FINAL NEET(UG)–2019 EXAMINATION

(Held On Sunday 05th MAY, 2019)

CHEMISTRY | TEST PAPER WITH ANSWER & SOLUTION

1. Under isothermal condition, a gas at 300 K expands from 0.1L to 0.25L against a constant external pressure of 2 bar. The work done by the gas is :-
[Given that 1L bar = 100 J]
(1) –30 J (2) 5kJ (3) 25 J (4) 30 J

Ans. (1)

Sol. $W = -P_{ext}(V_2-V_1)$
$P_{ext} = 2$ bar
$V_1 = 0.1$ L
$V_2 = 0.25$ L
$W = -2$ bar$[0.25 - 0.1]$ L
$W = -2 \times 0.15$ bar L
$W = -0.30$ bar L
$W = (-0.30) \times 100 = -30$ J

2. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is :-
(1) C_2A_3 (2) C_3A_2 (3) C_3A_4 (4) C_4A_3

Ans. (3)

Sol. Anion A in HCP
No of ions of A in Unit cell = 6
No of Octahedral voids = 6
75% is occupied by cations C

$$\text{No of cations C} = 6 \times \frac{75}{100} = 6 \times \frac{3}{4} = \frac{9}{2}$$

$C_{9/2}A_6$
C_9A_{12}
Simple ratio C_3A_4

3. pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is :-
(1) 0.5×10^{-15} (2) 0.25×10^{-10} (3) 0.125×10^{-15} (4) 0.5×10^{-10}

Ans. (1)

Sol. $\underset{}{Ca(OH)_2(s)} \rightleftharpoons \underset{S}{Ca^{+2}(aq)} + \underset{2S}{2OH^-(aq)}$

pH = 9 ; pOH = 5 ; $[OH^-] = 10^{-5} = 2S$

$$S = \frac{10^{-5}}{2}$$

$K_{sp} = [Ca^{+2}][OH^-]^2$
$K_{sp} = S \times (2S)^2$
$K_{sp} = 4S^3$

$$K_{sp} = 4 \times \left(\frac{10^{-5}}{2}\right)^3$$

$K_{sp} = 0.5 \times 10^{-15}$

4. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :-

(1) 10 (2) 20 (3) 30 (4) 40

Ans. (3)

Sol. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

2 mole $NH_3(g)$ requires 3mole $H_2(g)$

20 mole $NH_3(g)$ requires

$$= \frac{3}{2} \times 20 \text{ mole } H_2(g)$$

$= 30$ mole

5. For an ideal solution, the **correct** option is :-

(1) $\Delta_{mix} S = 0$ at constant T and P (2) $\Delta_{mix} V \neq 0$ at constant T and P

(3) $\Delta_{mix} H = 0$ at constant T and P (4) $\Delta_{mix} G = 0$ at constant T and P

Ans. (3)

Sol. For ideal solution $\Delta H_{mix} = 0$

6. For a cell involving one electron $E^{\ominus}_{cell} = 0.59V$ at 298 K, the equilibrium constant for the cell reaction is :-

$$\left[\text{Given that } \frac{2.303RT}{F} = 0.059V \text{ at } T = 298K\right]$$

(1) 1.0×10^2 (2) 1.0×10^5 (3) 1.0×10^{10} (4) 1.0×10^{30}

Ans. (3)

Sol. $E_{cell} = E^o{}_{cell} - \dfrac{2.303\ RT}{nF}\log_{10} Q$

at equlibrium $E_{cell} = 0$, $Q = K_{eq.}$

$$0 = E^o_{cell} - \frac{0.0591}{1}\log_{10} K_{eq.}$$

$E^o{}_{cell} = +0.0591 \log_{10} K_{eq.}$

$0.59 = +\ 0.0591 \log_{10} K_{eq.}$

$+10 = \log_{10} K_{eq.}$

$K_{eq.} = 10^{+10}$

7. Among the following, the one that is **not** a green house gas is :-

(1) nitrous oxide (2) methane (3) ozone (4) sulphur dioxide

Ans. (4)

Sol. Besides carbon dioxide, other greenhouse gases are methane, water vapour, nitrous oxide, CFCs and ozone.

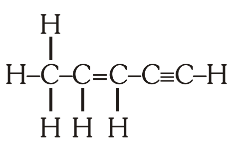
8. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is :-

(1) 10 σ bonds and 3π bonds (2) 8 σ bonds and 5π bonds

(3) 11 σ bonds and 2π bonds (4) 13 σ bonds and no π bond

Ans. (1)

Sol.



Number of sigma bonds = 10

Number of π-bonds = 3

9. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory ?

