ADITYA JUNIOR COLLEGES

KAKINADA - RAJAMAHENDRAVARAM - BHIMAVARAM - AMALAPURAM - PALAKOL
NARASAPURAM - TADEPALLIGUDEM - MANDAPETA - ELURU - SRIKAKULAM - VISAKHAPATNAM

Test Type : Full Syllabus | Time : 8.00 A.M. to 11.00 A.M.

JEE(MAIN) PRACTICE TEST - 1

TEST DATE : 22-03-2020

KEY

S.NO	MATHS			PHYSICS			CHEMISTRY		
	1-10	11-20	21-25	26-30	31-40	41-50	51-60	61-70	71-75
1	1	2	5.33 to 5.34	-	4	1	3	3	4.00
2	1	4	67.20		2	2	3	1	3.00
3	1	2	0.66 to 0.67		2	4	1	2	5.00
4	3	1	3.00		2	3	2	3	6.00
5	3	2	0.00		1	3	3	3	14.00
6	3	1	-	3	1	2.50	3	1	-
7	1	2		4	1	7.00	4	3	
8	4	3		1	3	30.00	1	2	
9	4	2		2	1	6.00	2	2	
10	2	3		3	2	2.20	1	3	

JEE(MAIN) PRACTICE TEST-1 (22-03-2020)

HINTS & SOLUTIONS

MAHEMATICS

1. Ans (1)

$$xdy + ydx = (xy)^2 \frac{dx}{x}$$

$$\int \frac{d(xy)}{(xy)^2} = \int \frac{dx}{x}$$

$$-\frac{1}{xy} = \ln x + C$$

$$\frac{1}{y} = -x\ln x + Cx$$

$$\Rightarrow y(1) = 1 \Rightarrow C = 1$$

$$\frac{1}{y} = -x\ln x + x$$

$$= \therefore \left[\frac{1}{y(e)}\right] = \left[\frac{e}{2}\right] = 1$$

2. Ans (1)

Sol. $\vec{a}, \vec{b}, \vec{c}$ non coplanar

$\Rightarrow \vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}$ are also non-coplanar

$$\Rightarrow \vec{a} = \lambda\, \vec{b} \times \vec{c} + \mu \vec{c} \times \vec{a} + v \vec{a} \times \vec{b}$$

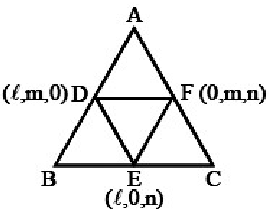
$$\Rightarrow \vec{a}.\vec{a} = \lambda \left[\vec{a}\ \vec{b}\ \vec{c}\right]$$

similarly μ and v

$$\therefore \vec{a} = \frac{(\vec{a}.\vec{a})(\vec{b} \times \vec{c})}{[\vec{a}\ \vec{b}\ \vec{c}]} + \frac{(\vec{a}.\vec{b})(\vec{c} \times \vec{a})}{[\vec{a}\ \vec{b}\ \vec{c}]} + \frac{(\vec{a}.\vec{c})(\vec{a} \times \vec{b})}{[\vec{a}\ \vec{b}\ \vec{c}]}$$

3. Ans (1)

Sol.



$$DF = \frac{BC}{2} = \sqrt{\ell^2 + m^2}$$

$$\Rightarrow BC^2 = 4\left(\ell^2 + m^2\right)$$

Similarly $AB^2 = 4\left(\ell^2 + n^2\right)$

and $AC^2 = 4\left(m^2 + n^2\right)$

$$\therefore \frac{AB^2 + BC^2 + AC^2}{\ell^2 + m^2 + n^2} = \frac{4\left(2\left(\ell^2 + m^2 + n^2\right)\right)}{\ell^2 + m^2 + n^2} = 8$$

4. Ans (3)

Sol. $aRb \Rightarrow ab$ is square of natural number

$\because \forall\, a \in N,\ a^2$ is square of a natural number $\Rightarrow Q$ is reflexive

Also $\forall\, a, b \in N$.

If ab is square of natural number, then ba is also a square of natural number $\Rightarrow R$ is symmetric.

