FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2024
OPEN TEST – I
PAPER –2
TEST DATE: 04-02-2024

ANSWERS, HINTS & SOLUTIONS

Physics

PART – I

SECTION – A

1. A

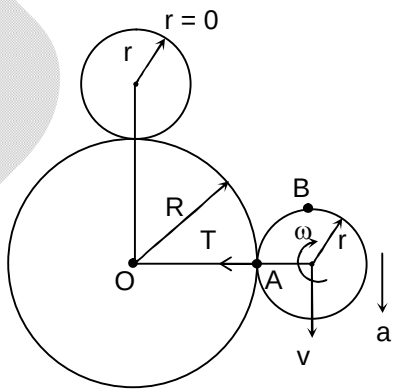
Sol. $mg(R+r)=\frac{1}{2}mv^2+\frac{1}{2}\left(\frac{1}{2}mr^2\right)\omega^2$

$\omega = v/r$

$v=\sqrt{\frac{4g}{3}}\sqrt{R+r}$

$\vec{a}_{A/g}=\vec{a}_{a/com}+\vec{a}_{com/g}$

$\vec{a}_{A/g}=\omega^2 r\hat{i}+r\alpha\hat{j}+\left(\frac{-v^2}{R+r}\right)\hat{i}-a\hat{j}=\omega^2 r\hat{i}-\frac{v^2}{R+r}+(r\alpha-a)\hat{j}$



For rolling $\Rightarrow a = r\alpha$, $v = r\omega$

$\Rightarrow \omega = v/r$

$\vec{a}_{A/g}=\left|\omega^2 r-\frac{v^2}{(R+r)}\right|\hat{i}$

$\left|\vec{a}_{A/g}\right|=\left(\frac{v}{r}\right)^2 r-\frac{v^2}{R+r}=\frac{4g}{3}\left(\frac{R}{r}\right)$

$\left|\vec{a}_{A/g}\right|=\frac{4g}{3}\frac{3r}{r}=4g=40\ m/s^2$

$\vec{v}_{B/g}=\vec{v}_{B/com}+\vec{v}_{com/g}$

$\vec{v}_{B/g}=v\hat{i}-v\hat{j}$

$\left|\vec{v}_{B/g}\right|=\sqrt{16}=4\ m/s$

2. A

Sol. $\mu N \geq \sqrt{(mg\sin\theta)^2 + (ma)^2}$

$\Rightarrow \mu mg\cos\theta \geq m\sqrt{a^2 + g^2\sin^2\theta}$

$\Rightarrow \mu \geq \sqrt{\tan^2\theta + \left(\frac{a}{g}\right)^2 \sec^2\theta}$

By putting a = g/2, and $\theta = 45°$

$\mu \geq \sqrt{\frac{3}{2}}$

3. D

Sol. $\frac{1}{20} = \left(\frac{3}{2} - 1\right)\left(\frac{1}{R} - \frac{1}{-R}\right)$

$\Rightarrow$ R = 20 cm

$$\frac{\left(\frac{4}{3}\right)}{v_1} - \frac{1}{(-30)} = \frac{\left(\frac{3}{2} - 1\right)}{+20} - \frac{\left(\frac{3}{2} - \frac{4}{3}\right)}{-20}$$

$\Rightarrow v_1 = \infty$

After reflection from mirror these rays appear to be passing from focus of mirror

$$\therefore \frac{1}{v} - \frac{\left(\frac{4}{3}\right)}{-40} = \frac{\left(\frac{3}{2} - \frac{4}{3}\right)}{+20} - \frac{\left(\frac{3}{2} - 1\right)}{-20}$$

$\Rightarrow v = \infty$

4. D

Sol. Do it by comparing units

5. A, C

Sol. $J \times 5R = 48\, mR^2\omega$

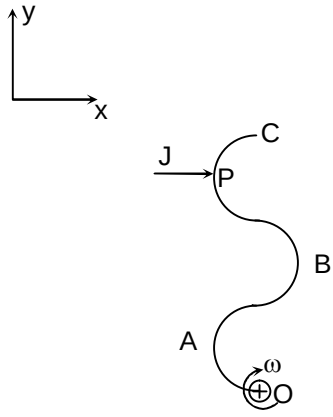
$\omega = \frac{5J}{48mR} = 4$ rad/s

$\vec{v}_{cm} = 3R\omega\hat{i} = 3\ m/s\ \hat{i}$

$\vec{J} + \vec{J}_H = 20(\vec{v}_{cm} - 0)$

$\vec{J} + \vec{J}_H = 20 \times 3\hat{i}$

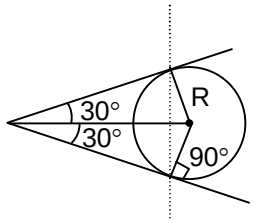
$\vec{J}_H = 60\hat{i} - 48\hat{i} = 12$ N-s $(\hat{i})$



6. A, B

Sol. $I = I_{cm} + md^2 = \frac{2}{5}mR^2 + m\left(\frac{R}{2}\right)^2 = \frac{13}{20}mR^2$

$mgR = \frac{1}{2} \times \frac{13}{20}mR^2\omega^2 \Rightarrow \omega = 20$ rad/s



7. A, D

Sol. $v_{max} = A\frac{2\pi}{T} = 20$ **m/s**

$f_{max} = 3.3\times10^3\left(\frac{330+20}{330}\right) = 3.5$ **kHz**

$f_{min} = 3.3\times10^3\left(\frac{330-20}{330}\right) = 3.1$ **kHz**

Energy density is $U_d = I_0/C$

In time dt sec, observer receives energy

$d\varepsilon = \frac{I_0}{c}A(c+v)dt$

$\therefore$ Apparent Intensity, $I_A = \frac{d\varepsilon}{Adt} = \frac{I_0(c+v)}{c} = 100\left(\frac{330+20}{330}\right) = 106$ W/m^2 (approx.)

