Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: Sr.S60_Elite, Target & LIIT-BTs JEE-MAIN(Theory Based Test) Date: 27-12-2024

Time: 09.00Am to 12.00Pm GTM-10/05 Max. Marks: 300

KEY SHEET

MATHEMATICS

1	**2**	2	**2**	3	**2**	4	**4**	5	**4**
6	**1**	7	**4**	8	**4**	9	**2**	10	**4**
11	**1**	12	**2**	13	**2**	14	**1**	15	**3**
16	**2**	17	**4**	18	**3**	19	**3**	20	**1**
21	**66**	22	**6**	23	**6**	24	**6**	25	**6**

PHYSICS

26	**1**	27	**4**	28	**3**	29	**1**	30	**3**
31	**2**	32	**2**	33	**1**	34	**2**	35	**3**
36	**4**	37	**4**	38	**4**	39	**1**	40	**3**
41	**4**	42	**1**	43	**3**	44	**1**	45	**2**
46	**1234**	47	**134**	48	**123**	49	**23**	50	**124**

CHEMISTRY

51	**2**	52	**2**	53	**1**	54	**4**	55	**3**
56	**2**	57	**1**	58	**3**	59	**3**	60	**3**
61	**1**	62	**4**	63	**4**	64	**2**	65	**1**
66	**2**	67	**2**	68	**2**	69	**3**	70	**1**
71	**6**	72	**4**	73	**3**	74	**9**	75	**4**

SOLUTIONS

MATHEMATICS

1. Statement-I: $f(x)=x^3$ Not satisfies

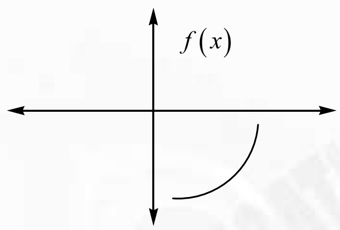
Statement-II: For odd if $\lim\limits_{x\to 0}$ exists it is 0

Statement-III: from graph, it is correct

Statement-IV: $f(x)=\begin{cases}\cos\left(\dfrac{1}{x}\right) & x\neq 0\\ 0 & x=0\end{cases}$ Not satisfies

2. Statement-II: $f(x)=-x^3$ at x=0 contradiction

Statement-III: $\left(f^2(x)\right)^1=2f(x)f'(x)=-ve$



Statement-IV: contradiction

3. $S_1\to$ Z can be zero

$S_2,S_3,S_4\to$ Use properties of complex numbers

4. Let $f:R\to R$ is defined by $f(x)=\left(x^2+\sin x\right)(x-1)$

Then, $f\left(1^+\right)=f\left(1^-\right)=f(1)=0$

Let $(fg):R\to R$ is defined by $(fg)(x)=f(x).g(x)$

Let $(fg)=h(x)=f(x).g(x)$ then $h:R\to R$

$h'(x)=f'(x)g(x)+f(x)g'(x)$

If g is differentiable at x=1

$h'(1)=f'(1)g(1)+0, \quad \left[\because f(1)=0\right]$

If g(x) is differentiable then h(x) I also differentiable (true)

If g(x) is differentiable at x=1, then fg is also differentiable at x=1

If g(c) is continuous at x=1, then $g\left(1^+\right)=g\left(1^-\right)=g(1)$

$h'\left(1^+\right)=\lim\limits_{h\to 0^+}\dfrac{h(1+h)-h(1)}{h}$

$h'\left(1^+\right)=\lim\limits_{h\to 0^+}\dfrac{f(1+h)g(1+h)-0}{h}=f'(1)g(1)$

$h'\left(1^-\right)=\lim\limits_{h\to 0^+}\dfrac{f(1-h)g(1-h)-0}{-h}=f'(1)g(1)$

$\Rightarrow h(x)=f(x).g(x)$ is differentiable at x=1(True)

So, If g is continuous at x=1, THEN fg is differentiable at x=1.