For transitive, let $ab = p^2 \Rightarrow p$ is divisible by b

Similarly let $bc = q^2 \Rightarrow q$ is divisible by b

$\therefore\ ab^2c = p^2q^2 \Rightarrow ac = \dfrac{p^2q^2}{b.b} \Rightarrow ac$ is also a perfect square

$\therefore R$ is transitive

5. Ans (3)

Sol. $\sim(\sim p \to q) \equiv \sim(\sim(\sim p) \vee (q)) \equiv \sim(p \vee q)$

Clearly option (3) is correct

$\sim(p \vee q) \wedge (p \vee (\sim p)) \equiv \sim(p \vee q) \wedge T$

$\equiv \sim(p \vee q)$

6. Ans (3)

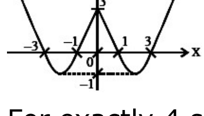
Sol. $$\int_0^1 e^{x^2} x\, dx = \alpha \int_0^1 e^{x^2} dx$$

$\Rightarrow \alpha \int_0^1 e^{x^2} dx = \dfrac{e-1}{2}$ As $1 < \int_0^1 e^{x^2} dx < e-1$

$$\alpha = \frac{e-1}{2\int_0^1 e^{x^2} dx} \Rightarrow \alpha \in \left(\frac{1}{2}, \frac{e-1}{2}\right)$$

7. Ans (1)

Sol.



For exactly 4 solutions : $\lambda = 0,1,2$

For atleast 3 solutions : $\lambda = 0,1,2,3$

Required probability = $\dfrac{3}{4}$

8. Ans (4)

Sol. Apply $C_1 \to C_1 - C_3$ and $C_2 \to C_2 - C_3$

$$f'(x) = \begin{vmatrix} -(b+1) & -(b+2) & 2ax+b+1 \\ b+1 & b+2 & -1 \\ b & b+1 & 2ax+b \end{vmatrix}$$

$R_1 \to R_1 + R_2$ and $R_3 \to R_3 - R_2$

$$f'(x) = \begin{vmatrix} 0 & 0 & 2ax+b \\ b+1 & b+2 & -1 \\ -1 & -1 & 2ax+b+1 \end{vmatrix}$$

$\Rightarrow f'(x) = 2ax + b \therefore f(x) = ax^2 + bx + c$

$f(0) = 2 \Rightarrow c \Rightarrow 2$

$f(1) = 1 \Rightarrow a + b + 2 = 1 \Rightarrow a + b = -1$

$f'\left(\frac{5}{2}\right) = 0 \Rightarrow 5a + b = 0,\ a = \frac{1}{4},\ b = -\frac{5}{4}$

$\therefore f(x) = \frac{1}{4}x^2 - \frac{5}{4}x + 2$

Range is $f(x) \in \left[\frac{7}{16}, \infty\right)$

9. Ans (4)

Sol. $\sum_{r=0}^{10} (-1)^r 10_{C_r} \left(\frac{1}{3}\right)^r + \sum_{r=0}^{10} (-1)^r 10_{C_r} \left(\frac{8}{9}\right)^r$

$= \left(1 - \frac{1}{3}\right)^{10} + \left(1 - \frac{8}{9}\right)^{10}$

$\frac{2^{10}}{3^{10}} + \frac{1}{9^{10}} \Rightarrow \frac{6^{10}+1}{3^{20}}$

10. Ans (2)

Sol. Given parabola can be rewriten as $(y-1)^2 = 4(x-2)$ Equation of any normal to the given parabola is

$y - 1 = m(x-2) - 2m - m^3$

$\Rightarrow y = mx - 4m - m^3 + 1$

Since, this passes through $(2a, 1)$

$\therefore m^3 + 2m(2-a) = 0$ will have three distinct and real values of m. If $a > 2$.

11. Ans (2)

Sol. Let the family of circles be

$x^2 + y^2 + 2gx + 2fy + c = 0$

$2g\left(2\left(\lambda - \frac{3}{2}\right)\right) + 2f\left(\frac{3}{2}\left(\lambda - \frac{4}{3}\right)\right)$

$= c - 6(\lambda + 2)$ (condition for orthogonality)

$\lambda[4g + 3f + 6] - \left[6g - \frac{8f}{3} - c + 12\right] = 0$

$(\forall\ \lambda \in R)$

$4g + 3f + 6 = 0$ and $6g - \frac{8f}{3} - c + 12 = 0$

Hence center lies on $4x + 3y - 6 = 0$

12. Ans (4)

Sol. Let $x^2 + x = t$

$x^2 + x - t = 0 \quad (\forall x \in R)$

$D = 1 + 4t \geq 0 \Rightarrow t \geq -1/4 \Rightarrow [-1/4, \infty)$

So, quadratic, $t^2 + at + 4 = 0;\ t \in [-1/4, \infty)$

All four roots are real and distinct.

