RITS-17

JEE ADVANCED-2020

ANSWER KEY

Code: 127490

PHYSICS		MATHEMATICS		CHEMISTRY	
1	AC	1	AD	1	ABD
2	AD	2	ABC	2	ABC
3	ABCD	3	BD	3	ABCD
4	AC	4	A	4	ACD
5	AC	5	ABCD	5	AC
6	ABD	6	C	6	BCD
7	BC	7	ABD	7	CD
8	ABCD	8	ABCD	8	ABD
9	C	9	A	9	D
10	A	10	A	10	C
11	A	11	A	11	D
12	B	12	A	12	C
13	B	13	B	13	A
14	B	14	A	14	C
15	A	15	D	15	A
16	B	16	D	16	B
1	5	1	3	1	4
2	2	2	2	2	5
3	3	3	3	3	8
4	4	4	5	4	6
5	1	5	1	5	1
6	5	6	3	6	7

Max Marks: 246

KEY & SOLUTIONS

PHYSICS

1	AC	2	AD	3	ABCD	4	AC	5	AC	6	ABD
7	BC	8	ABCD	9	C	10	A	11	A	12	B
13	B	14	B	15	A	16	B	17	5	18	2
19	3	20	4	21	1	22	5				

MATHEMATICS

23	AD	24	ABC	25	BD	26	A	27	ABCD	28	C
29	ABD	30	ABCD	31	A	32	A	33	A	34	A
35	B	36	A	37	D	38	D	39	3	40	2
41	3	42	5	43	1	44	3				

CHEMISTRY

45	ABD	46	ABC	47	ABCD	48	ACD	49	AC	50	BCD
51	CD	52	ABD	53	D	54	C	55	D	56	C
57	A	58	C	59	A	60	B	61	4	62	5
63	8	64	6	65	1	66	7				

PHYSICS

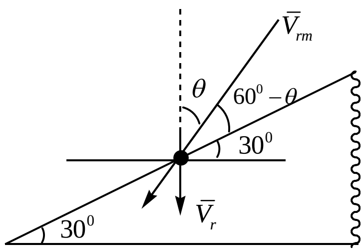
1. Apply the law of disintegration.

2. $\bar{V}_r = -30\hat{j}; \bar{V}_m = \frac{10\sqrt{3}}{2}\hat{i} + \frac{10}{2}\hat{j} = 5\sqrt{3}\hat{i} + 5\hat{j}$

$\bar{V}_{rm} = \bar{V}_r - \bar{V}_m = -30\hat{j} - \left(5\sqrt{3}\hat{i} + 5\hat{j}\right) = -5\sqrt{3}\hat{i} - 35\hat{j}$

$\therefore \tan\theta = \frac{|V_x|}{|V_y|} = \frac{5\sqrt{3}}{35} = \frac{\sqrt{3}}{7}$

$\therefore \theta = \tan^{-1}\left(\frac{\sqrt{3}}{7}\right)$ with vertical.



Angle of V_{rm} with inclined plane is $60^0 - \theta = \beta$

$tan\beta = \tan(60 - \theta)$

$\Rightarrow \tan\beta = \frac{\tan 60^0 - \tan\theta}{1 + \tan 60^0 \tan\theta} = \frac{\sqrt{3} - \frac{\sqrt{3}}{7}}{1 + \sqrt{3}\left(\frac{\sqrt{3}}{7}\right)} = \frac{3\sqrt{3}}{5}$

$\therefore \beta = \tan^{-1}\left(\frac{3\sqrt{3}}{5}\right)$ with the inclined plane

3. We know, $F_x = \frac{-dU_x}{dx}$ *and* $f_y = \frac{-dU_y}{dx}$

Hence, force on the particle is $\bar{F} = -\left(3\hat{i} + 4\hat{j}\right)N$

$|F| = 5N = \text{constant} \quad \Rightarrow \text{a} = \frac{|\text{F}|}{m} = 5m/s^2$

Hence, the acceleration of the particle is constant, so option (a) is constant

At t=0 , particle was at rest at (6,4)

From $x = 6 + \frac{1}{2}a_x t^2 = \left(6 - \frac{3}{2}t^2\right)m$ and $y = 4 + \frac{1}{2}a_y t^2 = \left(4 - 2t^2\right)m$

