

KCET Paper 01 Only Solutions- PHYSICS

Q.1 (A)

Sol. $\tau = rF = [M^1L^2T^{-2}]$

Q.2 (C)

Sol. $\frac{s_p}{s_q} = \frac{\frac{3}{2}\pi r}{2r} = \frac{3}{4}\pi$

Q.3 (D)

Loss in potential energy = Gain in kinetic energy

$$mgh = \frac{1}{2}mv^2$$

$$v = \sqrt{2gh}$$

∴ Speed is independent of angle of projection.

Q.4 (C)

Sol. Concept of Inertia.

Q.5 (C)

M.S.D = 1 mm

LC = M.S.D - V.S.D. = 0.1 mm

Side length of the cube →

$$= 10 \times \text{M.S.D.} + 1 \text{ L C}$$

$$= 10.1 \text{ mm}$$

Q.6 (A)

Sol. work done = ΔKE

$$(\text{KE})_i = \frac{1}{2}I\omega^2 + \frac{1}{2}mv^2 = \frac{3}{4}mv^2$$

$$= \frac{3}{4} \times 100 \times (20 \times 10^{-2})^2 = \frac{3}{4} \times 100 \times 400 \times 10^{-4} = 3\text{J}$$

Q.7 (C)

Sol.: Given $\theta = 2t^3 - 3t^2 - 4t - 5$

$$\omega = \frac{d\theta}{dt} = 6t^2 - 6t - 4$$

$$\alpha = \frac{d\omega}{dt} = 12t - 6$$

$$\text{Now, } \alpha|_{t=1s} = 12(A) - 6 = 6 \text{ rad/s}^2$$

Q.8 (A)

Sol. Orbital speed near the surface of earth

$$\Rightarrow V_0 = \sqrt{\frac{GM}{R}} = 7$$

Orbital speed in the new orbit

$$\Rightarrow V' = \sqrt{\frac{GM}{4R}} = \frac{1}{2} \times 7 = 3.5 \text{ km-s}^{-1}$$

Q.9 (D)

Sol. As stress is shown on x-axis and strain on y-axis

$$\text{So we can say that } Y = \cot \theta = \frac{1}{\tan \theta} = \frac{1}{\text{slope}}$$

So elasticity of wire P is minimum and of wire R is maximum

Q.10 (B)

Sol. $Q_4 + 10 + 5 - 8 = 0$

$$Q_4 = 7 \text{ m}^3/\text{s}$$

$$\therefore 0.5v = 7$$

$$v = \frac{7}{0.5} \frac{70}{5} = 14 \text{ m/s}$$

Q.11 (A)

Sol. Emissive power $E \propto T^4$

$$\frac{E_1}{E_2} = \left(\frac{T_1}{T_2}\right)^4$$

$$\frac{E_1}{E_2} \Rightarrow \left(\frac{T_1}{T_1/2}\right)^4 \Rightarrow 816$$

$$\left(E_2 \Rightarrow \frac{E_1}{16}\right)$$

Q.12 (B)

Sol. Gradual loss of elasticity due to repeated deforming force/strain.

Q.13 (D)

Sol. In cyclic process.

$$\Delta U = 0$$

Q.14 (B)

Sol. RMS speed is given by

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

At constant temperature

$$v_{\text{rms}} \propto \frac{1}{\sqrt{M}}$$

Ratio of v_{rms} of oxygen and hydrogen.

$$\frac{(v_{\text{rms}})_O}{(v_{\text{rms}})_H} = \sqrt{\frac{M_H}{M_O}}$$

$$\frac{500}{(v_{\text{rms}})_H} = \sqrt{\frac{2}{32}} = \frac{1}{4}$$

$$(v_{\text{rms}})_H = 2000 \text{ m/s}$$

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Q.15 (C)

Sol. Resultant amplitude = $\sqrt{3^2 + 4^2} = 5$

Q.16 (B)

Sol. $\frac{2\pi}{\lambda} = \frac{\pi}{3}$
 $\frac{\lambda}{2} = 3\text{cm}$

Q.17 (B)

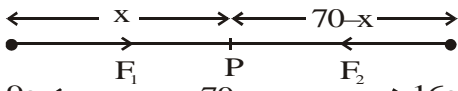
Sol. $\vec{S} = 10\hat{j}$ $\vec{E} = 2\hat{i} + 4\hat{j} + 3\hat{k}$
 $\phi = \vec{E} \cdot \vec{S}$
 $\phi = (2\hat{i} + 4\hat{j} + 3\hat{k}) \cdot (10\hat{j}) \Rightarrow \phi = 40 \text{ units}$

Q.18 (D)

Q.19 (C)

$q = ne$
 $80 \times 10^{-6} = n \times 1.6 \times 10^{-19}$

Q.20 (D)

Sol. 
 $9e \leftarrow \xrightarrow{70\text{cm}} 16e$
 At point P, the charge is at rest i.e. $F_{\text{net}} = 0$
 $F_1 = F_2$
 $\frac{K(9e)(q)}{x^2} = \frac{K(16e)}{(70-x)^2} q$
 $\Rightarrow x = 30 \text{ cm from } 9e \text{ or } 40 \text{ cm from } 16e.$

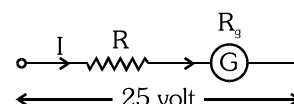
Q.21 (D)

The electric potential at the centre of a charged conductor is equal to the electric potential at the surface of the conductor.