(i) $D > 0 \Rightarrow a \in (-\infty, -4) \cup (4, \infty)$

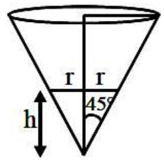
(ii) $f(-1/4) > 0 \Rightarrow a < \frac{65}{4}$

(iii) $\frac{-b}{2a} > -\frac{1}{4} \Rightarrow a < \frac{1}{2}$

$\therefore a \in (-\infty, -4)$

13. Ans. (2)

Sol.



$\because \frac{h}{r} = \tan 45°$

$\frac{dv}{dt} = -2 \Rightarrow \frac{d}{dt}\left(\frac{1}{3}\pi r^2 h\right) = -2$

$\Rightarrow \frac{d}{dt}\left(\frac{1}{3}\pi r^3\right) = -2$

$\Rightarrow \pi r^2 \frac{dr}{dt} = -2$ .... (i)

Also $\frac{d}{dt}(2\pi r) = 2\pi \frac{dr}{dt} = 2\pi\left(\frac{-2}{\pi r^2}\right) = \frac{-4}{r^2}$.

At $r = 2,\ \frac{d}{dt}(2\pi r) = \frac{-4}{4} = -1 \Rightarrow d = -1$

14. Ans (1)

Sol. For equilateral triangle

$|Z_1 - Z_2| = |Z_2 - Z_3| = |Z_3 - Z_1| = a$

Also $\left|\frac{Z_2 - Z_3}{2} - Z_1\right|$ will be the length of median as well as altitude i.e.,

$\left|\frac{Z_2 + Z_3}{2} - Z_1\right| = \frac{\sqrt{3}a}{2}$

Hence $\sin\theta = \sqrt{\frac{a^2 + a^2}{3a^2 + a^2}} = \frac{1}{\sqrt{2}} \Rightarrow \theta = \frac{\pi}{4}$

15. Ans (2)

Sol. Let a_i be of the form $3i$

For this $a_i \in \{3, 6, 9, 12, 15, 18\} \Rightarrow 6!$ ways

Similarly $a_{i+1} = 3i + 1$ and $a_{i+2} = 3i + 2$ each of which will have $6!$ ways each

$\therefore$ total ways = $(6!)^3$

16. Ans (1)

Sol. Let common ratio $=r \left(r \in I^+\right)$

$GP \to x,\ xr,\ xr^2$

Also $1+\log_2\left(x^2 r + xr^2\right) = \log_2\left(x^2 r^2 + xr\right)$

$2xr(x+r) = xr\ (xr+1)$

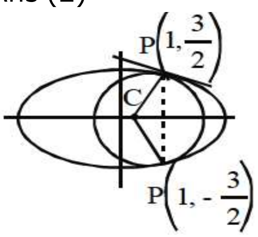
$x = \frac{2r-1}{r-2} = 2 + \frac{3}{r-2} \quad (\because xr \neq 0)$

$\Rightarrow r-2 = 1$ or $3 \Rightarrow r = 3$ or 5

$x = 5\ or\ 3$ So Nos. are 5, 15, 45 or 3, 15, 75

17. Ans (2)

Sol.



by symmetry centre of circle lies on x-axis.