When the particle crosses the x-axis y=0 $\Rightarrow t_1 = \sqrt{2}s$

$\therefore$ Displacement during this time, $S = \frac{1}{2}at^2$

$S = \frac{1}{2} \times 5 \times \left(\sqrt{2}\right)^2 = 5m$

Hence, work done by the force, upto this instant is $W = FS = 5 \times 5 = 25J$

Hence, option (b) is correct

The particle crosses y-axis when x = 0

Hence, $6-\frac{3}{2}t_2^2=0 \Rightarrow t_2=2\sec$

$\therefore$ speed of the particle at this instant will be

$V=at_2=5\times 2=10\,m/s^2$

Hence, option (c) is correct

At t=4 sec, $x=6-\frac{3}{2}(4)^2=-18m$

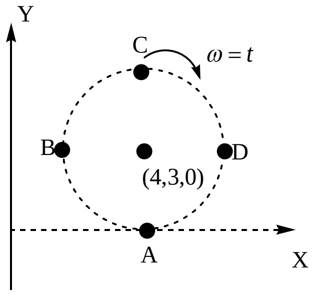
And $y=4-2(4)^2=-28m$

Hence, option (d) is correct

4. $h\nu = w + K.E_{max}$

$r=\frac{mv}{Bq}$

5. Relative velocity of object w.r.t image will be zero for the 3rd time when particle reaches B in 2nd rotation



$\Rightarrow\left(2\pi+\frac{\pi}{2}\right)=\frac{1}{2}(1)t^2$

$\therefore t=\sqrt{5\pi}\sec$.

6. Just before collision, the total energy of two satellites is

$E=-\frac{Gmm}{2r}-\frac{Gmm}{2r}=-\frac{Gmm}{r}$

Let orbital velocity is V, then from momentum conservation

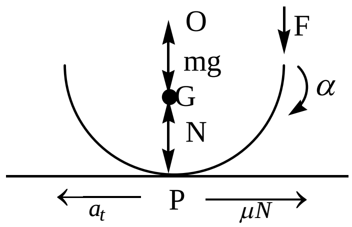
$mv-mv=2m\times v_1 \Rightarrow V_1=0$

i.e velocity of combined mass is zero. Hence, combined mass falls towards earth. At this instant, the total energy of the system only consists of the gravitational potential energy given by $U=-\frac{GM(2m)}{2r}$

7. Conceptual

8. Torque due to applied force $\tau=Fr=I_p\alpha$

Where I_p is the moment of inertia about an axis passing through point of contact



$I_0 = I_G + m(OG)^2 = mr^2$

$\Rightarrow I_G = mr^2 - m(OG)^2$

$I_p = I_G + m(GP)^2 = mr^2 - m(OG)^2 + m(r - OG)^2$

$= 2mr^2 - \dfrac{4mr^2}{\pi}$ where $OG = \dfrac{2r}{\pi} = \dfrac{2mr^2}{\pi}(\pi - 2)$

Angular acceleration

$\alpha = \dfrac{Fr\pi}{2mr^2(\pi-2)} = \dfrac{F\pi}{2mr^2(\pi-2)}$ in the clockwise direction

At P, $mg + F = N$

Friction force $f = \mu N = \mu(mg + F)$

For pure rolling, $a = \dfrac{\mu(mg+F)}{m} = \alpha(PG)$

$\mu = \dfrac{m\alpha(PG)}{(mg+F)} = m\left[\dfrac{F\pi}{2mr(\pi-2)}\right]\dfrac{r(\pi-2)}{\pi(mg+F)} = \dfrac{F}{2(mg+F)}$.