Option (b) (d) $h'\left(1^+\right)=\lim\limits_{h\to 0^+}\dfrac{h(1+h)-h(1)}{-h}$

$h'\left(1^+\right)=\lim\limits_{h\to 0^+}\dfrac{f(1+h)g(1+h)}{h}=f'(1)g\left(1^+\right)$

$h'\left(1^-\right)=\lim\limits_{h\to 0^+}\dfrac{f(1-h)g(1-h)}{-h}=f'(1)g\left(1^-\right)$

$\Rightarrow g\left(1^+\right)=g\left(1^-\right)$

So, it does not mean that if fg is differentiable at x=1, then fg is continuous or differentiable at x=1

5. Statement-I: Use by parts 2 times

Statement-II: Indefinite integral +c must be kept

Statement-IV: $F(x)=\int\sin^2 x dx=g(x)+c$

$F(x+\pi)=F(x)$ Might not satisfy for every 'c', (also Integral contains linear expression in x)

6. Given, $\mathrm{f}(\mathrm{x})=\int_0^{x\tan^{-1}x}\dfrac{e^{t-\cos t}}{1+t^{2023}}dt$

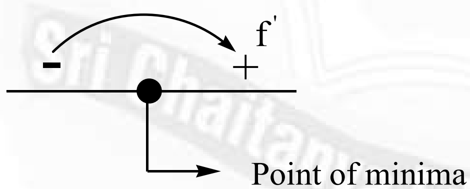
$\mathrm{f}'(\mathrm{x})=\dfrac{e^{x\tan^{-1}x-\cos\left(x\tan^{-1}x\right)}}{1+\left(x\tan^{-1}x\right)^{2023}}\cdot\left(\dfrac{x}{1+x^2}+\tan^{-1}x\right)$

For $x<0$, $\tan^{-1}x\in\left(-\dfrac{\pi}{2},0\right)$

For $x\geq 0$, $\tan^{-1}x\in\left[0,\dfrac{\pi}{2}\right]$ $\Rightarrow x\tan^{-1}\ \forall x\in R$

And $\dfrac{x}{1+x^2}+\tan^{-1}x=\begin{cases}>0 & \text{For x} > 0\\ <0 & \text{For x} < 0\\ 0 & \text{For x} = 0\end{cases}$

i.e



So, $\mathrm{f}(\mathrm{x})$ is minimum at x=0

Here minimum value is f (0) = $\int_0^0 = 0$.

$\psi(\mathrm{x})$ and $\phi(\mathrm{x})$ can be negative functions

7. Use definition of Area. $S_1(F), S_2(F)$

8. When $x\in[0,1]$, then $\dfrac{dy}{dx}+2y=1\Rightarrow y=\dfrac{1}{2}+C_1e^{-2x}$ $\because y(0)=0\Rightarrow y(x)=\dfrac{1}{2}-\dfrac{1}{2}e^{-2x}$

Here, $y(1)=\frac{1}{2}-\frac{1}{2}e^{-2x}=\frac{e^2-1}{2e^2}$

When $x\notin[0,1]$ then $\frac{dy}{dx}+2y=0\Rightarrow C_2=\frac{e^2-1}{2}$

$\because y(1)=\frac{e^2-1}{2}\Rightarrow\frac{e^2-1}{2}=c^2e^{-2}\Rightarrow C_2=\frac{e^2-1}{2}$

$\because y(x)=\left(\frac{e^2-1}{2}\right)e^{-2x}\Rightarrow y\left(\frac{3}{2}\right)=\frac{e^2-1}{2e^3}$

