DPP No. # 11 (JEE-ADVANCED)

PHYSICAL / INORGANIC CHEMISTRY

Total Marks : 100 **Max. Time : 80 min.**

Single choice Objective (–1 negative marking) Q.1 to Q.8	(3 marks 2½ min.)	[24, 20]
Multiple choice objective (–1 negative marking) Q.9 to Q.11	(4 marks, 3 min.)	[12, 09]
Assertion and Reason ('–1' negative marking) Q.12 to Q.13	(3 marks 2½ min.)	[06, 05]
Comprehension (–1 negative marking) Q.14 to Q.19	(3 marks 2½ min.)	[18, 15]
Match Listing (–1 negative marking) Q.20	(8 marks, 3 min.)	[08, 08]
Single Digit Subjective Questions (no negative marking) Q.21 to Q.25	(4 marks 2½ min.)	[20, 12½]
Double Digit Subjective Questions (no negative marking) Q.26	(4 marks 2½ min.)	[04, 2½]
Match the column (4 vs 5) (no negative marking) Q.27	(8 marks, 8 min.)	[08, 08]

ORGANIC CHEMISTRY

Total Marks : 69 **Max. Time : 57 min.**

Single choice Objective (–1 negative marking) Q.28 to Q.34	(3 marks 2½ min.)	[21, 17½]
Multiple choice objective (–1 negative marking) Q.35 to Q.36	(4 marks, 3 min.)	[08, 06]
Assertion and Reason ('–1' negative marking) Q.37	(3 marks 2½ min.)	[03, 2½]
Comprehension (–1 negative marking) Q.38 to Q.40	(3 marks 2½ min.)	[09, 7½]
Single Digit Subjective Questions (no negative marking) Q.41 to Q.42	(4 marks 2½ min.)	[08, 05]
Double Digit Subjective Questions (no negative marking) Q.43	(4 marks 2½ min.)	[04, 2½]
Match the column (4 vs 4) (no negative marking) Q.44	(8 marks, 8 min.)	[08, 08]
Match the column (5 vs 4) (no negative marking) Q.45	(8 marks, 8 min.)	[08, 08]

PHYSICAL / INORGANIC CHEMISTRY

1. Which of the following is true when equal volume of 0.04 M NaCl solution is mixed with 0.1 M $K[Ag(CN)_2]$.

Given : $(K_{inst}[Ag(CN)_2]^-) = 4 \times 10^{-19}$, K_{sp} (AgCl) $= 2.8 \times 10^{-10}$ and $\sqrt[3]{5} = 1.7$).

(A) More $K[Ag(CN)_2]$ will be formed.
(B) AgCl will be precipitated.
(C) There is no change in concentration of K^+
(D) None of these.

2. A solid crystallises as cubic close packing of O^{2-} ions. A^{x+} ions occupy 25% of the tetrahedral voids and B^{y+} ions occupy 50% of the octahedral voids. The suitable values of 'x' and 'y' are :

(A) x = 1, y = 3 (B) x = 2, y = 1 (C) x = 3, y = 2 (D) x = 1, y = 2

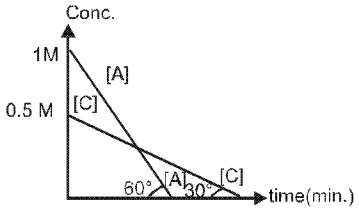
3. For the two reactions

Reaction I : $A \rightarrow B$

Reaction II : $C \rightarrow D$

following curves are plotted

which of the following is incorrect option :



(A) $(t_{100\%})_{\text{reaction I}} = \frac{2}{3}(t_{100\%})_{\text{reaction II}}$

(B) [A] = [C] at t = $\frac{\sqrt{3}}{4}$ minutes

(C) When [B] = [A] at that time [C] = [D]

(D) If both $[A]_0$ and $[C]_0$ are 1 M then $(t_{50\%})_I = \frac{1}{3}(t_{50\%})_{II}$

4. Following data of osmotic prssure (π) is obtained when different moles $C_{17}H_{35}COONa$ are mixed in 1L solution at 25°C :

Moles	0	0.01	0.02	0.03	0.04
$\frac{\pi}{RT}$ (moles/liter)	0	0.02	0.04	0.058	0.076

Select the incorrect nature of mixture at different concentration.

(A) Upto 0.02 M concentration, the mixture is true solution.

(B) After 0.03 M concentration, the mixture is a colloidal.

(C) At 0.04 M concentration, the mixture is homogenous.

(D) The critical micelle concentration (CMC) of $C_{17}H_{35}COONa$ may be 0.03 M.

5. 1 mole of a compound $Co(NH_3)_5Cl_2Br$ gives 2 moles of curdy white precipitate, when treated with excess of $AgNO_3$ solution. Which of the following is incorrect about the compound ?

(A) The compound may be represented as $[Co(NH_3)_5Br]\,Cl_2$.

(B) The Van't Hoffs factor (i) is 3, when $\alpha = 1.0$

(C) The boiling point of 1M – aq. solution of $Co(NH_3)_5Cl_2Br$ should be triple of its value, when it were non-electrolyte.

(D) None of these

6. Calcium imide on hydrolysis gives gas (B) which on oxidation by bleaching powder gives gas (C).Gas (C) on reaction with magnesium give compound (D) which on hydrolysis gives again gas (B). Identify (B),(C) and (D).

(A) NH_3 , N_2 , Mg_3N_2

(B) N_2 ,NH_3 , MgNH

(C) N_2 ,N_2O_5 , $Mg(NO_3)_2$

(D) NH_3 , NO_2 , $Mg(NO_2)_2$

7. $A + H_2O \longrightarrow B + HCl$

$B + H_2O \longrightarrow C + HCl$

Compound (A), (B) and (C) will be respectively :

(A) PCl_5, $POCl_3$, H_3PO_3

(B) PCl_5, $POCl_3$, H_3PO_4

(C) $SOCl_2$, $POCl_3$, H_3PO_3

(D) PCl_3, $POCl_3$, H_3PO_4

8._ Which of the following fails to react significantly with air at room temperature?