9. Initial angular momentum, $L_i = L_{plate} + L_{particle}$

$\Rightarrow L_i = mv_0 a\sqrt{2}$

Final angular momentum, $L_f = \left(\dfrac{ma^2}{6} + \dfrac{ma^2}{2} + 2ma^2\right)\omega$

According to law of conservation of angular momentum

$L_i = L_f$

$mv_0 a\sqrt{2} = \left(\dfrac{16ma^2}{6}\right)\omega$

$\therefore \omega = \dfrac{3v_0}{4\sqrt{2}}$

10. Angular impulse = change in angular momentum

$= I\omega = \left(\dfrac{ma^2}{6} + \dfrac{ma^2}{2}\right)\omega = \dfrac{mv_0 a}{2\sqrt{2}}$

11. Shape of the central, first and second fringes are circle

12. For length of second maxima find perimeter of the circle

13 & 14. Calculate pressure with time using slope

15. When the distance between plates of one of capacitors is x,

$$C_x = \frac{A \in_0}{x} \text{ and } C = \frac{\in_0 A}{d}$$

Change on C_x is $q = Q_x = \frac{C_x}{C + C_x} Q_0$

$$F_x = \frac{Q_x^2}{2A \in_0} = \frac{C_x^2 Q_0^2}{(C + C_x)^2 \times 2A \in_0}$$

$$dw = F_x dx$$

$$W = \int dw = \int_d^{2d} f_x dx = \frac{Q_0^2 d}{12A \in_0}$$

16. $F_x = \frac{C_x^2 Q_0^2}{(C + C_x)^2 \times 2A \in_0}$ where $C_x = \frac{\in_0 A}{x}$

This is also equal to force by external agent (as a =0)

$$F_{ext} = F_x$$

$$= \frac{\left(\frac{A \in_0}{x}\right)^2 Q_0^2}{\left(\frac{A \in_0}{d} + \frac{A \in_0}{x}\right)^2 2A \in_0} = \frac{Q_0^2}{2\left(\frac{x}{d} + 1\right)^2 A \in_0}.$$

17. According to I law of thermodynamics

$$dQ = du + dw$$

where $du = nC_v dT = n\left(\frac{3R}{2}\right) dT$

and $dw = pdv = PAdx$

where $P = P_0 + \frac{Mg}{A}$

Also , $PV = (n) RT$

On differentiation, $PdV = RdT$

$$\therefore dQ = \frac{3}{2} pdv + pdv = \frac{5}{2} pdv = \frac{5}{2} PAdx$$

Further, $dQ = q.dt$

$$\therefore qdt = \frac{5}{2} PAdx$$

$$\Rightarrow q = \frac{5}{2} PA \frac{dx}{dt} = \frac{5}{2}\left(P_0 + \frac{Mg}{A}\right) A.\upsilon$$

$$\Rightarrow \upsilon = \frac{2}{5} \frac{q}{(P_0 A + Mg)}$$

18. Equation of motion down the incline is given by

$$mg \sin\alpha - (kx) mg \cos\alpha = ma$$

$$\Rightarrow a = g \sin\alpha - (kx) g \cos\alpha$$

But, $a = \frac{dv}{dt} = \left(\frac{dv}{dx}\right)\left(\frac{dx}{dt}\right) = v\frac{dv}{dx}$

$\therefore Vdv = \left(g\sin\alpha - kxg\cos\alpha\right)dx$

$\int_0^v vdv = \int_0^x \left(g\sin\alpha - kxg\cos\alpha\right)dx$

$\frac{V^2}{2} = gx\sin\alpha - \frac{kx^2}{2}g\cos\alpha$

$\therefore V = \sqrt{2gx\sin\alpha - kx^2 g\cos\alpha}$

Velocity again becomes zero, after $x = \frac{2}{k}\tan\alpha$.

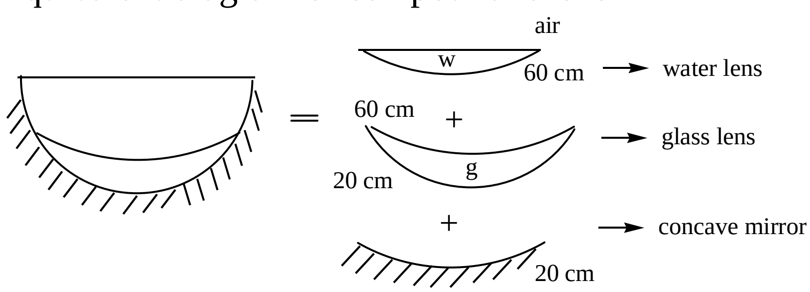
19. Let $\bar{x}$ be the length of the rod immersed in water at any instant 't'. Then, acceleration at that instant is $a = \frac{Apparent\ weight}{Mass\ of\ the\ rod}$