9. $S_1\to V(ax+b)=a^2V(x)$

$S_2\to$ mean $(ax\pm b)=a\,mean(X)\pm b$

Mode $(x_1,x_2,.....x_n)=K$

Mode of $(ax_1\pm\alpha, ax_2\pm\alpha,.......ax_n\pm\alpha)=ak\pm\alpha$

central tendencies depend on shift of origin & scaling

Variance depends on scaling but not shift of origin

10. $\text{f}-\text{g}=x \quad x\text{ is rational}$

$=-x \quad x\text{ is irrational}$

11. Use graphs of $\sin^{-1}(\sin x)$ and $\cos^{-1}(\cos x)$

12. Apply Limits & Properties

13. a, b can be irrational

14. $P(X_i>Y_i)+P(X_i<Y_i)+P(X_i=Y_i)=1$

And $P(X_i>Y_i)=P(X_i<Y_i)=p$

For $i=2$ $\quad P(X_2=Y_2)=P(5,5)+P(4,4)=\frac{5}{12}\times\frac{5}{12}\times2+\frac{1}{6}\times\frac{1}{6}$

$=\frac{25}{72}+\frac{1}{36}=\frac{27}{72}=\frac{3}{8}$ $\quad P(X_2>Y_2)=P(10,0)=\frac{5}{12}\times\frac{5}{12}+\frac{5}{12}\times\frac{1}{6}\times2=\frac{5}{16}$

For $i=3$ $\quad P(X_3=Y_3)=P(6,6)+P(7,7)$ $\quad=\frac{1}{6\times6\times6}+\frac{5}{12}\times\frac{1}{6}\times\frac{5}{12}\times6=\frac{77}{432}$

$P(X_3>Y_3)=\frac{1}{2}\left(1-\frac{77}{432}\right)=\frac{355}{864}$

$III\to T, IV\to S$

15. Refer to properties of conics

16. $S_1: a=b=c=0$ Then it is not linear

S2 is obviously True

17. Since, given $|a+b+c|=|a+b-c|$ $\quad|\vec{a}+\vec{b}+\vec{c}|^2=|\vec{a}+\vec{b}-\vec{c}|^2$

$\Rightarrow2\vec{a}\cdot\vec{b}+2\vec{b}\cdot\vec{c}+2\vec{c}\cdot\vec{a}=2\vec{a}\cdot\vec{b}-2\vec{b}\cdot\vec{c}-2\vec{c}$ $\Rightarrow4\vec{a}\cdot\vec{c}=0$ $\quad$ So, (B) is incorrect

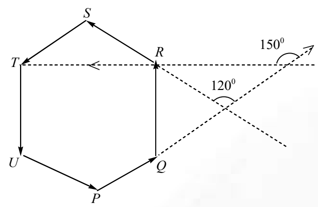
Now, $|\vec{a}+\lambda\vec{c}|^2\geq|\vec{a}|^2$ $\quad$ True $\forall\lambda\in R$ (A) is correct.

$\overrightarrow{PQ}\times\left(\overrightarrow{RS}+\overrightarrow{ST}\right)=\overrightarrow{PQ}\times\overrightarrow{RT}$ $\quad$ (using triangle law)

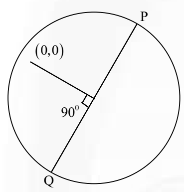
$= \left|\overrightarrow{PQ}\right| \times \left|\overrightarrow{RT}\right| \sin 150 \hat{n} \neq 0 \Rightarrow Statement-1\ is\ true.$

Also, $\overrightarrow{PQ} \times \overrightarrow{RS} = \left|\overrightarrow{PQ}\right| \times \left|\overrightarrow{RS}\right| \sin 120^0 \times \hat{n}_1 \neq 0$

And $\overrightarrow{PQ} \times \overrightarrow{ST} = \left|\overrightarrow{PQ}\right| \times \left|\overrightarrow{ST}\right| \sin 180^0 \times \hat{n}_2 \neq 0 \quad \therefore Statement-2\ is\ false$

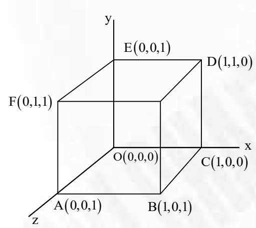


18. $AB = 0 \ \ |B| \neq 0 \quad AB = 0 \Rightarrow A = 0$
19. Draw graphs
20. Refer P & C synapses Integrated and objective
21. Since area of ΔOCP $\quad \frac{1}{2} \times PC \times \sqrt{5} = \frac{\sqrt{35}}{2}; PC = \sqrt{7}$



$a_1^2 + b_1^2 + a_2^2 + b_2^2 = OP^2 + OQ^2 \quad = 2(5+7) = 24$

22.