(A) Be (B) Li (C) Ba (D) All of these

9.* Which of the following statement(s) is/are correct ?

(A) Chlorine dioxide (ClO_2) is powerful oxidising agent but bleaching action is poorer than Cl_2.

(B) ClO_2 in alkaline solution undergoes disproportionation.

(C) ClO_2 is diamagnetic in nature.

(D) ClO_2 is a yellow gas but deep red liquid.

10.* The freezing point of a 0.08 molal aqueous solution of $NaHSO_4$ is –0.372°C. Which of the following is/are correct for the given solution? Assume no hydrolysis and m ≈ M. (K_f of water = 1.86 K kg/mole)

(A) 0.2 moles of ions are present in 1 kg solvent.

(B) Degree of dissociation of HSO_4^- is 0.6.

(C) Dissociation constant for the reaction $HSO_4^- \rightleftharpoons H^+ + SO_4^{2-}$ is 4×10^{-2}.

(D) RLVP of the given solution is $\frac{9}{2509}$.

11.* A nonvolatile solute 'X' completely dimerises in water, if the temperature is below –3.72°C and the solute completely dissociates as $X \rightarrow Y + Z$, if the temperature is above 100.26°C. In between these temperature,(including both temperature) 'X' is neither dissociated nor associated. One mole of 'X' is dissolved in 1kg water.

Given : K_b of water = 0.52 K.Kg mol^{-1} ; K_f of water = 1.86 K.Kg mol^{-1}

Which of the following statement(s) is/are true regarding the solution ?

(A) The freezing point of solution is – 1.86°C.

(B) The boiling point of solution is 101.04°C.

(C) When the solution is cooled to –7.44°C, 75% of water present intially will separate as ice.

(D) When the solution is heated to 102.08°C,50% of water present intially will escape out as vapor.

12. **Statement-1 :** Knowing K_{a_1} of CO_2, pH can be determined of an aqueous solution of Na_2CO_3 of known concentration.

Statement-2 : Only first hydrolysis of CO_3^{2-} ion is significant because for most of dibasic acids, $K_{a_1} >> K_{a_2}$

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

13._ **Statement-1 :** Salts of Be and Mg do not give flame test.

Statement-2 : $CaCl_2$ gives apple green colour in flame test.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Comprehension # 1

An ore of a common metal contain a green colored compound 'M' of metal, which dissolves readily in hydrochloric acid. However the dissolves readily in hydrochloric acid. However the metal does not dissolve in dilute hydrochloric acid. The compound 'M' gives effervescence of gas 'X' and produces a blue colored solution of 'P' on treatment with HCl. The gas 'X' is non-combustible colorless and odorless. The gas 'X' reacts with aqueous suspension obtained by adding 'Y' in water to give white precipate of 'Z'. Z on heating gives back X and Y. When gas Q is passed through 'P' a black precipitate of 'R' is obtained. When a gas 'S' is passed through P the blue solution turns deep blue.

14. The compound "M" is :

(A) $MgCO_3$, $Mg(OH)_2$ (B) $CuFeS_2$ (C) $CuCO_3$, $Cu(OH)_2$ (D) $FeCO_3$

15. Gases 'Q' and 'S' are allowed to enter a long tube of length 100 cm from opposite ends under identical conditions. What is the distance travelled by 'Q' before it meets 'S' ?

(A) 50 cm (B) 41.4 cm (C) 46.5 cm (D) 59 cm

16. Which of the following is used as raw material in Solvay's process to produce CO_2 ?

(A) M (B) Y (C) Z (D) R

Comprehension # 2

Two liquids A and B mix to form an ideal binary liquid solution, On adding non volatile solid solute C to the solution, A starts polymerising into a hexamer non volatile soluble solid 'A_6' following zero order kinetics, with a rate constant = 10^{-1} moles/ min. If initially 10 moles of A and 20 moles of B were taken to form liquid solution and 5 moles of C were added then answer the following questions based on above information and data given below: [**Data:** vapor pressure of pure A = 100 torr, vapor pressure of pure B = 90 torr]

17. The vapor pressure of the solution 1 hrs. after solid C is added will be given by :

(A) $\frac{220}{3}$ torr (B) 98 torr (C) $\frac{2200}{29}$ torr (D) $\frac{2200}{24}$ torr

18. Which of the following statements is incorrect regarding the above process ?

(A) The vapor pressure will keep on decreasing initially.

(B) The vapor pressure will become constant 100 min. after addition of C.

(C) Two hours after addition of C, the vapor pressure will become 72 torr.

(D) Four hours after addition of C, the vapor pressure will become 67.5 torr.

19. If C is not added so there is no polymerisation of A, then mol fraction of A in vapour phase will be :

(A) 5/14 (B) 9/14 (C) 1/3 (D) 2/3

20. The standard reduction potential data at 25°C is given below.

$E^\circ (Fe^{3+}.Fe^{2+})$ = + 0.77 V ; $E^\circ (Fe^{2+}.Fe)$ = – 0.44 V ;

$E^\circ (Cu^{2+}.Cu)$ = + 0.34 V ; $E^\circ (Cu^{+}.Cu)$ = + 0.52 V ;

$E^\circ (O_2(g) + 4H^+ + 4e^- \rightarrow 2H_2O)$ = + 1.23 V ; $E^\circ (O_2(g) + 2H_2O + 4e^- \rightarrow 4OH)$ = + 0.40 V

$E^\circ (Cr^{3+}.Cr)$ = – 0.74 V ; $E^\circ (Cr^{2+}.Cr)$ = – 0.91 V

Match E° of the rebox pair in List I with the values given in List II and select the correct answer using the code given below the lists :