$\frac{dv}{dt} = \frac{\pi r^2 l\rho g - \pi r^2 x\rho_0 g}{\pi r^2 l\rho g} = g\left(1 - \frac{x}{\sigma l}\right)$

$\left(\frac{dv}{dx}\right)\left(\frac{dx}{dt}\right) = g\left(1 - \frac{x}{\sigma l}\right) \Rightarrow vdv = g\left(1 - \frac{x}{\sigma l}\right)dx$

On integration, $\int_0^v vdv = \int_0^x g\left(1 - \frac{x}{\sigma x}\right)dx$ $\Rightarrow v = \sqrt{2gl\left(1 - \frac{1}{2\sigma}\right)}$

20. Equivalent diagram of compound lens is



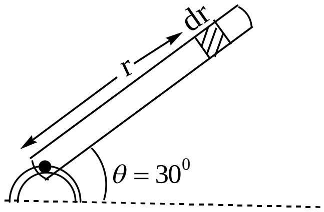
Effective power $P_{eff} = 2\left(P_w + P_g\right) + P_m$

Where $P_w = \frac{1}{f_w} = \left(\mu_w - 1\right)\left[\frac{1}{\infty} - \frac{1}{-60}\right] = \frac{1}{180}$

And $P_g = \frac{1}{f_g} = \left(\mu g - 1\right)\left[\frac{1}{-60} - \frac{1}{-20}\right] = \frac{1}{60}$

And $P_m = -\frac{1}{f_m} = \frac{-2}{R} = \frac{-2}{-20} = \frac{1}{10}$

$\therefore F_{eff} = \frac{90}{13}cm$

21. 

The spring force when stretched by x is $F = kx$.

The magnetic force experienced by small element dr is $dF = Bidr$. The torque '$d\tau$' due to this force is $d\tau = rdF = (Bir)dr$

Total torque $\tau = \int d\tau = Bi\int_0^l r\,dr = \frac{Bil^2}{2}$

At equilibrium, net torque about the hinge is zero $(kx)l\sin 30^0 - \frac{Bil^2}{2} = 0 \Rightarrow x = \frac{Bil}{k}$.

22. $a_x = \frac{qE}{m}$

$\frac{dv_x}{dt} = \frac{q}{m}(5-2x)$

$vdv = \frac{q}{m}(5-2x)dx$

On integration, $\frac{V^2}{2} = \frac{q}{m}(5x - x^2)$

$\therefore V = \sqrt{\frac{2q}{m}(5x-x^2)}$

For 'x' to be maximum, $V = \frac{dx}{dt} = 0$

$\therefore 5x - x^2 = 0 \qquad \Rightarrow x = 5m$

MATHEMATICS

23. $a^4 + b^4 + c^4 - 2c^2a^2 - 2c^2b^2 + 2a^2b^2 = 2a^2b^2$

$\Rightarrow (a^2+b^2-c^2)^2 = 2a^2b^2 \Rightarrow \cos^2 c = \frac{1}{2}$

24. For $f(x)$ $-1 \le x \le 1$ and $-1 \le 1-x \le 1$

$\Rightarrow -1 \le x \le 1$ and $-2 \le -x \le 0$

$\Rightarrow -1 \le x \le 1$ and $0 \le x \le 2 \Rightarrow 0 \le x \le 1$

B) $\sin^{-1}(1-x) = \frac{\pi}{2} - 2\sin^{-1}x \Rightarrow 1-x = \cos(2\sin^{-1}x)$

$\Rightarrow 1-x = 1-2x^2 \Rightarrow x = 0, \frac{1}{2}$

25. $A_n = \sum_{r=0}^{n} \frac{\sin\frac{x}{2^{r+1}}}{\cos\frac{x}{2^{r+1}}.\cos\frac{x}{2^r}} = \sum_{r=0}^{n}\left(\tan\frac{x}{2^r} - \tan\frac{x}{2^{r+1}}\right) = \tan x - \tan\frac{x}{2^{n+1}}$

$f(x) = \tan x \quad \therefore f(x) = \underset{x\to 0}{Lt}\frac{\tan x - \sin x}{x^3} = \underset{x\to 0}{Lt}\frac{\sin x.(1-\cos x)}{x.x^2} = \frac{1}{2}$