Q.22 (D)

Sol. $C = \frac{\epsilon_0 A}{d} = 2 \times 10^{-6} \text{ F}$
 $C' = \frac{K\epsilon_0 A}{2d} = 6 \times 10^{-6} \text{ F}$
 $\frac{k}{2} = 3 \Rightarrow \boxed{k=6}$

Q.23 (C)

Sol. 

According to question $25 = I(R + R_g)$
 $= (4 \times 10^{-4} \times 25) (R + 50)$
 $\Rightarrow R + 50 = 2500 \Rightarrow R = 2450\Omega$

Q.24 (B)

Sol. For balanced wheatstone bridge

$$\frac{100}{400} = \frac{200R}{(200+R) \times 400}$$

Solving we get $R = 200\Omega$

Q.25 (C)

Sol. Power $p = \frac{V^2}{R}$

$$\therefore p \propto \frac{1}{R}$$

$$\therefore \frac{p_1}{p_2} = \frac{R_2}{R_1} = \frac{1}{2}$$

$$p_1 : p_2 = 1 : 2$$

Q.26 (A)

Sol. $v_d = \mu E$

$$= \frac{e\tau}{m} \left(\frac{V}{l} \right)$$

$$v_d = \left(\frac{e\tau}{ml} \right) V$$

$$v_d \propto V$$

$$\frac{v_{d1}}{v_{d2}} = \frac{V}{2V}$$

$$v_{d2} = 2v_{d1}$$

Q.27 (C)

Sol. $R = R_0(1 + \alpha\Delta T)$
 $3R_0 = R_0(1 + 4 \times 10^{-3}\Delta T)$
 $\Delta T = 500^\circ\text{C}$

Q.28 (B)

Q.29 (D)

Sol. $\frac{\theta}{i} = \frac{NAB}{C}$

Q.30 (B)

Sol. $B = \mu_0 ni$

$$\frac{B_2}{B_1} = \frac{n_2 i_2}{n_1 i_1} = \frac{100 \times (i/3)}{200 \times i}$$

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$$B_2 = \frac{1}{6} \times 6.28 \times 10^{-2} = 1.05 \times 10^{-2} \text{ Wb/m}^2$$

Q.31 (A)

Sol. Magnetic field due to current carrying will at centre is [FT-10]

$$B = \frac{\mu_0 i N}{2R} = \frac{4\pi \times 10^{-7} \times 6 \times 50 \times 100}{2 \times 10}$$

$$B = 2\pi \times 10^{-7} \times 25 \times 180 = 50 \pi \times 10^{-5} \\ = 1.57 \times 10^{-3} \text{ T} = 1.57 \text{ mT}$$

Q.32 (C)

Sol. Magnetic induction at a point (x distance away from centre) on the axis of a current carrying circular coil

$$B = \frac{\mu_0 n i a^2}{2(a^2 + x^2)^{3/2}}$$

where, a = radius of the coil
Since, $x \gg a$, so a can be neglected

$$\therefore B = \frac{\mu_0 n i a^2}{x^3} \quad \therefore B \propto \frac{1}{x^3}$$

Q.33 (D)

Sol. For paramagnetic

Magnetic susceptibility, $\chi \propto \frac{1}{T}$

\Rightarrow inversely proportional to absolute temperature

Q.34 (A)

Sol. In SI units, we have $B = \mu_0(H + I)$

Q.35 (C)

Q.36 (A)

Sol. Change in flux = Resistance \times Area under i-t curve

$$\Rightarrow \Delta\phi = 10 \times \frac{1}{2} \times 4 \times 0.1 = 2 \text{ weber}$$

Q.37 (B)

Sol.
$$e = -\frac{LdI}{dt} \Rightarrow L = -\frac{e}{(dI/dt)}$$

$$L = -\frac{8}{(2/0.05)} = -0.2 \text{ H} \\ = 0.2 \text{ H (only positive value)}$$

Q.38 (B)

In step down transformer $N_1 > N_2$ (N_2 : no. of turns in primary)

N_2 = no. of turns in secondary

Q.39 (C)

Sol.
$$\tan \phi = \tan 45^\circ = \frac{X_L}{R}$$

$$\therefore X_L = R$$

Q.40 (B)

Q.41 (D)

Sol. Electromagnetic wave is not a charged particle. It has electric and magnetic field as its components \Rightarrow Neither electric field nor magnetic field.

Q.42 (A)

Using,
$$\frac{1.5}{v} - \frac{1}{-15} = \frac{1.5-1}{+30}$$

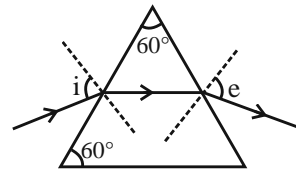
$$\therefore v = -30 \text{ cm}$$

Q.43 (D)

In an astronomical telescope the distance between eye-piece and objective = $f_o + f_e$
= sum of focal lengths of the objective and eye-piece.