Equation of face diagonal OD line is $\quad I_1 : \vec{r} = \lambda\left(\hat{i} + \hat{j}\right)$

Equation of main diagonal BE is $\quad I_2 : \vec{r} = \hat{j} + \mu\left(\hat{i} - \hat{j} + \hat{k}\right)$

Shortest distance $= \left|\frac{j.\left(\hat{i}+\hat{j}\right) \times \left(\hat{i}-\hat{j}+\hat{k}\right)}{\left(\hat{i}+\hat{j}\right) \times \left(\hat{i}-\hat{j}+\hat{k}\right)}\right| \left|\frac{j.\left(\hat{i}-\hat{j}-2k\right)}{\hat{i}-\hat{j}-2\hat{k}}\right| = \frac{1}{\sqrt{6}}$

In other case S.D is zero.

23. Statement-I: Refer to chord properties of conics

Statement -II: $P = \left\{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\right\} \Rightarrow \sin\theta = \left(\sqrt{2}+1\right)\cos\theta \Rightarrow \tan\theta = \sqrt{2}+1$

$Now, Q = \left\{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\right\} \ \Rightarrow \cos\theta = \left(\sqrt{2}-1\right)\sin\theta \Rightarrow \tan\theta = \frac{1}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1}$

$\Rightarrow \tan\theta = \sqrt{2}+1 \qquad \therefore P = Q$ $\qquad$ Statement -III: $(a-b)^2 + (b-c)^2 + (c-b)^2 = 0$

24. Statement-I: Use addition theorem of probability

Statement-II: Total number of relation both symmetric and reflexive = $2^{\left(\frac{n^2-n}{2}\right)}$

And total number of symmetric relation = $2^{\left(\frac{n^2+n}{2}\right)}$

Then number of symmetric relation which are not reflexive =

$2^{\frac{n(n+1)}{2}}-2^{\left(\frac{n(n-1)}{2}\right)}=2^{10}-2^{6}=1024-64=960$

25. Apply De morgan's law $(B\cup C)'=B'\cap C'$

Complement of set B containing subsets of A which do not contains 2 but element 1.

And C' is a set containing subsets of A whose sum of elements is not prime.

So, we need to calculate number of subsets of (3, 4, 5, 6, 7} whose sum of elements plus 1 is composite.

Number of 5 elements subset = 1

Number of 4 elements subset which does not include 3 or 7=3

Number of 3 elements subset = 6 (except selecting {3, 4, 5},(3, 6, 7},{4, 5, 7}or{5, 6, 7})

Number of 2 elements subset =7 (except selecting (3, 7}, {4, 6}, {5, 7})

Number of 1 elements subset -3 (except selecting {4} or {6})

Number of 0 elements subset = 1

Here, $=1+3+6+7+3+1=21$

Therefore, $n\ (B\cup C)$=27-21= 107

Statement-II: $x=\left(8\sqrt{3}+13\right)^{13}={}^{13}C_0\left(8\sqrt{3}\right)^{13}+{}^{13}C_1\left(8\sqrt{3}\right)^{12}(13)^1+.......(i)$

$$x'=\left(8\sqrt{3}-13\right)^{13}={}^{13}C_0\left(8\sqrt{3}\right)^{13}-{}^{13}C_1\left(8\sqrt{3}\right)^{12}(13)^1+.......(ii)$$