Normal at P is $\frac{4x}{1} - \frac{3y}{3/2} = 1$

$\Rightarrow$ Point C is $\left(\frac{1}{4}, 0\right)$

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

$= \sqrt{\frac{9}{16} + \frac{9}{4}} = \frac{3\sqrt{5}}{4}$

18. Ans (3)

Sol. As we know that

A. (Adj A) = $|A| I$

Replace 'A' by A^{-1}

A^{-1} Adj $\left(A^{-1}\right) = \left|A^{-1}\right| I$

$\Rightarrow |A|\, Adj\ \left(A^{-1}\right) = A$

19. Ans (2)

Sol. Given $\lim_{x\to 1} \frac{\ln^2(2-x)}{x^2+ax+b}$, exists

as $x \to 1 \Rightarrow \ln^2(2-x) = 0$

$\therefore 1+a+b = 0 \Rightarrow a+b = -1$ .... (i)

Applying L' Hospital Rule

$\Rightarrow \lim_{x\to 1} \frac{-2\ln(2-x)}{2x+a} \left(\frac{0}{0}\right)$ form

$\Rightarrow a = -2 \Rightarrow b = 1$

$\therefore\ a+5b = -2+5\times 1 = 3$

20. Ans (3)

Sol. $f(g(x)) = f\left(2x - x^2\right)$

$= \cot^{-1}\left(2x - x^2\right)$

$\because -\infty < 2x - x^2 \le 1$

$0 < 2x - x^2 \le 1$

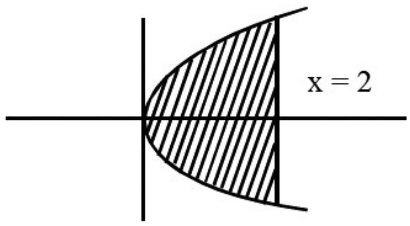
$\cot^{-1} 0 > \cot^{-1}\left(2x - x^2\right) \ge \cot^{-1}(1)$

$\frac{\pi}{2} > f(g(x)) \ge \frac{\pi}{4}$

21. Ans (5.33)

Sol. let $p(x, y)$ be any point on the curve,

Now $\frac{dy}{dx} = \frac{1}{y} \Rightarrow y\ dy = dx \Rightarrow \frac{y^2}{2} = x + c$

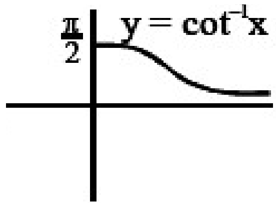


$\therefore$ if passes through M (2, 2) so $c = 0\ y^2 = 2x$.

Here required area =

$2\int_0^2 \sqrt{2x}\, dx = 2\sqrt{2}\left[\frac{2}{3} x^{\frac{3}{2}}\right]_0^2$ = 5.33

22. Ans (67.20)



Sol. $n_1 = 200$ $\quad n_2 = 300$

$\overline{x_1} = 25$ $\quad \overline{x_2} = 10$

$\sigma_1^2 = 9$ $\quad \sigma_2^2 = 16$

$\sigma_1^2 = \frac{\sum x^2}{200} - 625$ and $\sigma_2^2 = \frac{\sum y^2}{300} - 100$

$\sum x^2 = 634 \times 200$ and $\sum y^2 = 116 \times 300$

$\sigma^2 = \frac{634\times 200 + 116 \times 300}{500} - \left(\frac{5000+3000}{500}\right)^2$

$\frac{1268+348}{5} - \left(\frac{80}{5}\right)^2$ = 67.20

23. Ans (0.66 or 0.67)

Sol. Let $\sin x = t$

So $\sqrt{5-2t} \ge 6t - 1$

$5 - 2t \ge 0 \Rightarrow t \le 5/2$ .... (i)

Case - I

$6t - 1 \le 0$

$t \le 1/6$ .... (ii) , $t \in R$ .... (iii)

Intersection of i, ii and iii is $t \le 1/6$

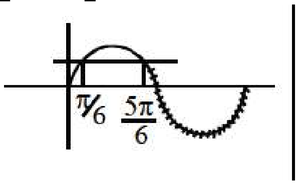
Case - II

$6t - 1 \ge 0$ $t \ge 1/6$ .... (iv)

$5 - 2t \ge 36t^2 - 12t + 1 \Rightarrow \left[-2/9, \frac{1}{2}\right]$ ... (v)

Intersection of (i), (iv), (v) is

$\left[\frac{1}{6}, \frac{1}{2}\right]$



Union of case I and case II $t \in \left[-1, 1/2\right]$

$[\therefore -1 \le \sin x \le \frac{1}{2}]$

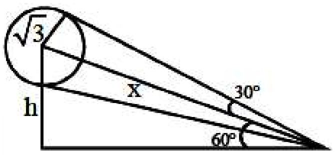
$\left[0, \pi/6\right] \cup \left[\frac{5\pi}{6}, 2\pi\right]$

