PRACTICE PAPER 18

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

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

Choose the correct option in the following questions.

1. **The unit of electric permittivity ε of a medium is**
   (*a*) Nm^2/C^2 (*b*) Nm^2/C (*c*) C^2/Nm^2 (*d*) C/Nm^2

2. **An insulated conical shaped metallic conductor is charged positively. The surface charge density on it is**
   (*a*) uniform throughout
   (*b*) minimum at the apex
   (*c*) maximum at the apex
   (*d*) maximum at its base

3. **The magnitude of force experienced by an electron placed at a point in the electric field $\vec{E}$ is equal to its weight *mg*. The magnitude of $\vec{E}$ is**
   (*a*) mge (*b*) $e/(mg)$ (*c*) mg/e (*d*) mg/e^2

4. **An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 NC^{-1}. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is**
   (*a*) 8 mC (*b*) 2 mC (*c*) 5 mC (*d*) 7 mC

5. **A sphere encloses an electric dipole within it. The total flux across the sphere is**
   (*a*) zero
   (*b*) half that due to a single charge
   (*c*) double that due to a single charge
   (*d*) dependent on the position of the dipole

6. **On moving a charge of 20 C by 2 cm, 2 J of work is done. Then the potential difference between the points is**
   (*a*) 0.1 V
   (*b*) 8 V
   (*c*) 2 V
   (*d*) 0.5 V

7. **A 2 μF capacitor is charged to 200 volt and then the battery is disconnected. When it is connected in parallel to another uncharged capacitor, the potential difference between the plates of both is 40 volt. The capacitance of the other capacitor is**
   (*a*) 2 μF (*b*) 4 μF (*c*) 8 μF (*d*) 16 μF

8. **Work done to bring a unit positive charge un-accelerated from infinity to a point inside electric field is called**
   (*a*) electric field
   (*b*) electric potential
   (*c*) capacitance
   (*d*) electric flux

9. **Kirchhoff's II law for the electric network is based on**
   (*a*) law of conservation of charge
   (*b*) law of conservation of energy
   (*c*) law of conservation of angular momentum
   (*d*) law of conservation of mass

10. **For a cell, the terminal potential difference is 3.6 V, when the circuit is open. If the potential difference reduces to 3 V, when cell is connected to a resistance of 5 Ω, the internal resistance of cell is**

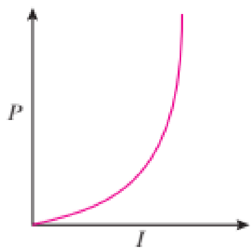
(*a*) 1 Ω (*b*) 2 Ω (*c*) 4 Ω (*d*) 8 Ω

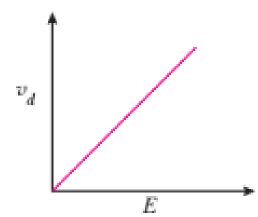
11. ***n*** **cells each of emf** E **and internal resistance** r **send the same current through an external resistance** R **whether the cells are connected in series or parallel. Then**

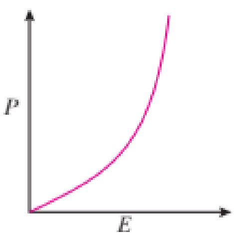
(*a*) $R = nr$ (*b*) $R = r$

(*c*) $r = nR$ (*d*) $R = (\sqrt{n})\, r$

12. **If** E **denotes electric field in a uniform conductor,** I **corresponding current through it,** v_d **drift velocity of electrons and** P **denotes thermal power produced in the conductor, then which of the following graphs is/are correct?**

(*a*)


(*b*)


(*c*)


(*d*) All of the above

13. **The current in a potentiometer wire is adjusted to give a null point at 56 cm with a standard cell of 1.02 V. The emf of another cell for which a null point at 70 cm is**

(*a*) 1 V (*b*) 1.02 V

(*c*) 1.275 V (*d*) 1.5 V

14. **A proton of mass** 1.67×10^{-27} **kg and charge** 1.6×10^{-19} **C is projected with a speed of** 2×10^{6} **m/s at an angle 60° with** ***x*****-axis. If a uniform magnetic field of 0.104 T is applied along** ***y*****-axis, the path of the proton is:**

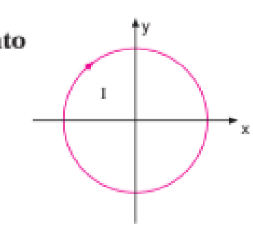
(*a*) a circle of radius 0·1 m and time period $2\pi \times 10^{-7}$ s