By (i)-(ii)

$$x-x'=2\left[{}^{13}C_0\left(8\sqrt{3}\right)^{13}(13)^1+{}^{13}C_3\left(8\sqrt{3}\right)^{10}(13)^3...\right]$$

Therefore, $x-x'$ is even integer, hence [x] is even

Now, $y=\left(7\sqrt{2}+9\right)^9={}^9C_0\left(7\sqrt{2}\right)^9+{}^9C_1\left(7\sqrt{2}\right)^8(9)^1+{}^9C_2\left(7\sqrt{2}\right)^7(9)^2\quad .....(iv)$

By (iii) - (iv)

$$y-y'=2\left[{}^9C_1\left(7\sqrt{2}\right)^8(9)^1+{}^9C_3\left(7\sqrt{3}\right)^6(9)^3+........\right]$$

$y-y'$= Even integer hence [y] is even

Statement –IV: ns is quadratic without constant term

Statement –V:

Given expression: $\left(x+\sqrt{x^3-1}\right)^5+\left(x-\sqrt{x^3-1}\right)^5$

We know that using binomial theorem,

$(x+a)^n+(x-a)^n=2\left[{}^nC_0x^n+{}^nC_2x^{n-2}a^2+{}^nC_4x^{n-4}a^4+......\right]$

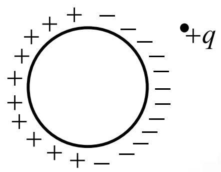
$\therefore$ The given expression $=2\left[{}^5C_0x^5+{}^5C_2x^3(x^3-1)+{}^5C_4x(x^3-1)^2\right]$

Since maximum power of x involved in the expansion is 7. Also only +Ve integral powers of x are involved in the expansion, therefore given expression is a polynomial of degree 7.

PHYSICS

26. $V_d = \mu E = \frac{\mu . V}{d} \Rightarrow v_d \propto V$. If V (potential difference)

27. Net charge = 0



Net charge = 0

28. Acceleration of charged particle $\vec{a} = \frac{q}{m}\left(\vec{E} + \vec{v} \times \vec{B}\right)$

Released from rest $\Rightarrow \vec{a} = \frac{q}{m}\vec{E} = a_0 (west)$ $\Rightarrow \vec{E} = \frac{ma_0}{e}(west)$

When it is projected towards north, acceleration due to magnetic force = $2a_0$

Therefore magnetic field $= \frac{2ma_0}{ev_0}(down)$, Direction of magnetic field $\overrightarrow{F_m} \to \left(\vec{v} \times \vec{B}\right)$

$-\hat{i} \to \left(\hat{j} \times -\hat{k}\right)$, The direction of magnetic force is towards west, for that the direction of magnetic field is vertically downward $\left(-\hat{k}\right)$

29. Here $\vec{\tau} = \overrightarrow{M} \times \vec{B} = \vec{O}\left(\because \overrightarrow{M} \uparrow\uparrow \vec{B}\right)$, Also parallel currents attract each other.

30. As seen from graph, $\Delta\ell_A = \Delta\ell_B \Rightarrow \frac{F_A L_A}{\pi r_A^2 Y_A} = \frac{F_B L_B}{\pi r_B^2 Y_B} \Rightarrow \frac{10 \times L}{\pi r_A^2 \times Y} = \frac{40 \times L}{\pi r_B^2 \times Y}$ $\Rightarrow \frac{r_A}{r_B} = \frac{1}{2}$

31. Balance A read less than 2kg & balance B read more than 5kg due to buoyancy

32. $m = \frac{4}{3}\pi r^3 \rho m$, Keeping m constant, if r is halved, ρ will increased by a factor of 8.