24. Ans (3.00)

Sol. $\sin 30° = \frac{\sqrt{3}}{x} = \frac{1}{2} \Rightarrow x = 2\sqrt{3}$

$\sin 60° = \frac{h}{x}$

$\Rightarrow h = 3$



25. Ans (0.00)

Sol. $\ln x, x+1, e^x - e^2$ becomes zero at $x = 1, -1$ and 2 respectively, for which $\sin \pi x$ is also zero.
Hence $f(x)$ is derivable at these points.
$\therefore$ number of points of non derivability = 0

PHYSICS

26. Ans (3)

Sol. Given at saturation $V_{CE} = 0V, V_{BE} = 0.8v$

$V_{CE} = V_{CC} - I_C R_C \Rightarrow I_C = \frac{V_{CC}}{R_C} = 5.0\,mA$

$I_B = \frac{I_C}{\beta} = \frac{5\,mA}{250} = 20\ \mu A$

27. Ans (4)

Sol. $I_D = \varepsilon_0 \frac{d\phi_E}{dt} = \varepsilon_0 \frac{d}{dt}(EA) = \varepsilon_0 A \frac{d}{dt}\left(\frac{V}{d}\right)$

$I_D = \frac{\varepsilon_0 A}{d}\frac{dV}{dt} = C\frac{dV}{dt}$

$\therefore \frac{dV}{dt} = \frac{I_D}{C} = \frac{2}{10^{-6}} = 2 \times 10^6 \frac{V}{S}$

28. Ans (1)

Sol. $l = 16.2 \pm 0.1cm$

$b = 10.1 \pm 0.1cm$

$lb = 163.62 \pm 2.6\ cm^2$

using proper rules

$lb = 164 \pm 3cm^2$

29. Ans (2)

Sol. As $I = \frac{I_0}{2}\cos^2\beta$

Final intensity = $I_1 \cos^2(90 - \beta)$

$= \frac{I_0}{8}\sin^2 2\beta$

30. Ans (3)

Sol. Average method :

Time to cross the river = $\frac{d}{u}$

Drift = $\frac{v_0}{2}\frac{d}{2u} \times 2 = \frac{v_0 d}{2u}$

Alter : Speed of river from bank to mid stream

$v = \frac{v_0}{d/2}x = \frac{2v_0 x}{d}$

$\int d(drift) = 2\int_0^{d/2} \frac{dx}{u} \times \frac{2V_0 x}{d}$

$\Rightarrow$ drift = $\frac{V_0 d}{2u}$

31. And (4)

Sol. $E_{photon} = \frac{12400\ eV\ \overset{0}{A}}{6200\ \overset{0}{A}} = 2eV$

$2eV \times \left(\frac{100 - x}{100}\right) - 1.1 = 0.4$

$\Rightarrow 2\left(\frac{100 - x}{100}\right) = 1.5 \Rightarrow 400 - 4x = 300$

$\Rightarrow x = 25\%$

32. Ans (2)

Sol. $\lambda_1 N_1 = \lambda_2 N_2 \quad \Rightarrow \lambda_1 N_0 e^{-\lambda_1 t} = \lambda_2 N_0 e^{-\lambda_2 t}$

$\frac{\lambda_1}{\lambda_2} = e^{(\lambda_1 - \lambda_2)t} \quad \Rightarrow \frac{t_2}{t_1} = e^{(\lambda_1 - \lambda_2)t}$

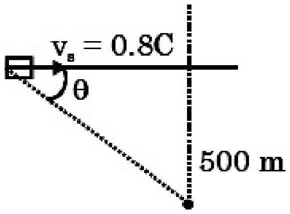
$\left(\therefore \lambda = \frac{\ln 2}{t_{\frac{1}{2}}}\right) \quad \Rightarrow (\lambda_1 - \lambda_2)\ t = \ln\left(\frac{t_2}{t_1}\right)$