SECTION – B

8. 3

Sol. For AB region of sphere

$n\frac{hC}{\lambda} = I\pi(R\sin\theta)^2$

$\therefore\ F_1 = n\frac{h}{\lambda} = \frac{I\pi R^2\sin^2\theta}{c}$

$\Omega = 2\pi(1-\cos\theta)$

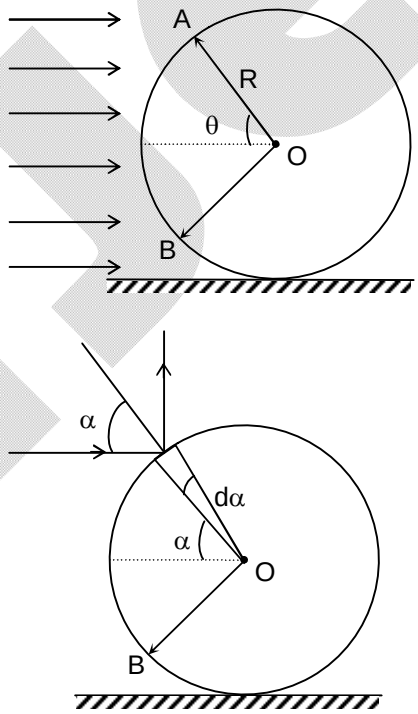
$\Rightarrow \theta = 45°$

For remaining portion

$dF_x = dF_2 = \left(\frac{2Ids\cos\alpha}{c}\cos\alpha\right)\cos\alpha$

$F_2 = \frac{4\pi R^2 I}{c}\int_{\theta}^{\pi/2}\cos^3\alpha\sin\alpha d\alpha = \frac{\pi R^2 I}{c}\cos^4\theta$

$F = F_1 + F_2 = \frac{3}{4}I\frac{\pi R^2}{c}$



9. 9

Sol. $B_P = \frac{\mu_0 J\pi(2a)^2}{2\pi(2a)} - \frac{\mu_0 J\pi a^2}{2\pi(3a)} - \frac{\mu_0 J\pi a^2}{2\pi a} = \frac{\mu_0 Ja}{3}$

$B_Q = \frac{\mu_0 J\pi(2a)^2}{2\pi\cdot 2a} - 2\times\frac{\mu_0 J\pi a^2}{2\pi\sqrt{5a^2}}\times\frac{2a}{\sqrt{5a^2}} = \frac{3\mu_0 Ja}{5}$

$\frac{B_Q}{B_P} = \frac{9}{5}$

10. 6

Sol. For steady state height H

$$Q = a\sqrt{2gH} \Rightarrow H = \frac{Q^2}{2ga^2}$$

$$-\pi x^2 \frac{dy}{dt} = a\sqrt{2gy}$$

$$\Rightarrow -\pi \frac{y}{k}\frac{dy}{dt} = a\sqrt{2gy}$$

$$-\int_{H}^{H/2} \sqrt{y}dy = \frac{ak}{\pi}\sqrt{2g}\int_{0}^{t} dt$$

$$t = \frac{\pi Q^3}{6ka^4g^2}\left(1-\frac{1}{2\sqrt{2}}\right)$$

P = 6

11. 4

Sol. Conservation of angular momentum

$$mv_0 x \sin(\pi-\theta) = mv_{max}R\sin 90°$$

$$\Rightarrow v_0 x \sin\theta = v_{max}R$$

Conservation of energy

$$-\frac{GMm}{x}+\frac{1}{2}mv_0^2 = -\frac{GMm}{R}+\frac{1}{2}mv_{max}^2$$

$$v_0^2 = \frac{2GMR^2\left(\frac{1}{R}-\frac{1}{x}\right)}{x^2\sin^2\theta - R^2}$$

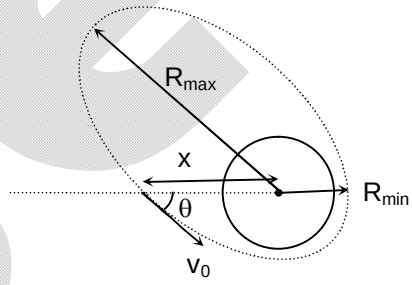
Since, x = 2R

$$v_0^2 = \frac{2GMR^2\left(\frac{1}{2R}\right)}{4R^2\sin^2\theta - R^2}$$

at $\theta = 90°$

Speed v_0 is minimum

$$v_{0(min)} = \sqrt{\frac{GM}{3R}}$$



12. 1

Sol. Heating power produced by family member is W_F

$W_F = k[10-(-20)] = 30\,k$ …(i)