(*b*) a circle of radius 0·2 m and time period 15×10^{-7} s

(*c*) a helix of radius 0·1 m and time period $2\pi \times 10^{-7}$ s

(*d*) a helix of radius 0·2 m and time period $4\pi \times 10^{-7}$ s

15. **A conducting loop carrying current** I **is placed in a uniform magnetic field pointing into the plane of the paper as shown in fig. The loop will have a tendency to**



(*a*) contract

(*b*) expand

(*c*) move towards positive *x*-axis

(*d*) move towards negative *x*-axis

16. **SI unit of magnetic pole strength is**

(*a*) ampere-meter (*b*) $\frac{\text{ampere}}{\text{meter}^2}$ (*c*) $\frac{\text{ampere}}{\text{meter}}$ (*d*) $\frac{\text{volt}}{\text{meter}}$

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

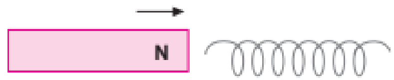
(*a*) halved (*b*) quadrupled

(*c*) unaffected (*d*) doubled

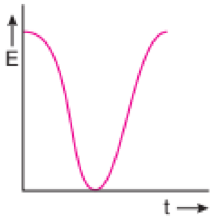
18. **The current passing through a choke coil of self-inductance 5 henry is decreasing at the rate of 2 A/s. The induced emf developed across the coil is**

(*a*) 10 volt (*b*) –10 volt (*c*) 2.5 volt (*d*) –2.5 volt

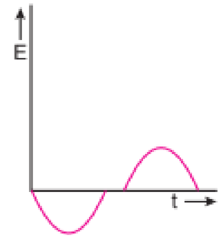
19. **The variation of induced emf (*E*) with time *t* in a coil if a short bar magnet is moved along its axis with a constant velocity is best represented as:**



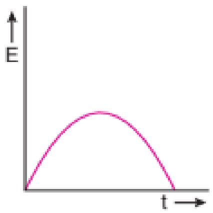
(*a*)



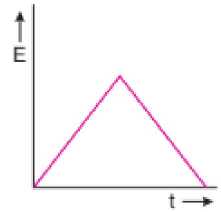
(*b*)



(*c*)



(*d*)



20. **An alternating current of 1·5 mA rms and angular frequency ω = 100 rad/s flows through a 10 kΩ resistor and a 0·50 μF capacitor in series. The rms potential difference across the capacitor is:**

(*a*) 4·8 V (*b*) 15 V (*c*) 30 V (*d*) 42 V

21. **The selectivity of a series LCR ac circuit is large, when**

(*a*) L is large and R is large (*b*) L is small and R is small

(*c*) L is large and R is small (*d*) L = R

22. **One 60 V, 100 W bulb is to be connected to 100 V, 50 Hz *ac* source. The potential drop across the inductor is**

(*a*) 10 V (*b*) 40 V (*c*) 20 V (*d*) 80 V

23. **In a pure inductive circuit, the current**

(*a*) lags behind the applied emf by an angle π

(*b*) lags behind the applied emf by an angle π/2

(*c*) leads the applied emf by an angle π/2

(*d*) and applied emf are in same phase

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

Statement P : In series LCR-circuit, the resonance occurs at one frequency only.

Statement Q : At resonance, the inductive reactance is equal and opposite to the capacitive reactance.

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

25. **Out of the following options which one can be used to produce a propagating electromagnetic wave?**

(*a*) A charge moving at constant velocity

(*b*) A stationary charge

(*c*) A chargeless particle

(*d*) An accelerating charge

26. Microwave oven acts on the principle of

(*a*) giving rotational energy to water molecules

(*b*) giving vibrational energy to water molecules

(*c*) giving translational energy to water molecules

(*d*) transferring electrons from lower to higher energy levels in water molecule

27. The condition under which a microwave oven heats up a food item containing water molecules most efficiently, is

(*a*) The frequency of the microwaves must match the resonant frequency of the water molecules

(*b*) The frequency of the microwaves has no relation with natural frequency of water molecules

(*c*) Microwaves are heat waves, so always produce heating

(*d*) Infrared waves produce heating in a microwave oven

28. A convex lens of focal length 12 cm is placed in contact with a plane mirror. If the object is placed at 20 cm from the lens, the position of final image is