Now, $V_0 \propto r^2 \rho$ $V_0' \propto \frac{r^2}{4}(8\rho)$ or $V'O \propto 2r^2\rho$, Dividing, $\frac{V_0'}{V_0} = 2$ or $V_0' = 2V_0$ or $V_0' = 2V$

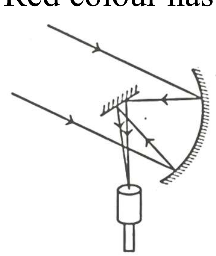
33. Saturation current is different so intensity is different but stopping potential is same and frequency is same so cathode material also same.

34. Slope of position-time graph gives velocity

35. Frictional force between two surfaces in contact always opposes relative motion between the surfaces in contact

36. $\mu = \frac{\text{Real thickness}(x)}{Apparent\ thickness(y)} \Rightarrow y = \frac{x}{\mu}, \frac{y_v}{y_R} = \frac{x}{\mu_v} \times \frac{\mu_R}{x} = \frac{\mu_R}{\mu_v}$,Since $\mu_v > \mu_R$ $\therefore y_R > y_v$

Red colour has maximum apparent thickness. Hence red colour is least raised.



37.

In a reflecting telescope secondary mirror turns light towards eyepiece which is outside the telescope tube

38. Due to scattering of light by water droplets

39. $\frac{Rotational\ K.E}{Total\ K.E} = \frac{2}{5} \Rightarrow \frac{\frac{1}{2}I\omega^2}{\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2} = \frac{2}{5} \quad \Rightarrow \frac{\frac{1}{2}mK^2\omega^2}{\frac{1}{2}mR^2\omega^2 + \frac{1}{2}mK^2\omega^2} = \frac{2}{5}$

$\Rightarrow \frac{K^2}{K^2 + R^2} = \frac{2}{5} \Rightarrow K^2 = \frac{2}{3}R^2 \ or\ K = \sqrt{\frac{2}{3}}R$, So it will be hollow sphere

40. $F_1 = F_2$ $\quad \because w_1 = \frac{1}{2}k_1x_1^2$, $\quad k_1x_1 = k_2x_2 = F$ $\quad w_1 = \frac{1}{2}k_1\left[\frac{F}{k_1}\right]^2$ $\quad w_1 = \frac{1}{2}\frac{F^2}{k^1}$

$\therefore w_2 = \frac{1}{2}\frac{F^2}{k^2}$ $\quad \because k_1 > k_2$ $\quad \therefore w_1 < w_2$

41. $P = \vec{F}.\vec{v}$, Tension is always perpendicular to velocity

42. $\left(x_m \propto \frac{1}{T}\right)$ for paramagnetic material

43. Since conducting shells come in contact they have same potential hence will flow to outer shell.

44. $f \propto V$ $\quad \& V \propto \sqrt{T}$ (where T is Temperature)

45. $E = -y\hat{i} - x\hat{j}$ $\quad \tan\theta = \frac{E_y}{E_x} = \frac{x}{y}$

46. Since only 6 different wavelengths are excited, therefore highest excited stat is $n-4$.
Two wavelengths are shorter than λ_0, Initially atoms were in excited state $n=2$
Corresponding transitions are $4\to3, 4\to2, 4\to1, 3\to2, 3\to1, 2\to1$.

47. After completion of every one oscillation particle returns to initial point with same velocity which it has initially at that point

48. For (A) : Orbital speed $v_0 = \sqrt{\frac{GM}{r}}$, For (B) : Time period of revolution $T^2 \propto r^3$

For (C/D) : Total energy $= -\frac{GMm}{2r}$

49. No. of collisions per unit area $\propto \frac{1}{time\ between\ two\ collisions \times area}$

$n/A \propto \frac{V_{rms}}{\text{distance b/w walls} \times A}$ $\quad V_1\ rms \propto \sqrt{T}$, Distance b/w walls x A volume

So $\frac{n}{A} \propto \frac{T^{1/2}}{v}$, If both T and V are halved, $\frac{n}{A}$ increases.

50. According to the standard Model, free protons are stable particles because their spontaneous decay has never been observed.
Free neutrons are unstable and decay into a proton, an electron, and an antineutrino through a process called beta decay.