	List I		**List II**	
P.	$E^\circ (Fe^{3+}, Fe)$		1.	– 0.36 V
Q.	$E^\circ (4H_2O \rightleftharpoons 4H^+ + 4OH^-)$		2.	–0.4 V
R.	$E^\circ (Cu^{2+} + Cu \rightarrow 2Cu^+)$		3.	–0.04 V
S.	$E^\circ(Cr^{3+}, Cr^{+2})$		4.	–0.83 V

Codes :

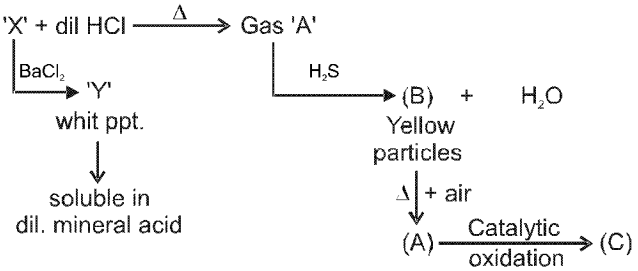
	P	Q	R	S		P	Q	R	S
(A)	4	1	2	3	(B)	2	3	4	1
(C)	1	2	3	4	(D)	3	4	1	2

21. Find the number of molecules which are planar :

(a) ClF_3 (b) SF_6 (c) XeF_6 (d) XeF_2 (e) XeF_4 (f) H_2O

(g) H_2S (h) NH_3 (i) PH_3 (j) PCl_5 (k) PCl_3 (l) OCl_2

22.



Find the sum of number of $p\pi$ - $p\pi$ and $p\pi$ - $d\pi$ bonds in trimer of 'C'.

23. A metal 'A' exists in the bcc structure having uncovered length along the edge equal to 1.2 Å. If molar mass of the metal is 307.2 gm/mole then calculate density of the crystal in g/mL.

[Use : $N_A = 6 \times 10^{23}$ and $\sqrt{3} = 1.7$]

24. Total number of isomers (including stereoisomers) for the complex $[Pd(NH_3)(H_2O)(NO_2)_2]$ are :

25. How many of the following elements have $\Delta_f H^\circ > 0$ at 298 K ?
O_2 (g), Monoclinic sulphur, Diamond, Red phosporous, O_3 (g), Cl_2 (g), Rhombic sulphur, Br_2 (g), O (g), I_2 (ℓ), H_2 (g), Liquid sodium, Fe(s), Black phosphorous.

26. The equilibrium partial pressure of N_2O_4(g) and NO_2(g) are 4 and 2 atm, respectively. Now, at constant temperature, the equilibrium pressure of system is increased to 60 atm. The new equilibrium partial pressure of N_2O_4(g) becomes :

27.

	Column-I		**Column-II**
(A)	Mohr's salt (aq.) + Na_2O_2	(p)	Colored solution
(B)	$AgNO_3$ + NaN_3	(q)	White and insoluble product posssible
(C)	Chrome alum(aq.) + Na_2O_2	(r)	Colored and insoluble product possible
(D)	Pb_3O_4 + HNO_3	(s)	Colorless solution
		(t)	evolution of gas possible on heating.

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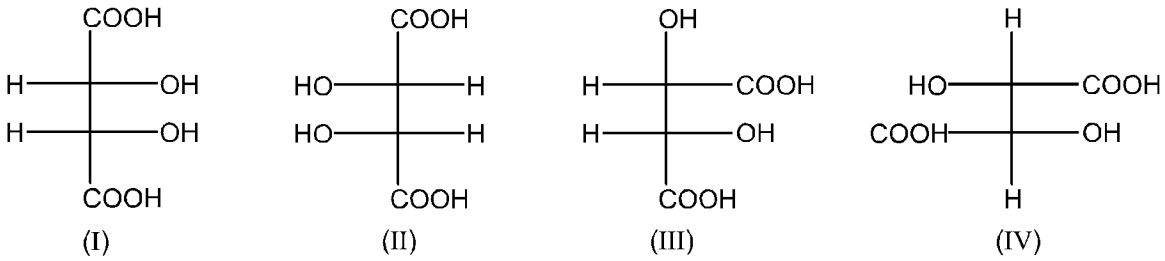
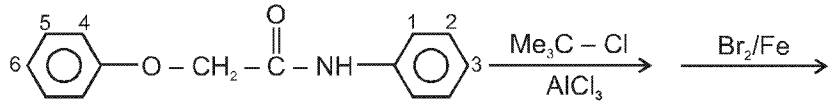
28. Which of the following structures are superimposable ?



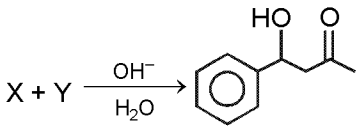
(A) I & II (B) II & III (C) III & IV (D) II & IV

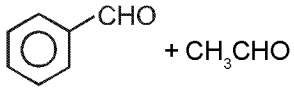
29. The main positions of electrophilic attack for the given reactions are respectively.

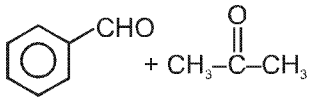


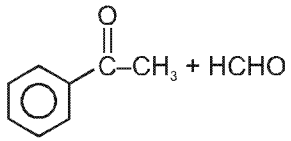
(A) 3, 1 (B) 6 , 3 (C) 6 , 4 (D) 3, 6

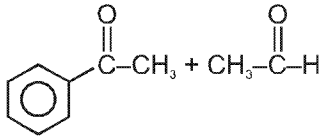
30. The reactant X & Y of following reactions are



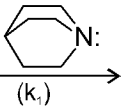
(A) 

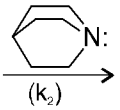
(B) 

(C) 

(D) 

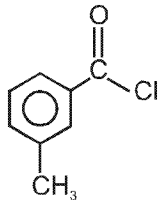
31. Observe the following reaction I and II k_1, k_1', k_2 and k_2' are rate constants. Select the correct option.