When the heater is switched on

$W_F + W_H = k[15-(-20)] = 35\,k$ …(ii)

When the bulb of power 0.2 kW is switched on

$W_F + W_H + 0.2 = k[16-(-20)] = 36\,k$ …(iii)

From equation (ii) and (iii)

0.2 = k

From (i) and (ii)

$W_H = 5k$

$W_H = 5 \times 0.2 = 1$ kW

13. 4

Sol. $\ell_{max} = \frac{uv}{g} = \frac{10 \times 20}{10} = 20$ m

SECTION – C

14. 5.74
Range 5.71 to 5.76

15. 1.34
Range 1.31 to 1.36

Sol. (Q.14-15):
Energy released in one nuclear reaction = $(2 \times 2.0141 - 4.0026) \times 931$ MeV = 23.83 MeV

Total energy produced by 1 kg of $_1H^2 = \frac{23.83 \times 1.6 \times 10^{-13}}{4 \times 1.66 \times 10^{-27}} = 5.74 \times 10^{14}$ J

Now,

$5.74 \times 10^{14} = m \times 4.2 \times 10^3 (100 - 27) + m \times 2.25 \times 10^6 + m \times 2 \times 10^3 (800 - 373)$

$\Rightarrow m = 1.68 \times 10^8$ kg

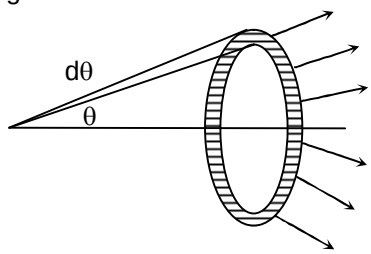
$\therefore$ supplied energy = $1.68 \times 10^8 \times 2 \times 10^3 \times (800 - 400) = 1.34 \times 10^{14}$ J

16. 23.33
Range 23.33 to 23.34

Sol. $Q = m\int sdT = 70m$ KJ

17. 0.12
Range 0.11 to 0.12

Sol. Since energy of radiation is uniformly spreaded in 2π solid angle.



$dQ = \frac{Q}{2\pi R^2} 2\pi R \sin\theta R d\theta$

$dP = \frac{dQ}{c}\cos\theta$

$P = \frac{Q}{c}\int_0^{\pi/2} \sin\theta\cos\theta d\theta$ = Q/2c

$mv_\tau = \frac{Q}{2c}$

$v_\tau = \frac{Q}{2mc} = 0.117 \times 10^{-3}$ m/s

$= 0.12 \times 10^{-3}$ m/s = 0.12 mm/s

Chemistry

PART – II

SECTION – A

18. A

Sol. $XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$

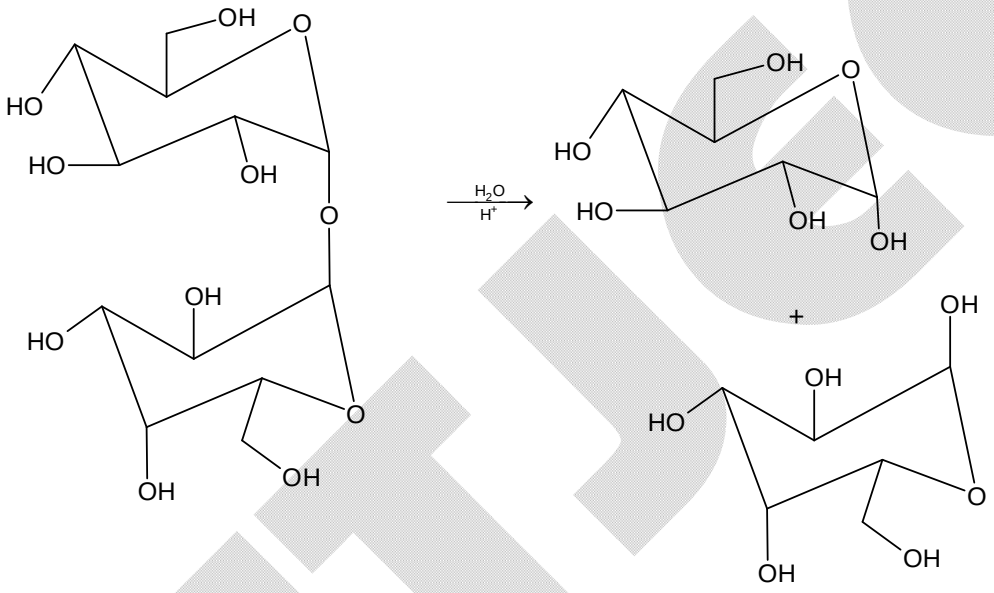
$XeF_2 + PF_5 \longrightarrow [XeF]^+ [PF_6]^-$

$XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$

$XeF_6 + 2H_2O \longrightarrow XeO_2F_2 + 4HF$

19. D

Sol.