$\Rightarrow \ln 2\left(\frac{1}{t_1}-\frac{1}{t_2}\right)t \quad = \ln\left(\frac{t_2}{t_1}\right)$

i.e., $t=\frac{t_1 t_2}{\ln 2(t_2-t_1)}\ln\left(\frac{t_2}{t_1}\right)=2hr$

33. Ans (2)

Sol. $\cos\theta=\frac{v_s t}{Ct}=0.8$



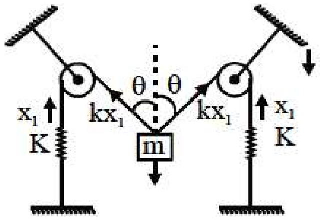
$f' = f\left[\frac{C}{C=v_s\cos\theta}\right]=1.8\left[\frac{C}{C-0.8C\cos\theta}\right]$

$=1.8\,\frac{1}{1-0.8^2}=1.8\frac{1}{1-0.64}$

$=\frac{1.8}{0.36}=\frac{180}{36}=5k\,Hz$

34. Ans (2)

Sol. Let block is dispalced through a small displacement x in downward direction and elongation in spring = x_1 then $x\cos\theta=x_1$ .... (1)



Restoring force $F=2kx_1\cos\theta$

$F=2k\,\cos^2\theta\, x$

Hence $T=2\pi\sqrt{\frac{m}{2k\cos^2\theta}}=2\pi\sec\theta\sqrt{\frac{m}{2k}}$

35. Ans (1)

Sol. $(\lambda_m)_B=3(\lambda_m)_A$

$\Rightarrow T_A=3T_B$ (By Wein's displacement law)

$E_1=4\pi(6)^2\,T_A^4=4\pi(6)^2\,(3T_B)^4$

$E_2=4\pi(18)^2\,\sigma T_B^4 \qquad \Rightarrow \frac{E_1}{E_2}=9$

36. Ans (1)

Sol. $U=2\left(4\pi r^2 S\right)$

$P=\frac{dU}{dt}=16\pi r S\alpha$

37. Ans (1)

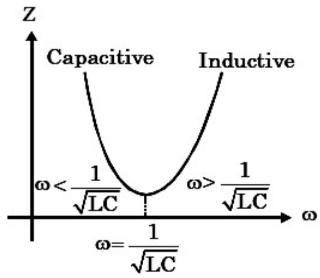
Sol. $q=q_0\cos\omega t$

$\Rightarrow -\frac{q_0}{2}=q_0\,\cos\omega t$

$\Rightarrow\ \cos\omega t=-\frac{1}{2}=\cos\frac{2\pi}{3} \ \Rightarrow\ t=\frac{2\pi}{3}\sqrt{LC}$

38. Ans (3)

Sol.



Sol. The circuit will have inductive nature if $\omega>\frac{1}{\sqrt{LC}}\left(\omega L>\frac{1}{\omega C}\right)$ Hence A is false. Also if circuit has inductive nature the current will lag behind voltage. Hence D is also false.

If $\omega=\frac{1}{\sqrt{LC}}\left(\omega L=\frac{1}{\omega C}\right)$ the circuit will have resistance nature. Hence B is false.

Power factor $\cos\phi=\frac{R}{\sqrt{R^2+\left(\omega L-\frac{1}{\omega C}\right)}}=1$

If $\omega L=\frac{1}{\omega C}$. Hence C is true.

39. Ans (1)

Sol. $A=A_0 e^{\frac{Rt}{-2L}} \ \Rightarrow\ \frac{1}{2}=e^{\frac{Rt}{-2t}}$

$\Rightarrow\ t=\frac{2L}{R}\ln 2=0.011\sec$

40. Ans (2)

Sol. Force between plates

$F=\frac{Q^2}{2A\varepsilon_0}=\frac{\left(\frac{\varepsilon_0 A}{x}V\right)^2}{2A\varepsilon_0}=\frac{\varepsilon_0 AV^2}{2x^2}$ where x is separation between plates $dW=F\,dx$

$W=\int_d^{2d}\frac{\varepsilon_0 AV^2}{2x^2}dx=\frac{\varepsilon_0 AV^2}{4x}=\frac{CV^2}{4}=200\,\mu J$

Alter : $W_{agent}+W_{battery}=\Delta U$

Therefore $W_{agent} = \frac{CV^2}{4} = 200\,\mu J$

41. Ans (1)

Sol. Reading of C= V { i in that branch = 0 }

Readin of $A = \frac{V}{R}$

42. Ans (2)

Sol. Electric field of a point charge is non-uniform hence net force can never be zero.

