac{1}{F} - \frac{1}{u} = -\frac{2}{15} + \frac{1}{20}$

$\Rightarrow v = -12$ cm

29. (*b*) A myopic eye has short sightedness defect of vision. They can't see the distant object. It will be corrected by concave lens.

30. (*a*) By geometry, $90° - \theta = 90° - \alpha$



$\Rightarrow \quad \theta = \alpha$

For total internal reflection at face AC,

$$\alpha = \theta > C$$

$$\Rightarrow \quad \sin\theta > \sin C$$

$$\Rightarrow \quad \sin\theta \geq \frac{n_w}{n_g} = \frac{4/3}{1\cdot 5} \Rightarrow \sin\theta > \frac{8}{9}$$

32. (*a*) For critical angle,

$$_1n_2 = \frac{1}{\sin i_c} = \frac{v_2}{v_1} = \frac{2v}{v} = 2$$

$$\sin i_c = \frac{1}{2} \Rightarrow i_c = 30°$$

Hence, for TIR, $i \geq i_c$, So, $i > 30°$.

33. (*c*) Since the refractive index is less at the beam boundary, the ray at the edges of the beam move faster compared to the axis of beam. Hence, the beam converges.

35. (*d*) Since the wavelength is different for different colours, therefore the fringe width and phase difference will be different for different colours. So on either side of central fringe, the width of the bright fringes for different colour will be different, and few coloured fringes are observed on either side of central white fringe.

36. (*d*) Resolving power, $\frac{1}{d} = \frac{\lambda}{2n\sin\theta}$ *i.e.*, depends upon wavelength

37. (*b*) Diffraction accounts for the bending of light.

39. (*b*) As we know,

$$eV_0 = \frac{hc}{\lambda} - \phi$$

$\therefore$ On reducing the wavelength, the cut-off potential would increase.

40. (*c*) As we know,

$$E_k = \frac{hc}{\lambda} - \phi$$

To increase the kinetic energy, the wavelength should be decreased.

41. (*d*) According to Einstein photoelectric equation,

$$K_{max} = \frac{1}{2}mv_{max}^2 = h\nu - W_0$$

$$\left(\frac{1}{2}mv_{max}^2\right)_1 = 1\,eV - 0.5\,eV = 0.5\,eV$$

$$\left(\frac{1}{2}mv_{max}^2\right)_2 = 2.5\,eV - 0.5\,eV = 2\,eV$$

$$\therefore \quad \frac{\left(v_{max}^2\right)_1}{\left(v_{max}^2\right)_2} = \frac{0.5}{2} = \frac{1}{4}$$

$$\Rightarrow \quad \frac{\left(v_{max}^2\right)_1}{\left(v_{max}^2\right)_2} = \frac{1}{2} = 1:2$$

42. (*b*) As we know,

$$eV_0 = \frac{hc}{\lambda} - \phi$$

The ultraviolet light has less wavelength than the visible light. Therefore, the stopping potential is more for UV light than that of visible light.

44. (*c*) It confers stability of electron in the orbit. It also signifies attractive force.

45. (*b*) α, β, γ; as α particles can be blocked by a few pieces of paper, β pass through a paper but stopped by aluminium foil, γ rays are most difficult to stop and requires concrete.

Hence, order of penetrating power, $\alpha < \beta < \gamma$.

47. (*c*) For each α-emission, 2 protons and 2 neutrons are lost. For each positron emission, 1 proton is lost and 1 neutron is gained

$$n_p = Z - 2 \times 3 - 2 \times 1 = Z - 8$$

$$n_n = (A - Z) - 2 \times 3 + 2 \times 1 = A - Z - 4$$

$$\therefore \quad \frac{n_n}{n_p} = \frac{A - Z - 4}{Z - 8}$$

49. (*b*) During first half cycle the diode between AB and CD is forward biased and during the next half cycle, the diode between BC and AD is forward biased. Therefore the circuit behaves as a full wave rectifier.

50. (*a*) LEDs require low operational voltage and consume less power as compared to conventional incandescent lamps.