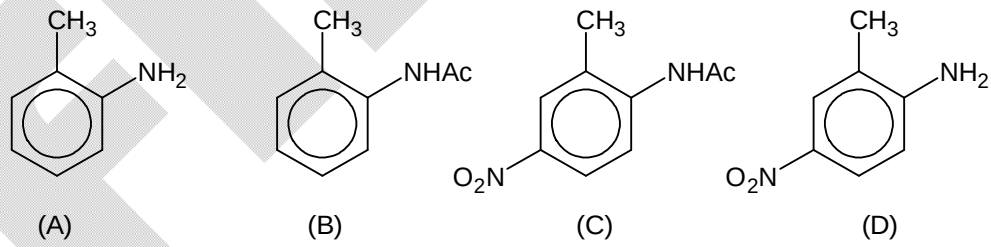
20. C

Sol. Chalcocite : Cu_2S and Cinnabar : HgS

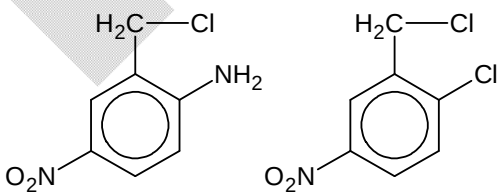
Self-reduction technique is used in the extraction of Cu, Pb and Hg.

21. C

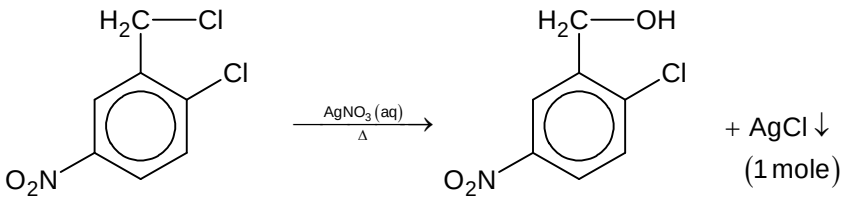
Sol.



(A) (B) (C) (D)



(E) (F)



(F)

$(1\,\text{mole})$

$$AgCl + 2NH_3 \longrightarrow \left[Ag(NH_3)_2\right]Cl$$

22. B, C, D

Sol. (A) Reactivity of group-I metals towards water increases from Li to Cs due to decreasing melting point of metals.

(B) $6Li + N_2 \longrightarrow 2Li_3N$ (Brown red solid)

(C) Fact

(D) Solubility of KCl at 100^oC = 56 g per 100 g H_2O;
Solubility of NaCl per 100 g H_2O = 38.4 at 100^oC

23. A, B, D

Sol. 10 moles of A and 10 moles of B

$$p_T = p_A^o x_A + p_B^o x_B = 0.6 \times \frac{1}{2} + 0.9 \times \frac{1}{2} = 0.75 \text{ atm}$$

Since, $\left(\frac{1}{4}\right)^{th}$ moles will be converted to vapour.

In vapour 5 moles total will be present

Assuming 'x' moles to be of 'A' in vapour phase

A : liquid $(10-x)$ vapour (x)

B : $10-(5-x)$ $(5-x)$

$=(5+x)$

(i) $$\frac{x}{5} = \frac{0.6 \times \frac{(10-x)}{15}}{p_T} \Rightarrow p_T = \frac{(10-x)\times 0.6}{3x}$$

(ii) $$\frac{5-x}{5} = \frac{0.9 \times \frac{(5+x)}{15}}{p_T} \Rightarrow p_T = \frac{(5+x)\times 0.3}{(5-x)}$$

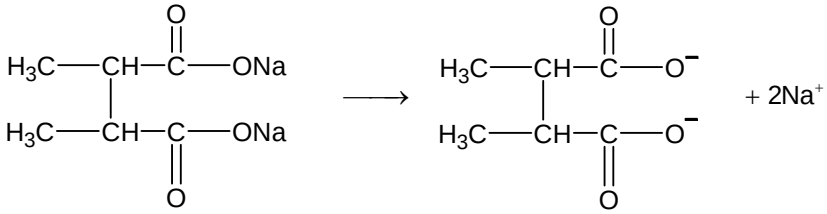
So, $$\frac{(10-x)\times 0.6}{3x} = \frac{(5+x)\times 0.9}{3(5-x)}$$

$$x^2 + 45x - 100 = 0$$

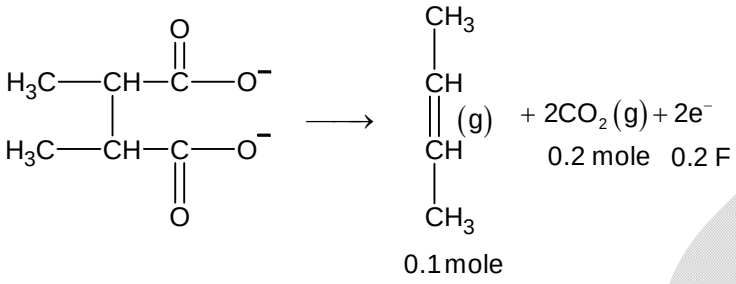
$$\therefore x = \frac{-45+\sqrt{2425}}{2} = \frac{-45+49.25}{2} = 2.125$$

24. A, B, C, D

Sol.