Q.44 (D)

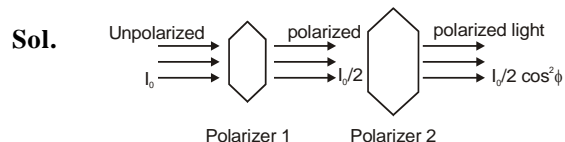
Sol. For equilateral prism, all angles are 60° for minimum deviation δ_{\min}



$$\mu = \frac{\sin\left(\frac{A + \delta_{\min}}{2}\right)}{\sin\frac{A}{2}}$$

At minimum deviation $i = e$
Angle of incidence = angle of emergence
and $\delta_{\min} = i + e - A = 2i - A = 2i - 60^\circ$
 $\Rightarrow r_1 = r_2 \Rightarrow$ ray is parallel to base

Q.45 (C)



From Malus law

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

where ϕ is the angle between transmission axis

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Q.46 (D)

$$\beta = \frac{D\lambda}{d} \text{ and } \beta' = \frac{(2D)\lambda}{(d/2)} = 4\beta$$

Thus the fringe width becomes four times.

Q.47 (B)

Sol. As $\lambda_{\text{blue}} < \lambda_{\text{red}}$, and width of diffraction bands is directly proportional to λ , therefore diffraction bands become narrower and crowded together.

Q.48 (A)

Sol. $(\text{K.E.})_{\text{max}} = h\nu - \phi$
 $\therefore \phi_B > \phi_A \quad \therefore (\text{K.E.})_A > (\text{K.E.})_B$

Q.49 (A)

Sol. $\frac{hc}{\lambda} = 5 \text{ eV}_0 + \phi$

$$\frac{hc}{3\lambda} = \text{eV}_0 + \phi \Rightarrow \frac{2hc}{3\lambda} = 4\text{eV}_0 \Rightarrow \phi = \frac{hc}{6\lambda}$$

Q.50 (D)

Sol. The radius of Bohr orbit, $r \propto n^2$

$$\therefore \frac{r_1}{r_2} = \left(\frac{n_1}{n_2}\right)^2 \Rightarrow r_2 = r_1 \left(\frac{n_2}{n_1}\right)^2 \quad \dots(1)$$

Given : $r_1 = 0.5 \text{ \AA}$, $n_1 = 1$, $n_2 = 4$ putting given values in eq. (A)

$$\therefore r_2 = 0.5 \left(\frac{4}{1}\right)^2$$

$$\Rightarrow r_2 = 0.5 \times 16$$

$$\therefore r_2 = 8 \text{ \AA}$$

Q.51 (A)

Sol. As $mvr = \frac{nh}{2\pi}$ and $\lambda = \frac{h}{mv}$

$$\Rightarrow r = \frac{n}{2\pi} \frac{h}{mv} \Rightarrow 2\pi r = n\lambda$$

for $n = 1$; $\lambda = 2\pi r$

Q.52 (C)

Experimental measurements show that volume of a nucleus is proportional to its mass number A. If R is the radius of the nucleus assumed to be spherical,

then its volume $\left(\frac{4}{3}\pi R^3\right) \propto A$ or $R \propto A^{1/3}$ or $R = R_0 A^{1/3}$

where R_0 is an empirical constant whose value is found to be $1.1 \times 10^{-15} \text{ m}$.

Q.53 (B)

Q.54 (B)

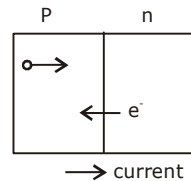
Q.55 (B)

Sol. Fusion of two nuclei in the range $51 < A < 100$ will release energy as after fusion they will get more specific binding energy.

Q.56 (B)

Sol. Voltage will be divided equally as resistance are equal

Q.57 (A)



Sol.

Q.58 $E = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{12400}{E(\text{eV})} = \frac{12400}{2.5} = 4960 \text{ \AA}$

Q.59 (D)

Sol. $u = ?$, $f = -20 \text{ cm}$, $m = \frac{1}{4}$

$$m = \frac{+v}{u} \Rightarrow \frac{1}{4} = \frac{v}{(u)} \Rightarrow v = \frac{u}{4} \dots\dots(i)$$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{\frac{u}{4}} - \frac{1}{u} = \frac{1}{-20}$$

$$\frac{4}{u} - \frac{1}{u} = \frac{-1}{20} \Rightarrow \frac{3}{u} = \frac{-1}{20}$$

$$u = -60 \text{ cm.}$$

Q.60 (A)

Sol. $|\tau|_{\text{max}} = PE$

$$\frac{\tau_1}{\tau_2} = \frac{P_1 E_1}{P_2 E_2} = \frac{1.2 \times 10^{-30} \times 5 \times 10^4}{2.4 \times 10^{-30} \times 15 \times 10^4} = \frac{1}{6}$$