(1) O_2 (2) N_2 (3) C_2 (4) Be_2

Ans. (3)

Sol. According to M.O.T. electronic configuration of C_2 molecule is -

$\sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \pi_2 p_x^2 = \pi_2 p_y^2$

so, C_2 molecule contain only 'π' bond

10. Which of the following reactions are disproportionation reaction ?

(a) $2Cu^+ \rightarrow Cu^{2+} + Cu^0$

(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{\oplus}$

Select the **correct** option from the following :-

(1) (a) and (b) only (2) (a), (b) and (c) (3) (a), (c) and (d) (4) (a) and (d) only

Ans. (1)

Sol. (a) $2Cu^+ \rightarrow Cu^{+2} + Cu$

$$\begin{bmatrix} Cu^+ \rightarrow Cu^{+2}\text{(oxidation)} \\ Cu^+ \rightarrow Cu\ \text{(Reduction)} \end{bmatrix}$$

(b) $MnO_4^{2-} \rightarrow MnO_4^-$ (oxidation)

$+6 \qquad +7$

$MnO_4^{2-} \rightarrow MnO_2$ (Reduction)

$+6 \qquad +4$

The above two reaction are disproportionation.

11. Among the following, the narrow spectrum antibiotic is :-

(1) penicillin G (2) ampicillin (3) amoxycillin (4) chloramphenicol

Ans. (1)

Sol. The antibiotics which effective mainly against Gram-positive or Gram-negative bacteria are **narrow spectrum antibiotics. Penicillin G** has a narrow spectrum.

ampicillin, amoxycillin, chloramphenicol are **broad spectrum antibiotics**.

12. The **correct** order of the basic strength of methyl substituted amines in aqueous solution is :-

(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$ (2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$ (4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

Ans. (1)

Sol. The order of basic strength in case of methyl substituted amines and ethyl substituted amines in aqueous solution is as follows :

$(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$

$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$

13. Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]\ I^-$ sol. ?

(1) 50 mL of 1M $AgNO_3$ + 50 mL of 1.5 M KI

(2) 50 mL of 1M $AgNO_3$ + 50 mL of 2 M KI

(3) 50 mL of 2 M $AgNO_3$ + 50 mL of 1.5 M KI

(4) 50 mL of 0.1 M $AgNO_3$ + 50 mL of 0.1 M KI

Ans. (1,2)

Sol. In negatively charged colloid $[AgI]\ I^-$, I^- is preferentially adsorbed.

$AgNO_3 + KI \rightarrow AgI + KNO_3$

When KI is in excess, I^- will be adsorbed on the surface of AgI and $[AgI]\ I^-$ is formed

14. Conjugate base for Bronsted acids H_2O and HF are:-

(1) OH^- and H_2F^+ respectively
(2) H_3O^+ and F^-, respectively
(3) OH^- and F^-, respectively
(4) H_3O^+ and H_2F^+, respectively

Ans. (3)

Sol. Conjugate base of H_2O is OH^-
Conjugate base of HF is F^-

15. Which will make basic buffer ?

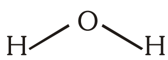
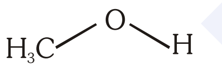
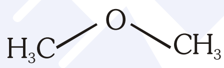
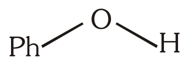
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1M NaOH
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

Ans. (3)

Sol. Basic buffer is mixture of weak base and salt of weak base with strong acid
milli mole of HCl = $100 \times 0.1 = 10$ milli mole
milli mole of $NH_4OH = 200 \times 0.1 = 20$ milli mole

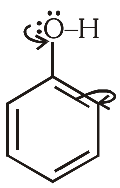
HCl +	NH_4OH →	NH_4Cl +	H_2O
10	20	–	–
–	10	10	

16. The compound that is most difficult to protonate is:-

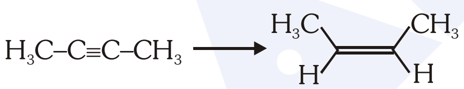
(1)  (2)  (3)  (4) 

Ans. (4)

Sol. In case of phenol lone pair of oxygen is delocalized in ring.



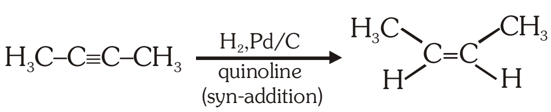
17. The most suitable reagent for the following conversion is :-



cis-2-butene

(1) Na/liquid NH_3
(2) H_2, Pd/C, quinoline
(3) Zn/HCl
(4) Hg^{2+}/H^+, H_2O

Ans. (2)

Sol. 