(*a*) 30 cm to the right

(*b*) 30 cm to the left

(*c*) 20 cm to the left

(*d*) 8·6 cm to the left

29. A point object is placed at the centre of a glass sphere of radius 6 cm and refractive index 1·5. The distance of the virtual image from the surface of the sphere is

(*a*) 2 cm

(*b*) 4 cm

(*c*) 6 cm

(*d*) 12 cm

30. The ratio of powers of a thin convex and a thin concave lens is $\frac{3}{2}$ and equivalent focal length of the combination in contact is 30 cm. Their individual focal lengths respectively (in cm) are

(*a*) 75, – 50

(*b*) 75, 50

(*c*) 10, – 15

(*d*) –75, 50

31. A biconvex lens of focal length f forms a circular image of sun of radius r in the focal plane. Then

(*a*) area of image is πr^2 and is proportional to f

(*b*) area of image is πr^2 and is proportional to f^2

(*c*) if lower part is covered by a black sheet, then area of image is $\frac{\pi r^2}{2}$

(*d*) with increase of f the intensity will increase

32. The angular resolution of a 10 cm diameter telescope at a-wavelength 500 nm is of the order of

(*a*) 10^{-4} rad

(*b*) 10^{-6} rad

(*c*) 10^{-3} rad

(*d*) 10^{7} rad

33. Angular width of interference fringe depends on

(*a*) distance between slit and screen

(*b*) wavelength of light

(*c*) ratio of the wavelength and slit width

(*d*) width of slit

34. In the Young's double slit experiment, the fringe pattern as seen on the screen is

(*a*) parabola

(*b*) hyperbola

(*c*) ellipse

(*d*) spiral

35. Match the following in Column A with Column B.

	Column A		Column B
(*i*)	Equipotential surface for a point charge	(*p*)	$U = -pE$
(*ii*)	Equipotential surface for a linear charge	(*q*)	Concentric spheres
(*iii*)	Electric potential inside a charged conductor	(*r*)	Coaxial cylinders
(*iv*)	Stable equilibrium of a dipole in field E	(*s*)	Constant

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

36. Thin films of oil and soap water owe their brilliant colours to

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

37. Young's experiment established that

(*a*) light consists of waves
(*b*) light consists of particles
(*c*) light is neither particle nor wave
(*d*) light is both a particle and a wave

38. The work function for photoelectric effect

(*a*) depends upon the frequency of incident light
(*b*) is same for all metals
(*c*) is different for different metals
(*d*) none of these

39. Which of the following has maximum stopping potential when metal is illuminated by visible light?

(*a*) Blue
(*b*) Yellow
(*c*) Violet
(*d*) Red

40. Einstein's photoelectric equation is:

(*a*) $h\nu = h\nu_0 + \frac{1}{2}mv^2$
(*b*) $h\nu_0 = h\nu + \frac{1}{2}mv^2$
(*c*) $h\nu = \frac{1}{2}mv^2$
(*d*) $2h\nu = h\nu_0 + mv^2$

41. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom is

(*a*) 1 : 1
(*b*) 1 : – 1
(*c*) 2 : – 1
(*d*) 1 : – 2

42. When an electron jumps from a level $n = 4$ to $n = 1$, the momentum of the recoiled hydrogen atom will be:

(*a*) $6{\cdot}8 \times 10^{-27}$ kg m/s
(*b*) $12{\cdot}75 \times 10^{-19}$ kg m/s
(*c*) $13{\cdot}6 \times 10^{-19}$ kg m/s
(*d*) zero

43. In Bohr's model of hydrogen atom, the total energy of the electron in n^{th} discrete orbit is proportional to

(*a*) n
(*b*) $\frac{1}{n}$
(*c*) n^2
(*d*) $\frac{1}{n^2}$

44. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is

(*a*) 2
(*b*) 1
(*c*) 4
(*d*) 0.5

45. The proportionality relation between the half life T and the radioactive decay constant λ is

(*a*) $T \propto \lambda$
(*b*) $T \propto 1/\lambda$
(*c*) $T \propto 1/\lambda^2$
(*d*) $T \propto 1/\lambda^4$

46. The maximum range of a radar using transmitter of 1 kW power is R. What is the maximum range if it uses a transmitter of power 4 kW?

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

47. Which of the following statements is not true for the nuclear force?

(*a*) It is attractive in nature.