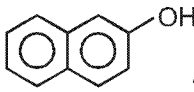
(I) $\xleftarrow[[k_1']]{(CH_3CH_2)_3N:}$ $CH_3 - I$ $\xrightarrow[(k_1)]{}$ 

(II) $\xleftarrow[[k_2']]{(CH_3CH_2)_3N:}$ $CH_3 - \underset{\underset{I}{|}}{CH} - CH_3$ $\xrightarrow[(k_2)]{}$ 

(A) $k_1 > k_1'$ (B) $k_2 < k_2'$ (C) $k_1 < k_2$ (D) $k_1' < k_2'$

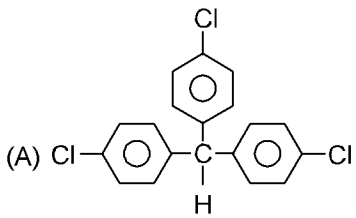
32. The product of the following reaction does not show positive test with

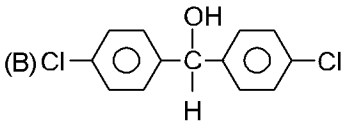
 $\xrightarrow[\Delta]{NH_3}$ $\xrightarrow[\Delta]{Br_2 / NaOH}$ product.

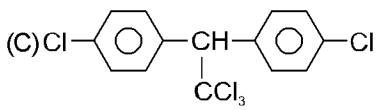
(A) $(CHCl_3 + KOH)/\Delta$ (Carbyl amine test) (B) HNO_2,  (β-naphthol test)

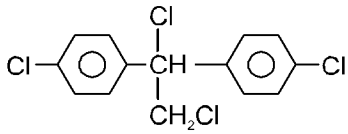
(C) Ph–SO_2Cl/NaOH (Hinsberg test) (D) Neutral $FeCl_3$ Test

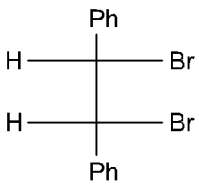
33. CCl_3–CH=O reacts with chlorobenzene in presence of sulphuric acid & produces :

(A) 

(B) 

(C) 

(D) 

34. Ph—C≡C—Ph $\xrightarrow{x}$ $\xrightarrow{y}$ 

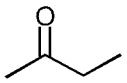
The reagents x and y are respectively :

(A) Br_2 / CCl_4 , H_2 / Ni (B) HBr , HBr

(C) Na / NH_3 (ℓ) , Br_2 / CCl_4 (D) Br_2 / CCl_4 , Lindlar's hydrogenation

35. Select the correct statements out of the following :
(A) β-D(+) glucopyranose is more stable than α-D(+) glucopyranose.
(B) Sucrose is laevorotatory sugar.
(C) Although fructose is a ketone but it gives positive Tollen's test.
(D) Starch contains α-glycosidic linkage whereas cellulose contains β-glycosidic linkage.

36. 2-Phenylbutan-2-ol can be prepared by :

(A) PhMgBr +  $\xrightarrow{\text{ether}}$ $\xrightarrow{H^{\oplus}}$

(B) $CH_3MgBr + Ph-\overset{\overset{O}{\|}}{C}-C_2H_5 \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}}$

(C) $C_2H_5MgBr + Ph-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}}$

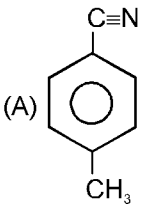
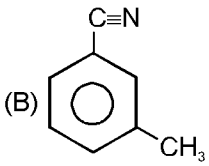
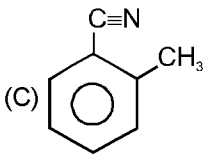
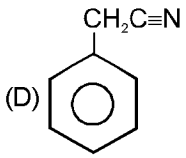
(D) $CH_3CH_2CH_2MgBr + PhCHO \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}}$

37. **Statement-1 :** Nitration of benzene and hexadeuterobenzene occurs almost at the same rate.
Statement-2 : Cleavage of C – H bond takes faster than C – D bond.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

Comprehension # 3

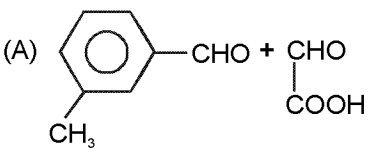
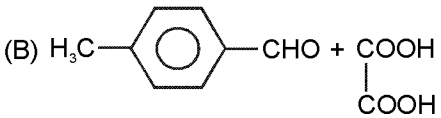
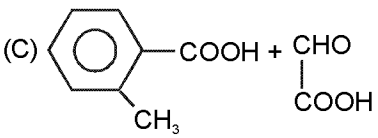
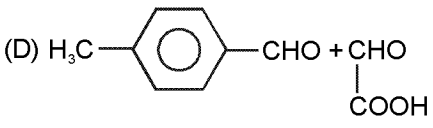
Compound (X) (C_8H_7N) on treatment with cold $SnCl_2$/dil.HCl (aqueous), produces Y (C_8H_8O). (Y) on heating with sodium acetate in acetic anhydride followed by acidification forms (Z) ($C_{10}H_{10}O_2$). All these compounds (X,Y,Z) on oxidation under severe conditions form a diacid which gives only one mononitro isomer in nitrating mixture.