26. $f\left(\frac{\pi^-}{2}\right) = \underset{h\to 0^+}{Lt} \frac{2\sinh - \sin 2h}{4h^2} = \underset{h\to 0}{Lt} \frac{2\sinh(1-\cosh)}{4h^2} = 0$

$g\left(\frac{\pi^+}{2}\right) = \underset{h\to 0^+}{Lt} \frac{e^{\sin t} - 1}{8h} = 1/8$

27. Equation of tangent at t_k is $y - t_k^3 = 3t_k^2 (x - t_k)$

$\Rightarrow t_{k+1}^3 - t_k^3 = 3t_k^2 (t_{k+1} - t_k)$

$\Rightarrow (t_{k+1} - t_k)(t_{k+1}^2 + t_k t_{k+1} + t_k^2 - 3t_k^2) = 0$

$\Rightarrow (t_{k+1} - t_k)(t_{k+1}^2 - t_k^2 + t_k t_{k+1} - t_k^2) = 0$

$\Rightarrow (t_{k+1} - t_k)(t_{k+1} - t_k)(t_{k+1} + 2t_k) = 0 \Rightarrow \frac{t_{k+1}}{t_k} = -2$

$\Rightarrow t_{k+1} = -2t_k \Rightarrow t_1 = 1, t_2 = -2, t_3 = (-2)^2, ...$

$\underset{n\to\infty}{Lt} \frac{1}{1} + \frac{1}{(-2)} + \frac{1}{(-2)^2} + ... = \frac{2}{3}$

$\Delta p_2 p_3 p_4 = \frac{1}{2} \times \begin{vmatrix} -2 & -8 & 1 \\ 4 & 64 & 1 \\ -8 & (-8)^3 & 1 \end{vmatrix}$

$\Delta p_1 p_2 p_3 = \frac{1}{2} \times \begin{vmatrix} 1 & 1 & 1 \\ -2 & -8 & 1 \\ 4 & 64 & 1 \end{vmatrix}$ and length of normal $= \sqrt{1 + \frac{1}{9}}$

28. $(ae^{-iB} + be^{iA})^n = \sum_{r=0}^{n} {}^nC_r a^{n-r} b^r$

$e^{i(rA-(n-r)B)} = c^n$

29. $2a = 3, 2ae = 5 \Rightarrow e = \frac{5}{3}$

$\therefore e_1 = \frac{5}{4}$ *and* $b = 2$

30. Centre at $c(2,2)$. Radius of director circle

$= OC = \sqrt{8} = \sqrt{a^2 + b^2}$. Also $b^2 = 1 \times 3 = 3$

$\Rightarrow a^2 = 5$ $\therefore$ Equation of ellipse is

$\frac{(x-y)^2}{10} + \frac{(x+y-4)^2}{6} = 1$

Put $y = 0 \Rightarrow x = \frac{5}{2}$

Put $x = 0 \Rightarrow y = \frac{5}{2}$

31. P(E) = 1 – P ($\bar{E}$)

$\bar{E}$ = {x/x has none of non-zero digits repeated}

Then 'x' can have 0 or 1 or 2 or 3 zeros.

$n(\bar{E}) = 5.4.3.2 + ({}^3C_1).(5.4.3) + ({}^3C_2).(5.4) + ({}^3C_3)(5) = 5 \times 73$

$P(E) = 1 - \left(\frac{5 \times 73}{5.6.6.6}\right) = \frac{143}{216}$

32. No. of favourable cases to $(E_1 \cap \bar{E}_2)$

$$\begin{cases} \text{no. of arrangements of } (5, 1, 0, 0), (4, 2, 0, 0), (4, 1, 1, 0); \\ (3, 3, 0, 0); (3, 2, 1, 0); (2, 2, 2, 0) \\ \text{to get a 4 digit number} \end{cases}$$

= 6 + 6 + 9 + 3 + 18 + 3 = 45

$P(E_1 \cap \bar{E}_2) = \left(\frac{45}{5 \times 6^3}\right) = \frac{1}{24}$

33-34. Let x denote amount of salt in the tank at any time t. Then

$\frac{dx}{dt} = 2 \times 3 - \frac{x}{300} \times 3$

$\therefore \frac{dx}{dt} = \frac{600 - x}{100} \Rightarrow -\log(600 - x) + \log c = \frac{t}{100}$