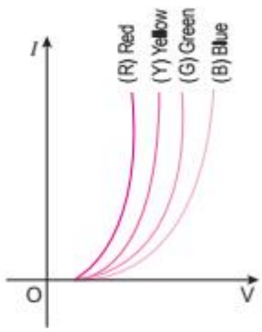
(*b*) It is charge dependent.

(*c*) It is short range.

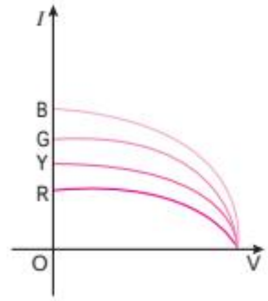
(*d*) It decreases very quickly with distance between two nucleons.

48. The *I-V* characteristic of an LED is

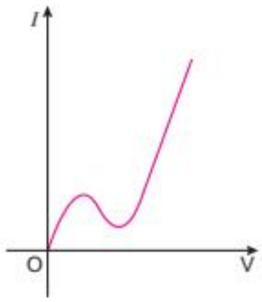
(*a*)



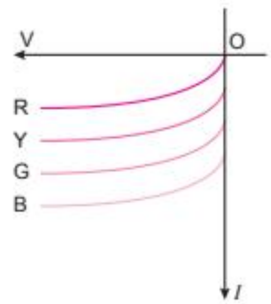
(*b*)



(*c*)



(*d*)



49. Crystalline solids are

(*a*) anisotropic

(*b*) isotropic

(*c*) amorphous

(*d*) none of these

50. If the ratio of the concentration of electrons to that of holes in a semiconductor is $\frac{7}{5}$ currents is $\frac{7}{5}$, then what is the ratio of their drift velocities?

(*a*) $\frac{5}{8}$ (*b*) $\frac{4}{5}$ (*c*) $\frac{5}{4}$ (*d*) $\frac{4}{7}$

ANSWERS

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

SOLUTIONS

PRACTICE PAPER–18

1. (*c*) $F = \frac{q_1 q_2}{4\pi\varepsilon_0 r^2} \Rightarrow \varepsilon_0 = \frac{q_1 q_2}{4\pi F.r^2}$

Unit = $\frac{C}{Nm^2}$

2. (*c*) $\sigma = \frac{Q}{A}$

$\sigma \propto \frac{1}{r^2}$

3. (*c*) As $F = qE$

$\Rightarrow mg = eE$

$\therefore E = mg/e$

4. (*b*) Given, $\tau = 4$ Nm, $l = 2$ cm $= 0.02$ m, $E = 2 \times 10^5$ N/C, $\theta = 30°$

$\tau = pE \sin\theta = ql\,E \sin\theta$

$\Rightarrow 4 = q(0.02) \times 2 \times 10^5 \times \sin 30°$

$\Rightarrow q = \frac{4}{0.02 \times 2 \times 10^5 \times \frac{1}{2}}$ C

$\Rightarrow q = 0.002$ C

$\Rightarrow q = 2$ mC

5. (*a*) Net charge carried by electric dipole = 0

$\therefore$ flux = 0.

6. (*a*) $W = q(\Delta V) \Rightarrow \Delta V = \frac{qV}{q} = \frac{2}{20} = 0.1$ V

7. (*c*) $V_{common} = \frac{C_1V_1 + C_2V_2}{C_1C_2} \Rightarrow 40 = \frac{2 \times 200 + 0}{2 + C_2}$

$\Rightarrow C_2 = \frac{320}{40} = 8\,\mu F$

10. (*a*) $r = R\left(\frac{E-V}{V}\right) = 5\left(\frac{3.6-3}{3}\right) = 1\,\Omega$

11. (*b*) As according to maximum power theorem

$R = r$

internal resistance = external load

12. (*d*) $v_d = \frac{eE}{m}\tau$ *i.e.*, $v_d \propto E$

or $P = \frac{V^2}{R} = \frac{\left(\frac{E}{d}\right)^2}{R} = \frac{E^2}{d^2R}$ *i.e.*, $P \propto E^2$

or $P = VI = I^2R$; *i.e.*, $P \propto I^2$

13. (*c*) In potentiometer, comparison of emfs,

$\frac{E_1}{E_2} = \frac{l_1}{l_2}$

$\Rightarrow \frac{1.02}{E_2} = \frac{56}{70}$

$\therefore E_2 = \frac{70}{56} \times 1.02 = 1.275$ V

14. (*c*) The path of particle is a helix of radius

$r = \frac{mv\sin\theta}{qB}, \quad T = \frac{2\pi m}{qB}$

$r = \frac{1.67 \times 10^{-27} \times 2 \times 10^6 \times \sqrt{3}}{1.6 \times 10^{-19} \times 0.104 \times 2} = 0.1$ m

$T = \frac{2\pi \times 1.67 \times 10^{-27}}{1.6 \times 10^{-19} \times 0.104} = 2\pi \times 10^{-7}$ s

15. (*b*) By Fleming left hand rule, magnetic force on any current element is directed radially outwards, so loop has tendency to expand.