38. What is structure of (X) :

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

39. What is not true about (Y) :
(A) It cannot gives fehling solution test
(B) It gives Iodoform test positive
(C) It gives Tollen's test positive
(D) It gives 2, 4-DNP test positive

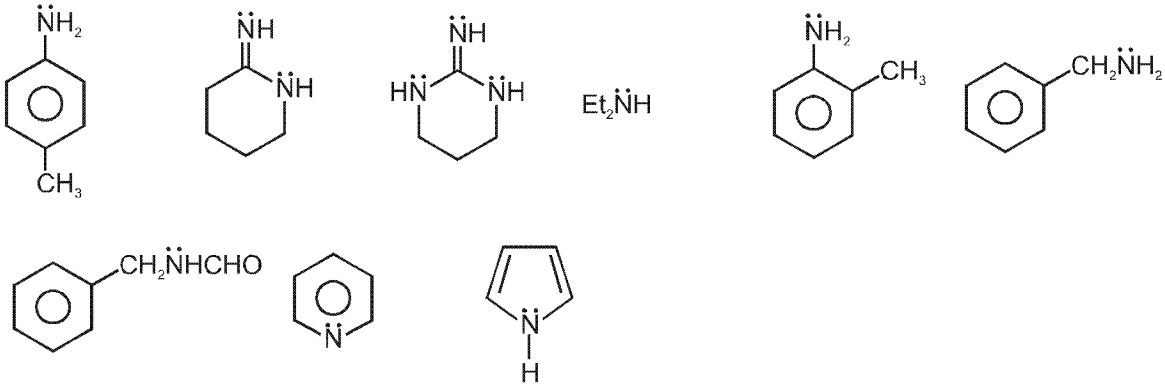
40. The reductive ozonolysis products of (Z) are :

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

41. $CH_3-CH_2-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow[-H_2O]{H^{\oplus}} [F] \xrightarrow{Br_2/CCl_4} C_5H_{10}Br_2$ (G)

How many total products of (G) are formed?

42. How many of the following are stronger bases than aniline ?

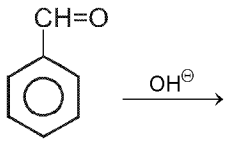
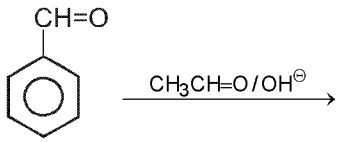
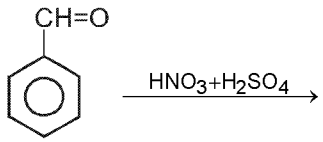
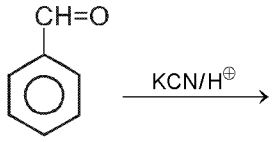
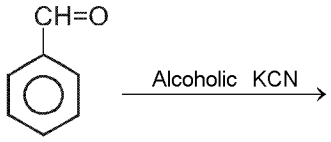


43. 3–Amino–2,3–dimethyl butan–2–ol when treated with $NaNO_2$/HCl gives product (X). (X) on treatment with $LiAlH_4$ forms (Y). (Y) on heating with conc. H_2SO_4 forms (Z). Calculate the molecular weight of (Z).

44. Match list I (reaction) with II (products) and then select the correct answer from the codes given below the lists :

List I	**List II**
(A) Phenol + NaOH + CH_3I	(p) Phenolphthalein
(B) Phenol + NaOH +$CHCl_3$	(q) Salicylic acid
(C) Phenol + Phthalic anhydride + conc. H_2SO_4	(r) Anisole
(D) Phenol + CO_2 + NaOH	(s) Salicylaldehyde

45.

Column-I	**Column-II**
(A) 	(p) Aromatic ring substitution
(B) 	(q) Nucleophilic addition
(C) 	(r) Condensation reaction
(D) 	(s) Formation of more than one organic products
(E) 	

CHEMISTRY

PHYSICAL / INORGANIC CHEMISTRY

1. After mixing

$[NaCl] = 0.02$ M ; $K[Ag(CN)_2] = 0.05$ M.

$[Ag(CN)_2]^- \rightleftharpoons Ag^+ + 2CN^-$ $\quad 4 \times 10^{-19}$

$0.05-x \quad x \quad 2x$

x is going to be very small in comparison to 0.05 as K_{inst} is very small.

So, $\quad 4 \times 10^{-19} = \dfrac{x \times (2x)^2}{0.05 - x} = \dfrac{4x^3}{0.05}$

$\Rightarrow \quad x^3 = 5 \times 10^{-21} \quad \Rightarrow \quad x \simeq 1.7 \times 10^{-7}$

Q_{sp} of AgCl $= 1.7 \times 10^{-7} \times 0.02 = 3.4 \times 10^{-9} > 2.8 \times 10^{-10}$

Hence, AgCl will be precipitated.

Further, $[Ag(CN)_2]^-$ dissociates on dilution and $[K^+]$ is halved on dilution.

2. O^{2-} ion = 4 [ccp lattice]

$A^{x+} = 8\,[TV]\dfrac{1}{4} = 2.$; $B^{y+} = 4[OV]\dfrac{1}{2} = 2.$

$\Rightarrow$ By charge balancing.

$2x + 2y - 8 = 0$ $\quad$ So, $\quad x + y = 4.$

3. (A) $t\ 100\% = \dfrac{a}{k}$

$$\frac{(t_{100\%})I}{(t_{100\%})II} = \frac{a_I}{a_{II}} \times \frac{k_{II}}{k_I} = \frac{1}{0.5} \times \frac{1/\sqrt{3}}{\sqrt{3}} = \frac{2}{3}$$

(B) $a - x = -k_A t + a$ $\quad$ or $\quad (1 - x) = -\sqrt{3}\,t + 1$ or $x = +\sqrt{3}\,t$

simiarly $0.5 - y = -\dfrac{1}{\sqrt{3}}t + 0.5$ or $y = \dfrac{t}{\sqrt{3}}$

when $\quad [A] = [C]$

$1 - x = 0.5 - y$

or $\quad 1 - \sqrt{3}\,t = 0.5 - \dfrac{t}{\sqrt{3}}$

$$0.5 = t\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) ; \quad t = \frac{\sqrt{3}}{4}\,\text{min.}$$

(D) $$\frac{(t_{50\%})I}{(t_{50\%})II} = \frac{a_I}{a_{II}} \cdot \frac{k_{II}}{k_I} = \frac{\frac{1}{\sqrt{3}}}{\sqrt{3}} = \frac{1}{3}$$

4. $\pi = iCRT$

$\frac{\pi}{RT} = iC$

$C_{17}H_{35}g\,COONa \rightarrow CH_3COO^- + Na^+$

1 0 0

$1-\alpha$ α α

$i = \frac{1+\alpha}{1} = 2$

$\pi_1 = 0.02$

$\pi_2 = 0.04$

$(\pi_3)_{Theo.} = 0.06$ and $(\pi_3)_{exp.} = 0.058$

$(\pi_3)_{exp.} < (\pi_3)_{Theo.}$ So. association.