At anode:



$+ 2CO_2(g) + 2e^-$

0.2 mole 0.2 F

0.1 mole

At cathode:

$H_2O(\ell) + e^- \longrightarrow \frac{1}{2}H_2(g) + OH^-$

0.2 mole 0.2F 0.1 mole 0.2 mole

Number Faraday's of electricity passed $= \frac{9.65\times10^{-3}\times2\times10^{6}}{96500} = 0.2\ F$

Moles of water electrolysed = 0.2

Mass of water $= 0.2\times18 = 3.6\,gm = 3.6$ mL

So, volume of solution after electrolysis = 2003.6 – 3.6 = 2000 mL = 2 L

So, $\left[OH^-\right]$ after electrolysis $= \frac{0.2}{2} = 0.1\,M$

pOH = 1 and hence pH = 13

SECTION – B

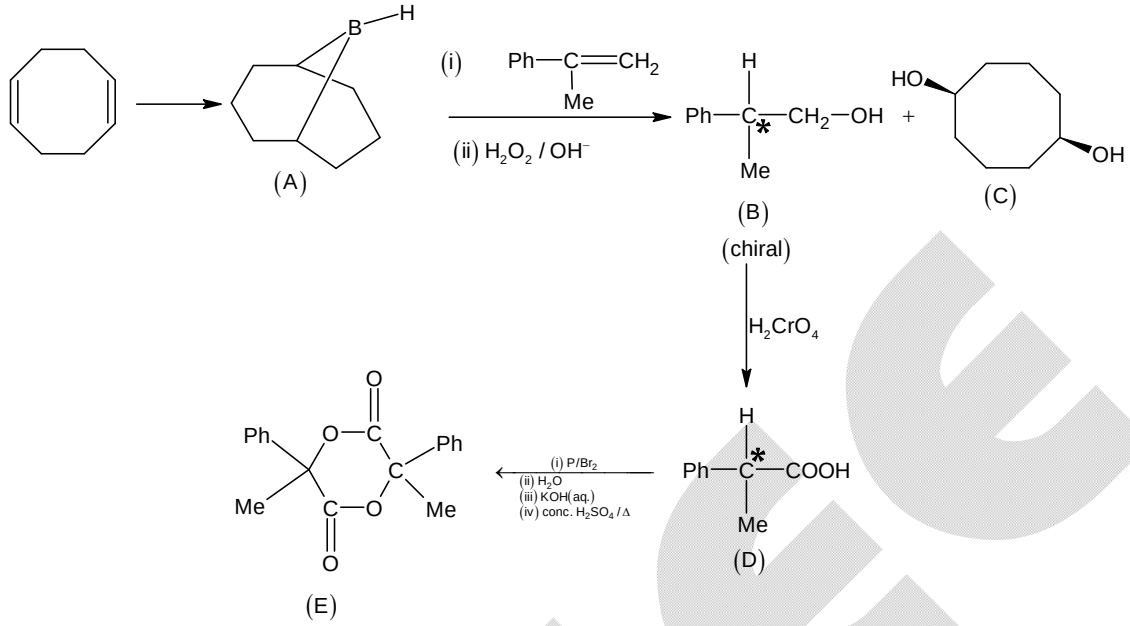
25. 61

Sol.

Complex	**Magnetic moment**
$\left[Ni(NH_3)_2Cl_2\right]$	$\sqrt{8}$
$\left[RhF_6\right]^{3-}$	0
$\left[Cu(NH_3)_4\right]^{2+}$	$\sqrt{3}$
$\left[PtCl_4\right]^{2-}$	0
$\left[Co(H_2O)_6\right]^{3+}$	0
$\left[Ag(CN)_2\right]^-$	0
$\left[MnCl_4\right]^{2-}$	$\sqrt{35}$
$\left[Fe(H_2O)_5(NO)\right]SO_4$	$\sqrt{15}$

26. 12

Sol.



So, x = 9, y = 2, z = 1.

27. 44

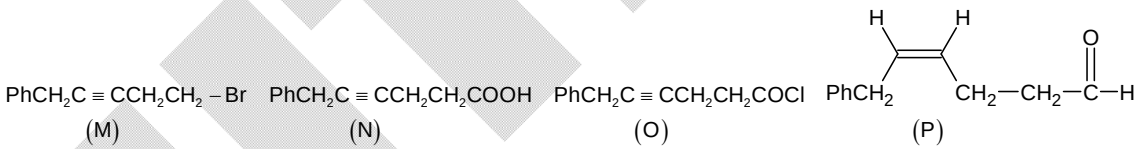
Sol. $A \underset{K_b = 2.4\ min^{-1}}{\overset{K_f = 1.80\ min^{-1}}{\rightleftharpoons}} B$

$t_{3/4} = \dfrac{2 \times \ell n 2}{K_f + K_b} = 20\ sec = x$

4th nearest neighbours in bcc lattice are 24 = y

28. 274

Sol.



29. 3

Sol. Optically active acids can be resolved by adding enantiomerically pure chiral amines.
Optically active compounds are (iii), (vii) and (viii).

30. 22

Sol. **x = 7** $\left[Si(CH_3)_4;\ XeF_4;\ B(OH)_3; [Ni(CN)_4]^{2-}; SF_6; [Zn(CN)_4]^{2-}; [IC\ell_4]^- \right]$

y = 15 $(SiCH_3)_4$ has 6 plane of symmetry while SF_6 has 9).

SECTION – C

31. 0.80

Sol. $\Delta S_1 + \Delta S_2 + \Delta S_3 + \Delta S_4 + \Delta S_5 + \Delta S_6 = 0$ (because the process is cyclic).