$\Rightarrow x = 600 - c.e^{-t/100}$ Put $t = 0, x = 50$

$\Rightarrow x = 600 - 550e^{-t/100}$

At $t = 50, x = 600 - 550e^{-05}$

35. $I = \int e^x \frac{1 - x^2 + 1}{(1-x)\sqrt{1-x^2}} dx = \int e^x \left(\sqrt{\frac{1+x}{1-x}} + \frac{1}{(1-x)\sqrt{1-x^2}}\right) dx = e^x \sqrt{\frac{1+x}{1-x}} + c$

36. Put $t = \tan^{-1} x \Rightarrow 0 < t < \frac{\pi}{2}$

$I = \int e^t.(t^2 + 2t) dt = e^t.t^2 + c$

$= e^{\tan^{-1} x}.(\tan^{-1} x)^2 + c$

37. Let $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix} \Rightarrow \det A = (a-b)(a+b)$

$a = b \Rightarrow a = 0, 1, 2, ..., p-1$

$a + b = p \Rightarrow (a, b) = (1, p-1), ..., (p-1, 1)$

$\therefore$ Total Number = $p + p - 1$

38. Trace = $2a \Rightarrow a = 1, 2, ..., p-1$

$\det A = a^2 - b^2 = (a-b)(a+b)$

$$\left.\begin{array}{l} a = 1 \Rightarrow b = 1 \text{ or } p-1 \\ a = 2 \Rightarrow b = 2 \text{ or } p-2 \\ \dots\dots\dots\dots\dots\dots\dots\dots \\ a = p-1 \Rightarrow b = p-1 \text{ or } 1 \end{array}\right\} \Rightarrow \quad \text{no. of pairs } (a, b) = 2(p-1)$$

39. $6 \le \sec^4\theta - \tan^4\theta + \sec^2\theta - \tan^2\theta = \sec^2\theta + \tan^2\theta + 1$

$\Rightarrow \sec^2\theta \ge 3$

40. $g(x) = x^2 - 2x \Rightarrow g'(x) = 2x - 2 = 2(x-1) \ge 0 \Rightarrow g(1) \le g(x) < g(2)$

$\Rightarrow -1 \le g(x) < 0 \Rightarrow [g(x)] = -1$

$$f(x)=\begin{cases}1-4x^2 & 0\le x\le \frac{1}{2}\\ 4x^2-1 & \frac{1}{2}\le x<1\\ -1 & 1\le x<2\end{cases}$$

$\therefore f(x)$ is not differentiable at $x=\frac{1}{2},1$

41. $(x-2007)(y-2007)=(2007)=3^4.223^2$

Number of Pairs (a,b) such that $a.b=3^4.223^2$ is $5\times 3=15$

42. $2^x+3^y+5^z=2^x+(4-1)^y+(4+1)^z$

$=2^x+4k+(-1)^y+1^z$

If $x=1$ then $y=2,4$ and $z=1,2,3,4,5$

If $x=2,3,4,5$ then $y=1,3,5$ and $z=1,2,3,4,5$

$\therefore k=70$

43. Point of intersection is $A(-1,2)$

Slope of reflected ray is given by

$$\frac{m+\frac{2}{3}}{1-\frac{2m}{3}}=\frac{\frac{-2}{3}-\frac{1}{2}}{1-\frac{2}{3}.\frac{1}{2}}\Rightarrow m=\frac{29}{2}$$

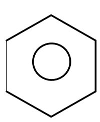
$\therefore$ Equation of the reflected ray is $29x-2y+33=0$

44. $2y.\frac{dy}{dx}=1\Rightarrow\frac{dy}{dx}=\frac{1}{2y}=1\Rightarrow y=\frac{1}{2}$

$\therefore A\left(\frac{5}{4},\frac{1}{2}\right)$ *and* $B\left(\frac{1}{2},\frac{5}{4}\right)$

$\therefore d=AB=\frac{3\sqrt{2}}{4}$

CHEMISTRY

45. Only  with ethanoyl chloride is friedal – crafts acetylation.

46. a, b, c represents correct Reactions

47. Acidified $KMnO_4$ oxidises all the compound in to benzoic acid

48. Due to large size Cs^+ is least hydrated among alkali metal cation due high hydration $Li^+_{(aq)}$ mobility is less. I.P. of Li is more than sodium due to small size.