So here at this point micelle formation has taken place and colloid has been formed. We can say at 0.04 M concentrate mixture will be heterogeneous.

6. (a)

$$\underset{}{Ca(NH)} + 2H_2O \longrightarrow \underset{(B)}{Ca(OH)_2} + NH_3\,(g)$$

$$\underset{(B)}{2NH_3} + 3CaOCl_3 \longrightarrow \underset{(C)}{N_2(g)} + 3CaCl_2 + 3H_2O$$

$$N_2(g) + 3Mg \longrightarrow \underset{(D)}{Mg_3N_2}$$

$$\underset{(D)}{Mg_3N_2} + 6H_2O \longrightarrow \underset{(B)}{3Mg(OH)_2} + 2NH_3$$

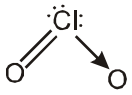
7. (B) PCl_5 (A) $+ H_2O \longrightarrow POCl_3$ (B) $+ 2HCl$

$POCl_3$ (B) $+ 3H_2O \longrightarrow H_3PO_4$ (C) $+ 3HCl$

8._ Due to less reactivity of Be.

9. ClO_2 is powerful oxidising agent, also strong chlorinating agent. Its bleaching power is almost 30 times stronger than Cl_2. In alkaline solution undergoes disproportionation

$$2ClO_2 + 2NaOH \longrightarrow NaClO + NaClO_3 + H_2O$$



unpaired electron that`s why paramagnetic

10.* $NaHSO_4 \longrightarrow Na^+ + HSO_4^-$

0.08 0 0

(0.08) (0.08)

Suppose the degree of dissociation of HSO_4^- is α

$HSO_4^- \rightleftharpoons H^+ + SO_4^{2-}$

At eq. $C(1-\alpha)$ $C\alpha$ $C\alpha$

$\Rightarrow$ $[H^+] = 0.08\,\alpha$

$[SO_4^{-2}] = 0.08\,\alpha$

$[HSO_4^-] = 0.08\,(1-\alpha)$

Total ions present $= 0.08 + 0.08\,(1-\alpha) + 0.08\,\alpha + 0.08\,\alpha$

$= 0.16 + 0.08\,\alpha$

$i = \frac{0.16 + 0.08\alpha}{0.08} = (2+\alpha)$

$\Delta T_f = K_f \times m \times i$

$0.372 = (2+\alpha) \times 1.86 \times 0.08$

$\Rightarrow$ $\alpha = 0.5$

$\Rightarrow K_{dissociation} = \frac{C\alpha^2}{1-\alpha} = \frac{0.08 \times \left(\frac{1}{2}\right)^2}{1/2} = 0.04$ RLVP $= x_{solute} = \frac{0.2}{0.2 + \frac{1000}{18}} = \frac{9}{2509}$

11.* (A) $\Delta T_b = iK_b \times m$
$= 0.52 \times 1 = 0.52$
$T_b = 100.52^oC$ So it will dissociate
hence $\Delta T_b = i\, K_b\, m = 1.04$
$T_b = 101.04K$
(B) $\Delta T_f = iK_f \times m = 1 \times 1.86 \times 1 = 1.86$; $T_f = -1.86^oC$ and X will not get dimerise

(C) $7.44 = \frac{1}{2} \times 1.86 \times \frac{1}{W_A} \times 1000$; $W_A = 125$ gm So weight of ice seprate $= 1000 - 125 = 875$

% of ice seprate= $\frac{875}{1000} \times 100 = 87.5\%$

(D) $2.08 = 2 \times 0.52 \times \frac{1}{W_A} \times 100$

$W_A = 500$ gm ; So 500 gm i.e. 50% of H_2O will evaporation

14. $\underset{(M)}{CuCO_3.Cu(OH)_2} + HCl \longrightarrow \underset{(blue)\ (P)}{CuCl_2(aq)} + \underset{(X)}{CO_2} \uparrow$

$Cu + HCl \longrightarrow$ No dissolution

$CaO + H_2O \longrightarrow Ca(OH)_2 \xrightarrow{+CO_2} CaCO_3 \downarrow (Z)$
(Y)

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

$CuCl_2 + \underset{(gas\ Q)}{H_2S} \longrightarrow \underset{(R)}{CuS} \downarrow (black)$

$CuCl_2 + \underset{(gas\ S)}{NH_3} \longrightarrow [Cu(NH_3)_4]Cl_2$ (deep blue)

15. $Q = H_2S$, $S = NH_3$
Let distance travelled by $H_2S = x$

$\Rightarrow \frac{x}{100-x} = \frac{\sqrt{17}}{\sqrt{34}} \Rightarrow \frac{x}{100-x} = \frac{1}{\sqrt{2}} \Rightarrow \sqrt{2}\,x = 100 - x \Rightarrow (\sqrt{2}+1)\,x = 100$

$\Rightarrow x = \frac{100}{(\sqrt{2}+1)} = 41.4$ cm

Comp # 17 to18

17. $n_A = 10$ mole $n_B = 20$ mole and $n_C = 5$ mole.
$P_A^o = 100$ torr, $P_B^o = 90$ torr

6A	$\rightarrow$	A_6 (s)
10		0
$10 - x$		$\frac{x}{6}$

$x = Kt = 10^{-1} \times 60 = 6$

after 1 hrs $\Rightarrow$ A = 4, B = 20, ; Solute = C + $\frac{x}{6} = 5 + 1 = 6$; $P^o = P_A^\circ x_A + P_B^\circ x_B$