Also, $\Delta S_2 = \Delta S_4 = \Delta S_6 = 0$ (reversible adiabatic process).

So, $\Delta S_1 + \Delta S_3 + \Delta S_5 = 0 = x$

So, $\dfrac{x+4}{5} = \dfrac{0+4}{5} = 0.80$

32. 2.50

Sol. $q_{total} + w_{total} = \Delta U = 0$ (cyclic process)

$q_{total} + (-700) = 0$

$\therefore q_{total} = 700$ J

Now, $Q_1 + Q_3 + Q_5 + Q_2 + Q_4 + Q_6 = 700$

$500 + 800 + Q_5 + 0 + 0 + 0 = 700$

$Q_5 = -600$ J

Also, $\Delta S_1 + \Delta S_3 + \Delta S_5 + \Delta S_2 + \Delta S_4 + \Delta S_6 = 0$ (cyclic process)

$$\frac{500}{250} + \frac{800}{200} + \frac{(-600)}{T_5} + 0 + 0 + 0 = 0$$

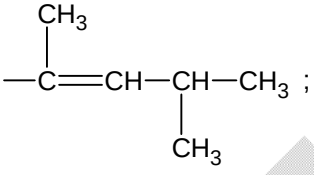
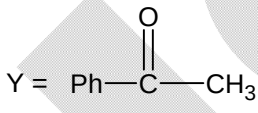
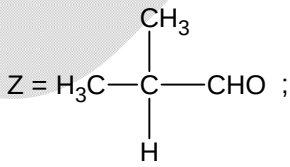
$T_5 = 100$K

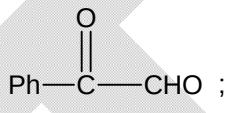
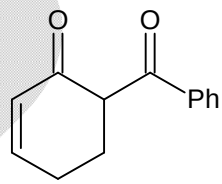
$T_1 = 250$ K (given)

So, $\frac{T_1}{T_5} = 2.50$

33. 16.00

Sol. On analyzing the above paragraph, one can conclude that:

X =  ; Y =  ; Z =  ;

A = HCOONa ; B =  ; C =  ;

Also, 'X' can form a total of 10 ozonides including cross-ozonides.

34. 5.25

Sol. m = 21; n = 8

Mathematics

PART – III

SECTION – A

35. B

Sol. Given $\frac{dy}{dx}=\frac{\cos x(7\sin x-3\cos y+3)}{\sin y(7\cos y-3\sin x-7)}$

Let sin x = t, cos y = u $\Rightarrow$ cos x dx = dt, –sin y dy = du

$\Rightarrow -\frac{du}{dt}=\frac{7t-3u+3}{7u-3t-7} \Rightarrow \frac{du}{dt}=\left(\frac{3u-7t-3}{7u-3t-7}\right)=\frac{3(u-1)-7t}{7(u-1)-3t}$

$\frac{du}{dt}=\frac{3\left(\frac{u-1}{t}\right)-7}{7\left(\frac{u-1}{t}\right)-3}$, let $\frac{u-1}{t}=v \Rightarrow (u-1)=vt$

$\frac{du}{dt}=v+t\cdot\frac{dv}{dt} \Rightarrow v+t\frac{dv}{dt}=\frac{3v-7}{7v-3}$

$t\frac{dv}{dt}=\left(\frac{3v-7-7v^2+3v}{7v-3}\right)$

36. C

Sol. $f(x)=\frac{(\tan x+\cot x)^2-(\tan x-\cot x)+2}{(\tan x+\cot x)^2+(\tan x-\cot x)+2}$; let tan x – cot x = t

$\Rightarrow y=\frac{t^2-t+2}{t^2+t+2}=0 \Rightarrow (y-1)t^2+(y+1)t+2(y-1)=0$

$\Rightarrow (y+1)^2-8(y-1)^2\geq 0 \Rightarrow \frac{2\sqrt{2}-1}{2\sqrt{2}+1}\leq y\leq \frac{2\sqrt{2}+1}{2\sqrt{2}-1}$

$\Rightarrow \frac{\left(2\sqrt{2}-1\right)^2}{7}\leq y\leq \frac{\left(2\sqrt{2}+1\right)^2}{7}$

37. A

Sol. Let $f(x)=\sum_{r=0}^{n}a_r x^r \Rightarrow (f(x))^2=\sum_{r=0}^{n}\left(a_r x^r\cdot f(x)\right)$

$\Rightarrow \int_0^1 (f(x))^2dx=\int_0^1\left(\sum_{r=0}^{n}a_r x^r\cdot f(x)\right)dx = a_0\int_0^1 f(x)dx+\sum_{r=1}^{n}\left(a_r\int_0^1 x^r\cdot f(x)dx\right) = \frac{1}{\sqrt{3}}\int_0^1 f(x)dx$

$\Rightarrow \frac{\int_0^1 f(x)dx}{\int_0^1 (f(x))^2dx} = \sqrt{3}$

38. D

Sol. $\vec{a}\cdot\vec{b}=0$

$\Rightarrow \tan^2 x-2\tan^2 y-1=0 \Rightarrow 1+\tan^2 x=2(1+\tan^2 y)$

$\Rightarrow \sec^2 x = 2\sec^2 y \Rightarrow \cos^2 y = 2\cos^2 x$
$\Rightarrow 1 - \sin^2 y = 1 + \cos 2x \Rightarrow \cos 2x + \sin^2 y = 0$