17. (*d*) Doubled as $L = \mu_0 \frac{N^2}{l} A$

18. (*a*) Emf induced across the coil,

$e = -L\frac{di}{dt} = -5 \times (-2) = +10$ V

19. (*b*) Induced emf,

$E = -\frac{d\phi}{dt} = -\frac{d}{dt}(BA) = -A\frac{dB}{dt}$

$= -A\frac{dB}{dx}\frac{dx}{dt} = -Av\frac{dB}{dx}$

The magnetic flux linked with coil initially increases, so induced emf is initially negative, then magnetic flux linked becomes constant; so $\frac{dB}{dx} = 0$ and then magnetic flux begins to decrease, so $\frac{dB}{dx}$ is negative and induced emf is positive. The change of sign is only shown in (*b*).

20. (*c*) $X_C = \frac{1}{\omega C} = \frac{1}{100 \times 0 \cdot 50 \times 10^{-6}}\,\Omega = 2 \times 10^4\,\Omega$

$V_C = X_C I = 2 \times 10^4 \times 1 \cdot 5 \times 10^{-3} = 30$ V

21. (*c*) $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$

The selectivity of a series LCR circuit can be increased by increasing the quality factor, *i.e.*, when L is large and R is small.

22. (*d*) Voltage across the inductor is

$V_l = \sqrt{V^2 - V_R^2} = \sqrt{(100)^2 - (60)^2}$

$= \sqrt{10000 - 3600} = \sqrt{6400} = 80$ V

25. (*d*) An accelerating charge produces a propagating electromagnetic wave.

26. (*b*) The frequency of the microwaves matches with the vibrational frequency of water molecules.

Hence, their energy is transferred efficiently to the kinetic energy of water molecules.

27. (*a*) Energy from the microwaves is transferred efficiently to the kinetic energy of water molecules at their resonant frequency.

28. (*d*) Here refraction at convex surface takes place twice; one before reflection from mirror and the other after it.

For first refraction,

$$\frac{1}{f}=\frac{1}{v_1}-\frac{1}{u_1} \quad \Rightarrow \quad \frac{1}{v_1}=\frac{1}{f}+\frac{1}{u_1}=\frac{1}{12}-\frac{1}{20}$$

$$\Rightarrow \quad v_1 = 30 \text{ cm}$$

The plane mirror reflects this, so virtual image is formed to the left of lens.

Now $u_2 = -v_1 = -30$ cm; $f_1 = -12$ cm

$$\therefore \quad \frac{1}{f_1}=\frac{1}{v_2}-\frac{1}{u_2}$$

Gives $\frac{1}{v_2}=\frac{1}{f_1}+\frac{1}{u_2}=-\frac{1}{12}-\frac{1}{30}$

$$\Rightarrow \quad v_2=-\frac{60}{7}=-8\cdot6 \text{ cm}$$

29. (*c*) From lens maker's formula,

$$\frac{n_2}{v}-\frac{n_1}{u}=\frac{n_2-n_1}{R}$$

$$\Rightarrow \quad \frac{1}{v}-\frac{1\cdot5}{6}=\frac{1-1\cdot5}{6} \quad \Rightarrow \quad v=-6 \text{ cm}$$

i.e., image is coincident with the object.