$P^o = 100 \times \frac{4}{24} + \frac{20}{24} \times 90 = 16.66 + 75$

$P^o = 91.66$ torr $\frac{P^o - P^s}{P^s} = \frac{n}{N} \Rightarrow \frac{91.66 - P^s}{P^s} = \frac{6}{24} = \frac{1}{4} \Rightarrow 73.33 \text{ torr} = \frac{220}{3}$

18. After 100 min. A will be zero

$6A$	$\rightarrow$	A_6
10		0
0		$\frac{10}{6}$

$A = 0$, $B = 20$ Solute $= 5 + \frac{10}{6} = 6.66$

After 100 min.

$$\frac{p^o - P^s}{P^s} = \frac{n}{N} \Rightarrow \frac{90 - P^s}{P^s} = \frac{6.66}{20}$$

$P_s = 67.5$ torr

20. (P) $E^o_{Fe3+,\,Fe}$ $\quad Fe^{3+} \xrightarrow[n=1]{+0.77V} Fe^{2+} \xrightarrow[n=2]{-0.44V} Fe$; $Fe^{3+} \rightarrow Fe$: xV, n = 3

$\Rightarrow$ $1 \times 0.77 + 2 \times (-0.44) = 3 \times x$

$\Rightarrow$ $x = -\frac{0.11}{3}$ V $\simeq -0.04$ V.

(Q) $4H_2O \rightleftharpoons 4H^+ + 4OH^-$

$2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$	-1.23 V
+ $O_2 + 2H_2O + 4e^- \longrightarrow 4OH^-$	$+0.4$ V
$4H_2O \rightleftharpoons 4H^+ + 4OH^-$	-0.83 V

(R) $E^o_{(Cu2+\,+\,Cu\,\rightarrow\,2Cu+)}$ $\quad Cu^{2+} \xrightarrow[n=1]{xV} Cu^{+} \xrightarrow[n=1]{-0.52V} Cu$; $Cu^{2+} \rightarrow Cu$: + 0.34V, n = 2

$x \times 1 + 0.52 \times 1 = 0.34 \times 2$

$x = 0.16$ V.

$\Rightarrow$ $Cu^{2+} + e^- \longrightarrow Cu^+$	0.16 V
+ $Cu \longrightarrow Cu^+ + e^-$	-0.52 V
$Cu^{2+} + Cu \longrightarrow 2Cu^+$	-0.36 V

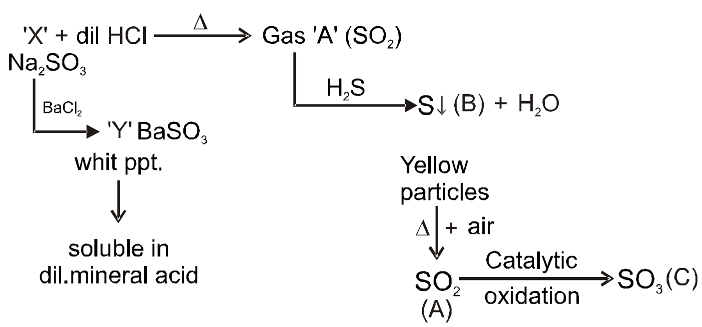
(S) $E^o_{(Cr3+,\;Cr2+)}$ $\quad Cr^{3+} \xrightarrow[n=1]{x} Cr^{2+} \xrightarrow[n=2]{-0.91V} Cr$; $Cr^{3+} \rightarrow Cr$: -0.74V, n = 3

$x \times 1 + 2 \times (-0.91) = 3 \times (-0.74)$

$x - 1.82 = -2.22$

$\Rightarrow$ $x = -0.4$ V

22.



23. $a - 2r = 1.2$ Å and $\sqrt{3}\,a = 4r$; $a - 2 \times \frac{\sqrt{3}}{4} a = 1.2$ Å

$a\left(1-\frac{\sqrt{3}}{2}\right) = 1.2$ Å $a = 8$Å ; $d = \frac{2 \times 307.2}{6 \times 10^{23} \times \left(8 \times 10^{-8}\right)^3} = 2$ g/mL

24. (A) $(NO_2)\,(NO_2) \rightarrow$ cis + trans (B) $(ONO)\,(NO_2) \rightarrow 3$ (C) $(ONO)\,(ONO) \rightarrow$ cis + trans

25. Monoclinic sulphur, Diamond, O_3 (g), Br_2 (g), O (g), $I_2(\ell)$, Liquid sodium.

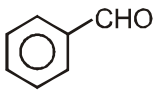
26. $N_2O_4\,(g) \rightleftharpoons 2NO_2(g)$
At equi. 4 atm 2 atm

$K = \frac{P_{NO_2}^2}{P_{N_2O_4}} = 1$; Let $p_{N2O4} = x$, $p_{NO2} = 60 - x$

$\Rightarrow \frac{(60-x)^2}{x} = 1$ $\Rightarrow$ $3600 + x^2 - 120\,x - x = 0$

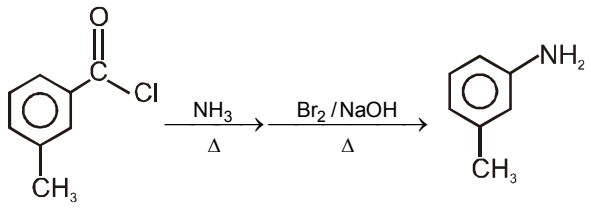
$\Rightarrow$ $x^2 - 121\,x + 3600 = 0$; $x = 52.73$; $x \simeq 53$ atm

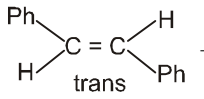
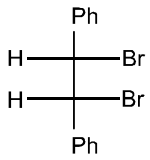
ORGANIC CHEMISTRY

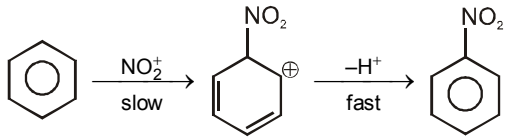
30. It is aldol formation reaction between  and .