39. B, C, D

Sol. $f'(x) = x^2 + x + 1 > 0 \ \forall\ x \in R \Rightarrow f(x)$ is monotonically increasing function
For $h(x) = f(g(x)) \ \forall\ x \in R$
$\Rightarrow h'(x) = f'(g(x))\, g'(x)$ where $f'(g(x)) > 0 \ \forall\ x \in R$
$\Rightarrow n_1 = 2, n_2 = 2$

40. A, B, C

Sol. Number designs using r number of marbles

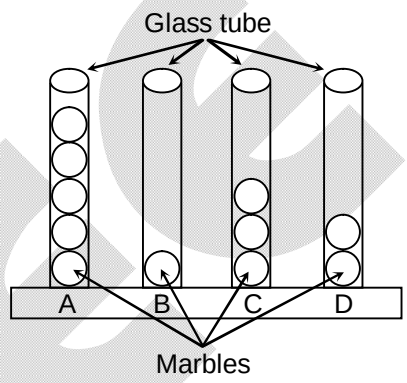
$$= {}^{12}C_r \cdot \frac{(r+3)!}{3!} = \frac{12!}{r!(12-r)!}\frac{(r+3)(r+2)(r+1)}{3!}$$

$$= 6 \cdot \frac{11!}{(12-r)!}(r+1)(r+2)(r+3)$$

$\therefore$ Total number of designs =

$$6\sum_{r=0}^{12}\left(\frac{11!}{(12-r)!}(r+1)(r+2)(r+3)\right)$$

$$= 6\sum_{r=1}^{13}\left(\frac{11!}{(13-r)!}r\left(r^2+3r+2\right)\right)$$



Number of designs when 10 marbles are used = ${}^{12}C_{10}\frac{13!}{3!} = \frac{12\times 11}{2}\times\frac{13!}{6} = 11\cdot 13!$

When $r \geq 10$

$$N = {}^{12}C_{10}\frac{13!}{3!} + {}^{12}C_{11}\frac{14!}{3!} + {}^{12}C_{12}\frac{15!}{3!} = 11(13!) + 12\cdot\frac{14!}{6} + \frac{15!}{3!} = 39(13!) + 5(14!) = 109(13!)$$

41. B, C

Sol. $A' = -A \Rightarrow A^2 = -AA' \Rightarrow +I = +AA'$
$\Rightarrow AA' = I \Rightarrow A$ is orthogonal
$\Rightarrow |AA'| = I \Rightarrow |A'| = |-A| = (-1)^n|A| = |A|$
$\Rightarrow |A|(1 - (-1)^n) = 0 \Rightarrow |A| = 0$ or $(-1)^n = 1$
Given $A^2 = -I \Rightarrow |A^2| = |-I| = (-1)^n$
$\Rightarrow |A^2| = (-1)^n \neq 0 \Rightarrow (-1)^n = 1 \Rightarrow n =$ even

SECTION – B

42. 6

Sol. Given $\frac{dy}{dt} + 2ty = t^2 \ \Rightarrow \frac{dy}{dt} = t^2 - 2ty$

Let $\lim_{t\to\infty}\left(\frac{y}{t}\right) = \lambda$ as $\lim_{t\to\infty} y \to \infty$

$$\Rightarrow \lim_{t\to\infty}\left(\frac{y}{t}\right) = \lim_{t\to\infty}\left(\frac{y'}{1}\right) = \lim_{t\to\infty}\left(t^2 - 2ty\right)$$

$$\Rightarrow \lim_{t\to\infty}\left(t^2\right)\left(1 - \frac{2y}{t}\right) \text{ exist}$$

If $\lim_{t\to\infty} 1 - \frac{2y}{t} = 0 \Rightarrow 1 - 2\lambda = 0\ ;\ \lambda = \frac{1}{2}$

$$\Rightarrow \lim_{t\to\infty}\left(\frac{12y}{t}\right)=\frac{12}{2}=6$$

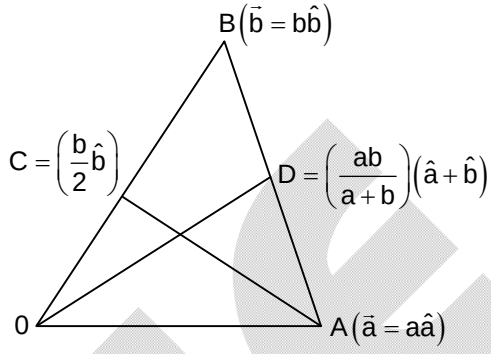
43. 2

Sol. $|OD|^2=\frac{a^2b^2}{(a+b)^2}|\hat{a}+\hat{b}|^2=\frac{a^2b^2}{(a+b)^2}\left(2+\frac{2\cdot4}{5}\right)$

$=\frac{18}{5}\frac{a^2b^2}{(a+b)^2}\Rightarrow|OD|=\frac{3\sqrt{2}ab}{\sqrt{5}(a+b)}$