30. (*c*) We have,

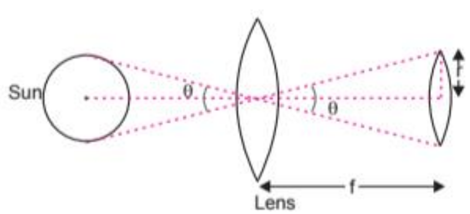
$$\frac{P_1}{P_2}=-\frac{3}{2} \quad \Rightarrow \quad \frac{f_2}{f_1}=-\frac{3}{2} \quad \Rightarrow \quad f_2=-\frac{3}{2}f_1$$

From combination of lens,

$$\frac{1}{F}=\frac{1}{f_1}+\frac{1}{f_2} \quad \Rightarrow \quad \frac{1}{30}=\frac{1}{f_1}-\frac{2}{3f_1}$$

$$\Rightarrow \quad f_1 = 10 \text{ cm}, \quad f_2=-\frac{3}{2}f_1=-15 \text{ cm}$$

31. (*b*) Area of image = πr^2



From fig., $\tan\frac{\theta}{2}=\frac{\theta}{2}=\frac{r}{f}$

[$\because$ θ is very small, so, $\tan\theta \simeq \theta$]

$$\therefore \quad r=f\left(\frac{\theta}{2}\right)\propto f$$

$\therefore$ Area of image $\propto r^2 \propto f^2$

32. (*b*) $d\theta=\frac{1.22\lambda}{D}=\frac{1.22\times500\times10^{-9}}{10\times10^{-2}}$

$= 6.1 \times 10^{-6}$ rad

i.e., of the order of 10^{-6} rad.

33. (*c*) Angular width = $\frac{\text{Arc}}{\text{Radius}}=\frac{\lambda D}{Dd}=\frac{\lambda}{d}$

36. (*b*) Their colours arise due to interference of sunlight reflected from the upper and lower surface of films.

39. (*c*) From Einstein photoelectric equation,

$KE_{max}=h\nu-\phi_0 \Rightarrow KE_{max}$ is maximum for violet.

41. (*b*) For H like species

$$TE = -KE$$

$$\frac{KE}{TE}=\frac{1}{-1}=1:-1$$

42. (*a*) As we know,

$$\frac{1}{\lambda}=R\left(\frac{1}{n_2^2}-\frac{1}{n_1^2}\right)=R\left(\frac{1}{1}-\frac{1}{16}\right)=\frac{15R}{16}$$

$$\lambda=\frac{16}{15R}$$

Also, from de-Broglie hypothesis,

$$\lambda=\frac{h}{p} \quad \Rightarrow \quad p=\frac{h}{\lambda}=\frac{h\times15R}{16}$$

$$p=\frac{6.63\times10^{-34}\times15\times1.097\times10^7}{16}$$

$= 6.8 \times 10^{-27}$ kg m/s

43. (*d*) $E_n=\frac{-Z^2Rhc}{n^2}$

$$E_n \propto \frac{1}{n^2}$$

44. (*c*) For the last line of Balmer series,

$$\frac{1}{\lambda_L}=R\left[\frac{1}{1^2}-\frac{1}{\infty}\right]=R$$

$$\Rightarrow \quad \lambda_L=\frac{1}{R}$$

For the last line of Balmer series,

$$\frac{1}{\lambda_B}=R\left[\frac{1}{2^2}-\frac{1}{\infty}\right]=\frac{R}{4}$$

$$\Rightarrow \quad \lambda_B=\frac{4}{R}$$

$$\therefore \quad \frac{\lambda_B}{\lambda_L}=\frac{4}{R}.\frac{R}{1}=4$$

45. (*b*) Half life of radioactive decay,

$T=\frac{0.6931}{\lambda}$, so $T\propto\frac{1}{\lambda}$

46. (*b*) Maximum range, $R \propto (P)^{1/4}$ [P = Power]

Now, $\dfrac{R_{\text{old}}}{R_{\text{new}}} = \left(\dfrac{P_{\text{old}}}{P_{\text{new}}}\right)^{1/4} = \left(\dfrac{1}{4}\right)^{1/4}$

$$\frac{R}{R_{\text{new}}} = \frac{1}{\sqrt{2}}$$

$\therefore \quad R_{\text{new}} = \sqrt{2}\,R$

48. (*a*) For a forward biased LED, current I increases with voltage V. The threshold voltages are slightly different for different colours.

49. (*a*) Crystalline solids are anisotropic as they show different physical properties along different directions.

50. (*c*) As we know,

$$I = enAv_d$$

$$\therefore \quad \frac{I_e}{I_h} = \frac{en_eAv_e}{en_hAv_h} = \frac{n_e}{n_h}\cdot\frac{v_e}{v_h}$$

or $$\frac{v_e}{v_h} = \frac{I_e}{I_h} \times \frac{n_h}{n_e} = \frac{7}{4} \times \frac{5}{7} = \frac{5}{4}$$