43. Ans (4)

Sol. Put $A = \delta_{\min}$ and $\mu = \sqrt{2}$

The relation $\mu = \frac{\sin\left(\frac{A+\delta_{\min}}{2}\right)}{\sin\left(\frac{A}{2}\right)}$ and solve vor A

We get, Angle of prism A = 90

44. Ans (3)

Sol. Objective lens should have large focal length and large aperture (L_2).

Eye piece should have small focal length and small aperture (L_4)

45. Ans (3)

Sol. Mean free path $(\lambda\,\alpha\; temp.)$

Average velocity is 0

Most probable speed $\alpha\sqrt{temp}$

Average kinetic energy $\alpha\, temp$.

46. Ans (2.50)

Sol. The gas absorbs heat till

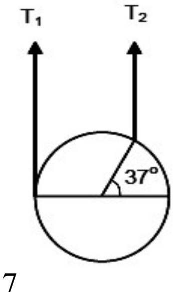
$$\frac{dP}{dV} = -\frac{\gamma P}{V}$$

$$-\frac{P_0}{V_0} = -\frac{5}{3}\frac{P}{V} \Rightarrow P = \frac{3P_0}{5V_0}V$$

Putting in the equation

$$\frac{3P_0}{5V_0}V = \frac{-P_0}{V_0}V + 4P_0 \quad \Rightarrow V = 2.5V_0$$

47. Ans (7.00)



Sol. $T_1 l = T_2 \times \left(\frac{4l}{5}\right)$

$$5T_1 = 4T_2$$

$$K = \frac{f_1}{f_2} = \sqrt{\frac{T_1}{T_2}} \cdot \frac{R_2}{R_1} = \frac{7}{5\sqrt{5}}$$

48. Ans (30.00)

Sol. By momentum conservatons Final speed of all three blocks.

$$v' = \frac{v}{4}$$

By energy conservations.

$$\frac{1}{2}Mv^2\left[\frac{3}{4}\right] = kx^2,\ x = \sqrt{\frac{3Mv^2}{8k}}$$

By putting values we get $x = 30\,cm$.

49. Ans : (6.00)

Sol. Solve in the reference fram fixed to the wall.

Before collision, velocity of ball 3 V towards it.

$\therefore$ After elastic collision of ball = 3v away from it

Time of flgiht = $\sqrt{\frac{2h}{g}}$

$\therefore$ distance between wall and ball

$$= 3v\sqrt{\frac{2h}{g}} = 6\,m.$$

(Here no pseudo force is applied since the wall keeps on moving with constant velocity w.r.t. ground, it being very heavy)

50. Ans : 2.20

Sol. $I_{centre} = \frac{2}{3}mR^2$

$$I_{cm} = \frac{5}{12}mR^2$$

ω is maximum when center of mass is at lowest position.

$$mg\frac{R}{2} = \frac{1}{2}\left(\frac{5}{12}mR^2\right)\omega^2$$

$$\omega^2\frac{R}{2} = \frac{6g}{5}$$

$$N_{\max} - mg = m\left(\frac{R}{2}\right)\omega^2$$

$$N_{\max} = mg + m.\frac{6g}{5}$$

$$N_{\max} = \frac{11mg}{5}$$

CHEMISTRY

51. Ans.(3)

Sol. $x = \frac{\text{moles for 1 lt}}{1}$

For 1000 ml $\rightarrow 1x\,\text{moles}$

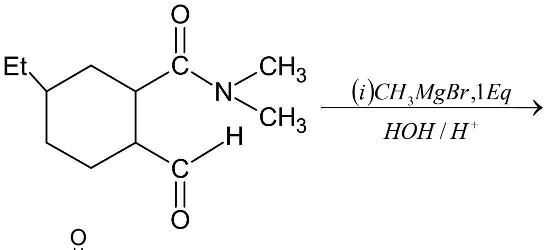
For 100 ml $\rightarrow ?$ moles

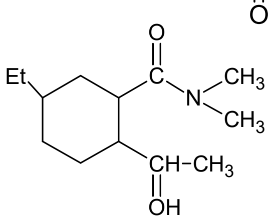
$$\Rightarrow \frac{100 \times 1x}{1000} = 0.1x$$