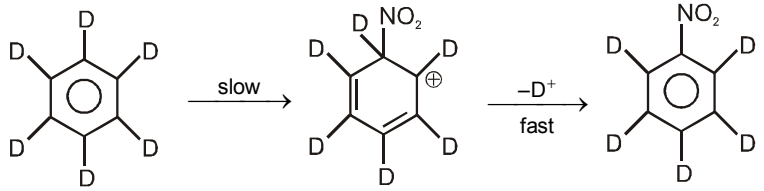
31.

k_1'	<	k_1	$\Leftarrow$	due to steric hinderence of nucleophile
k_2'	<	k_2	$\Leftarrow$	due to steric hinderence of nucleophile
k_1	>	k_2	$\Leftarrow$	due to steric hinderence of R – X
k_1'	>	k_2'	$\Leftarrow$	due to steric hinderence of R – X

32. 

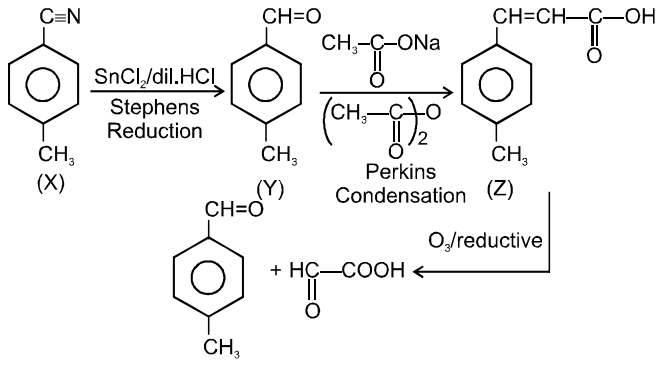
34. $Ph - C \equiv C - Ph \xrightarrow[Na(NH_3(\ell))]{X}$  $\xrightarrow[CCl_4]{Br_2}$ 

37. 



Both benzene ring have nearly same electron density so attack of E^+ occur at same rate.

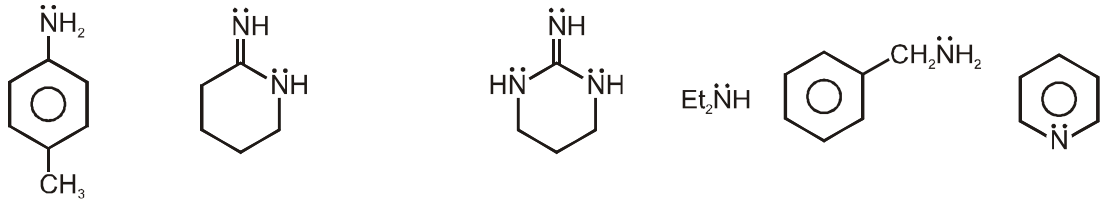
40.



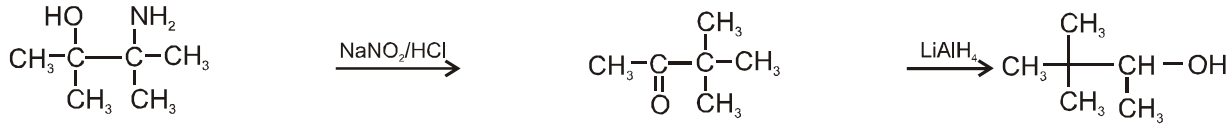
41. $CH_3–CH_2–CH=CH–CH_3$ (cis + trans) $\xrightarrow{Br_2}$ $CH_3–CH_2–\overset{*}{C}H(Br)–\overset{*}{C}H(Br)–CH_3$ (dℓ + dℓ)

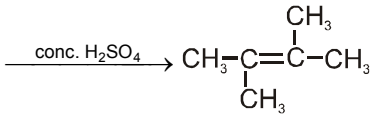
$CH_3–CH_2–CH_2–CH=CH_2 \xrightarrow{Br_2} CH_3–CH_2–CH_2–\overset{*}{C}H(Br)–CH_2(Br)$ (dℓ)

42.



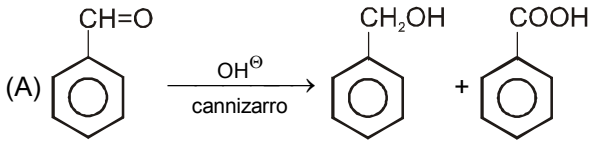
43.

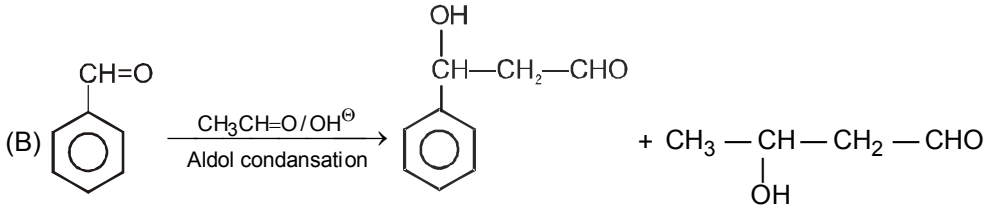


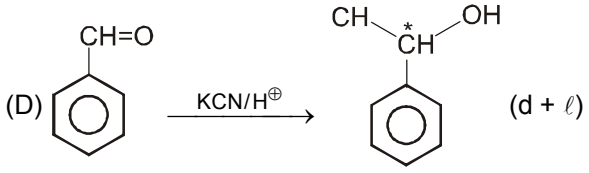


; Molecular formula = C_6H_{12} Molecular weight = 84

45.







(d + ℓ)