$|AC|^2=\left|\frac{b}{2}\hat{b}-a\hat{a}\right|^2=\frac{b^2}{4}+a^2-\frac{4}{6}ab$

$|AC|=\sqrt{\frac{b^2}{2}+a^2-\frac{4}{5}ab}$



$\overrightarrow{AC}\cdot\overrightarrow{OD}=0\Rightarrow\left(\frac{b}{2}\hat{b}-a\hat{a}\right)\cdot\left(\hat{a}+\hat{b}\right)=0\Rightarrow\left(\frac{b}{2}-a\right)\frac{4}{5}+\left(\frac{b}{2}-a\right)=0$

$\Rightarrow b=2a\Rightarrow|AC|=\sqrt{a^2+a^2-\frac{8}{5}a^2}=\frac{\sqrt{2}}{\sqrt{5}}a$

$|OD|=\frac{\sqrt{2}}{\sqrt{5}}\cdot3\cdot\frac{2a^2}{3(a)}=\frac{2\sqrt{2}}{\sqrt{5}}a\Rightarrow\frac{|OD|}{|AC|}=2$

44. 3

Sol. $A=xI+2E_1-\sqrt{2}E_2+\sqrt{3}E_3$

$(2xI-A)=xI-2E_1+\sqrt{2}E_2-\sqrt{3}E_3$

$\Rightarrow A(2xI-A)=\left(xI+2E_1-\sqrt{2}E_2+\sqrt{3}E_3\right)\left(xI-2E_1+\sqrt{2}E_2-\sqrt{3}E_3\right)$

$\Rightarrow x^2I-4E_1^2-2E_2^2-3E_3^2=(x^2+9)I\Rightarrow n^2=9\Rightarrow n=3$

45. 4

Sol. Equation of transverse axis

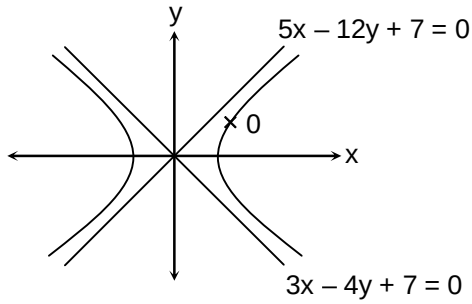
$\frac{3x+4y+7}{5}=\frac{5x-12y+7}{13}$

$\Rightarrow 39x+52y+91=25x-60y+35$

$\Rightarrow 14x+112y+56=0$

$\Rightarrow 7x+65y+28=0$

$\Rightarrow x+8y+4=0$



$\Rightarrow\frac{b}{a}=\left|\frac{-\frac{1}{8}+\frac{3}{4}}{1+\left(-\frac{1}{8}\right)\left(-\frac{3}{4}\right)}\right|=\frac{\frac{5}{8}}{\frac{35}{32}}=\frac{5}{35}\times\frac{28}{5}=\frac{4}{7}$

$\Rightarrow e=\sqrt{1+\frac{16}{49}}=\frac{\sqrt{65}}{7}\Rightarrow a=\sqrt{65}$, $b=7\Rightarrow\sqrt{65-49}=\sqrt{16}=4$

46. 7

Sol. $a+b+c=-a$

$ab+bc+ac=b$

$abc=-c\Rightarrow(ab+a)c=0$ where $c=0$

$\Rightarrow b=-2a$ and $(a-1)b=0$

$\Rightarrow a = 1, b = -2$
$a^3 + b^3 + c^3 = 1 - 8 + 0 = -7$

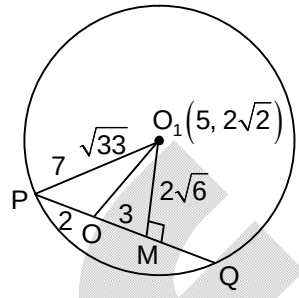
47. 7

Sol. $O_1O = \sqrt{33}$ and OM = 3

$\Rightarrow O_1M = 2\sqrt{6}$

And PM = 5

$\Rightarrow O_1P = 7$



SECTION – C

48. 1.50

49. 8.00

Sol. (Q.48.-49):

$\angle\theta = \frac{\pi}{3}$

50. 1.25

Sol. Three if area of $\Delta PAB = \frac{ab}{2}\left(\sqrt{2}-1\right)$

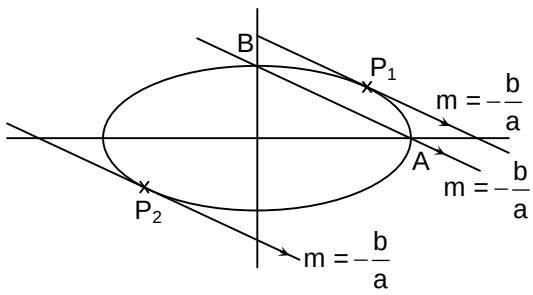
51. 1.50

Sol. $\frac{ab}{2}\left(\sqrt{2}+1\right)$

Sol. (Q.50.-51):

Length of $AB = \sqrt{a^2+b^2}$

Let $h \rightarrow$ distance of point P from AB

$\Rightarrow \frac{1}{2} \times \sqrt{a^2+b^2} \times h$ = Area of ΔPAB

Maximum area of ΔPAB = Area of ΔP_2AB