49. $\underset{(Orange)}{Cr_2O_7^{2-}}+10H^++4Na_2O_2\rightarrow \underset{blue\,colour}{CrO_5}+8Na^++5H_2O$.

50. $2O_3 \rightarrow 3O_2$ | $6-2x = 3x \Rightarrow x = 1.2$

$6-2x \quad 3x$ | O_3 moles left = 6-2.4=3.6

O_2 moles formed = 3.6

Mass ratio of ozone to oxygen $=(3.6\times 48):(3.6\times 32)=3:2$

No. of 'O' atoms $=(3.6\times 3)+(3.6\times 2)=18$

51.

$$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O; E^0_{R.P} = 1.23V$$

$$2SO_4^{2-} \rightarrow S_2O_8^{2-} + 2e^-; E^0_{O.P} = -2.01V$$

(on adding) $O_2 + 2SO_4^{2-} + 4H^+ + 2e^- \rightarrow S_2O_8^{2-} + 2H_2O; E^0_{cell} = -0.78V$

Since the EMF of cell is negative, the reverse reaction is spontaneous.

Hence : water is oxidized to O_2 & $S_2O_8^{2-}$ is reduced to SO_4^{2-}

52. For a I order reaction, $t_{1/2} = \frac{0.693}{k}$

i.e independent of initial concentration of reactants

53. $Ph-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow[NaOH]{I_2} CHI_3 + Ph-\overset{\overset{O}{\|}}{C}-ONa$

54. Under Basic medium reactivity of Halogens is $Cl_2 = Br_2 = I_2$

55. $BO \quad of \quad O_2 \rightarrow 2; O_2^- \rightarrow 1.5; O_2^+ \rightarrow 2.5;$ In F_2 molecules $\sigma 2P_z$ energy is less than $\pi 2P_x$ and $\pi 2P_y$

$\rightarrow O_2, O_2^-, B_2$ molecules are para due to unpaired e^-

56. O_2^+, NO, N_2^- has bond order 2.5 & para.

57 & 58.

A is $Hg(NO_3)_2$

B is Hg

C is NO_2

D is O_2

E is HgS

F is $HgCl_2$

G is Hg_2Cl_2

H is Hg

I is $K_2[Hg(CN)_4]$

59. Conceptual

60. Conceptual

61. b, c, e, f give Iodoformtest

62. Totally 5 moles are used

63. A is $Cu_2[Fe(CN)_6]$

B is $K_2[Pb(I)_4]$

C is $Na(Ag(CN)_2)$

64. $Ni^{+2}\left(t_{2g}^{6}eg^{2}\right)\Rightarrow$ magnetic moment due to 2 unpaired ρ

65. $\lambda_1 = 2a_0\left(\lambda\alpha\frac{n}{z}; a_0 = \text{cosntant}\right)$

$\lambda_2 = a_0; \lambda_3 = 3a_0$

$\therefore \frac{\lambda_3 - \lambda_2}{\lambda_1} = \frac{3a_0 - a_0}{2a_0} = 1$

66. $P_{NH_3} = P_{HCN} = 0.149atm \Rightarrow K_P = 0.149\times 0.149 = 0.022atm$

In second case: $NH_4CN_{(s)} \rightleftharpoons NH_{3_{(g)}} + HCN_{(g)}$

Initially :	0.25	0
At Equation :	(0.25 + x)	x

$K_p = (0.25 + x)x = 0.022$

Or $x^2 + 0.25x - 0.022 = 0$

$\therefore\ x = \frac{-0.25 + \sqrt{(0.25)^2 - 4(1)(0.022)}}{2(1)}$

$= \frac{-0.25 + \sqrt{0.0625 - 0.088}}{2}$

$$= \frac{-0.25 + \sqrt{0.1505}}{2} = \frac{-0.25 + 0.388}{2} = 0.07$$

$$\therefore [HCN] = 7 \times 10^{-2}$$

Hence y = 7