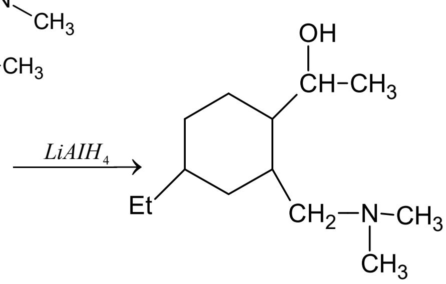
$$0.1x = \frac{MV}{1000} \Rightarrow V = 100x\,\text{ml}$$

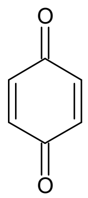
52. Ans (3)
Sol. It is not applicable for weak electrolyte.
53. Ans (1)
Sol. Theory
54. Ans (2)
Sol. A $\rightarrow$ product

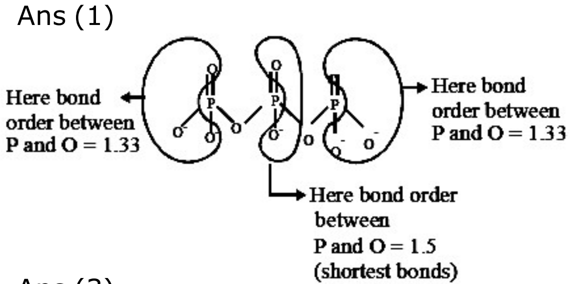
$$a \xrightarrow{30\min} \frac{a}{2} \xrightarrow{60\min} \frac{a}{4} \xrightarrow{80\min} \frac{a}{8}$$

So, order is 1
55. Ans (3)
Sol.






56. Ans (3)
Sol.


absence of $\alpha-$hydrogen
57. Ans (4)
Sol. MnO_2, Δ is used to oxidised allylic and benzylic primary alcohol to aldehyde
58. Ans (1)
59. Ans (2)
Sol. except Litum all have higher first ionisation energy than Boron
60. Ans (1)
Sol.


61. Ans (3)
Sol. $O_2^+ : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 .(\sigma^* 2s)^2 (\sigma 2p_z)^2$
$\left(\pi 2p_x^2 = \pi 2p_x^1 = \pi^* 2p_y^o\right)$
Bond order = 1/2 (10-5) = 2.5,
(II) NO is derivative of O_2 and isoelectronic with O_2^+:
SO $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2$
$\left(\pi 2p_x^2 = \pi 2p_y^2\right)\left(\pi^* 2p_x^1 = \pi^* 2p_y^0\right)$
Bond order = 1/2 (10-5) = 2.5
62. Ans (1)
Sol. Complex $[FeL_6]^{2+}$ absorbs violet colour light $\Rightarrow$ high $\Delta_0 \Rightarrow$ low spin complex $\Rightarrow$ zero unparied electron.
63. Ans (2)
Sol. $NaBH_4$ will prefer 1, 4 addition when treated with conjugated unsaturated ketone.
64. Ans (3)
Sol. Because meta product will be the major product.
65. Ans (3)
Sol. $\Delta G^0 = \Delta H^0 - T\Delta S^0$
66. Ans (1)
Sol. $\pi = CRT$
67. Ans (3)
68. Ans (2)
Sol. Refer theory
69. Ans (2)
Sol $Z = \dfrac{PV_m}{RT}$
70. Ans (3)
71. Ans (4.00)
Sol. $pH = pK_a + \log\dfrac{[X^-]}{[HX]}, K_a = 10^{-4}$
72. Ans (3.00)
Sol. Only primary amine will give +ve cabylamine test (offersiv snell of isocyanide is observed in b, d, and f only)
73. Ans (5.00)
(d), (f), (g), (h) and (j)
Sol. Presence of $-\overset{O}{\overset{\|}{C}}-CH_3$, group in aldehyde/ketone or formation of $-\overset{O}{\overset{\|}{C}}-CH_3$ group under reaction condition.
74. Ans (6.00)
Sol. $FeC_2O_4 \xrightarrow{\Delta} FeO + CO_2 + CO$
75. Ans (14.00)