CHEMISTRY

51. Key-2

Sol: Diastereomer of each other

52. Key: 2

Sol: (A) is more stable radical and undergoes Markovnikov addition to form (B)

53. I,III,IV are statements are Correct

54. KEY-4

55. $\Lambda_m = \frac{k}{M} \times 1000; (x+y) = \frac{k}{M} \times 1000$

$$\Rightarrow M = \frac{1000 \times k}{(x+y)}$$

Solubility $\left(in\ gL^{-1}\right) = \frac{k \times 1000 \times 188}{x+y}$

56. H_3PO_2 reduces diazonium salt into benzene derivative.

57. KEY-1

SOL. $A_x B_y \rightarrow xA^{y+} + yB^{x-}$

$1-\alpha \qquad x\alpha \qquad y\alpha$

$i = 1 - \alpha + x\alpha + y\alpha$

$\alpha = \frac{i-1}{(x+y-1)}$

58. KEY-3

SOL. : Cannizaro reaction

59. O_2 and Xe have comparable ionization energies

60. KEY-3

SOL. $\log k = \log A - \frac{E_a}{2.303RT} (y = c + mx)$

Slope $= \frac{-E_a}{2.303R} = \frac{1}{2.303} (given) \left(\tan\theta = \frac{1}{2.303}\right)$

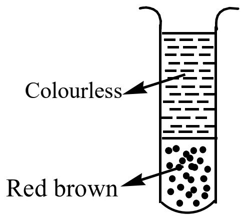
$-E_a = 2.303R \times slope$

$= 2.303 \times \frac{R}{2.303} = R = 2cal$

61. $Na_2Cr_2O_7$ is hygroscopic and that is why, it is not used as a primary standard in volumetric analysis.

62. KEY-4

SOL.



$Cl_2 + 2NaBr \rightarrow Br_2 + 2NaCl$

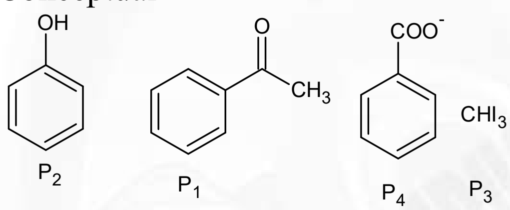
Cl_2 oxidises Br^- to Br_2 in trichloro ethane is reddish brown in colour. Two layers are observed as trichloro ethane is immisible with water.

63. KEY-4

SOL. Solubility is directly proportional to K_{Sp}. MnS has highest K_{Sp} anong the given substances and hence has highest solubility

64. KEY-2

SOL. Conceptual



65. KEY-1

66. Key-2

sol. Cl^- is weak ligand so no pairing of electrons take palce. so $[NiCl_4]^{-2}$ is tetrahedral.

pph_3 group is bulkier one so it favours tetrahedral geometry, through pph_3 is strong field ligand.

67. KEY-2

SOL: (b) Bond dissociation energy orders

Cl_2	>	Br_2	>	F_2	>	I_2	
242.6		192.8		158.8		151.1	kj/mol

68. $PV^{\gamma} = K$ (K is constant) $\quad dPV^{\gamma} + P\gamma V^{\gamma-1}dV = 0$

$$\frac{dP}{P} - \frac{\gamma V^{\gamma-1}}{V^{\gamma}}dV \qquad \frac{dP}{P} = -\gamma\frac{dV}{V}$$

69. KEY-3

70. KEY-1

71. KEY-6

SOL: CONCEPTUAL

72. pair of diastereomers is formed (m), therefore, two fractions are obtained

73. P= 1-Bromo 3-chloro Benezen

74. KEY-9

SOL. $B_2H_6 - 6 = x \quad B_3N_3H_6 - 12 = y$

$$\frac{x+y}{2} = \frac{18}{2} = 9$$

75. n-factor = 4