18. Which of the following species is **not** stable ?

(1) $[SiF_6]^{2-}$ (2) $[GeCl_6]^{2-}$ (3) $[Sn(OH)_6]^{2-}$ (4) $[SiCl_6]^{2-}$

Ans. (4)

Sol. $SiCl_6^{2-}$ does not exist since

(i) size of Cl^- is large so it cannot accommodate around Si^{+4} due to limitation of size
(ii) Interaction between lone pair of chloride ion and Si^{+4} is not very strong

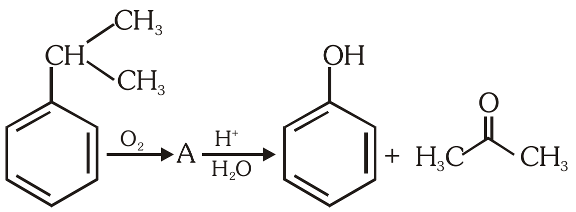
19. Which of the following is an amphoteric hydroxide?

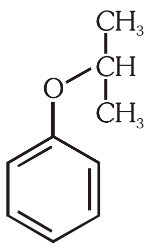
(1) $Sr(OH)_2$ (2) $Ca(OH)_2$ (3) $Mg(OH)_2$ (4) $Be(OH)_2$

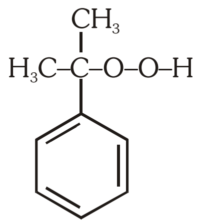
Ans. (4)

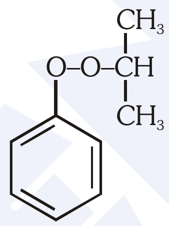
Sol. $Be(OH)_2$ is an amphoteric hydroxide rest all are basic hydroxides

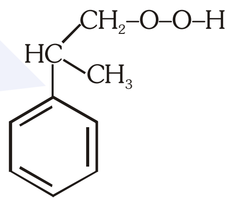
20. The structure of intermediate A in the following reaction is :-



(1) 

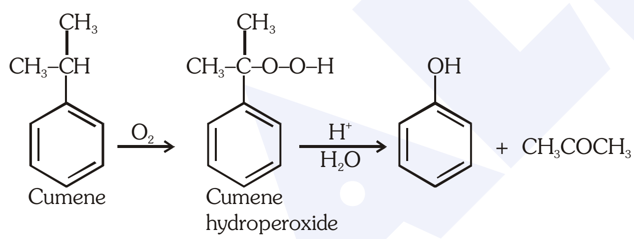
(2) 

(3) 

(4) 

Ans. (2)

Sol. Phenol is manufactured from the hydrocarbon, cumene. Cumene (isopropylbenzene) is oxidised in the presence of air to cumene hydroperoxide. it is converted to phenol and acetone by treating it with dilute acid. Acetone, a by-product of this reaction, is also obtained in large quantities by this method.



21. The manganate and permanganate ions are tetrahedral, due to

(1) The π–bonding involves overlap of p–orbitals of oxygen with d–orbitals of manganese

(2) There is no π–bonding

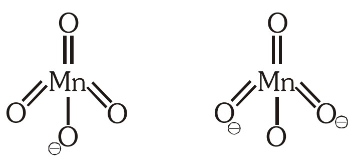
(3) The π–bonding involves overlap of p–orbitals of oxygen with p–orbitals of managanese

(4) The π–bonding involves overlap of d–orbitals of oxygen with d–orbitals of manganese

Ans. (1)

Sol. MnO_4^{-2} (Mangnate ion) and MnO_4^- (Permangnate ion)

both are tetrahedral



Since 'π' bond is formed between p-orbital of oxygen and d–orbital of Managnese

22. For the second period elements the **correct** increasing order of first ionisation enthalpy is :-

(1) Li < Be < B < C < N < O < F < Ne (2) Li < B < Be < C < O < N < F < Ne

(3) Li < B < Be < C < N < O < F < Ne (4) Li < Be < B < C < O < N < F < Ne

Ans. (2)

Sol. For same shell

$[s^1 < p^1 < s^2 < p^2 < p^4 < p^3 < p^5 < p^6]$

Li < B < Be < C < O < N < F < Ne

23. If the rate constant for a first order reaction is k, the time (t) required for the completion of 90% of the reaction is given by :-

(1) t = 0.693/k (2) t = 6.909/k (3) t = 4.606/k (4) t = 2.303/k

Ans. (3)

Sol. For first order reaction

$$k = \frac{1}{t}\ln\left[\frac{A_o}{A_t}\right]$$

For 99% completion,

$[A]_o = 100$, $[A]_t = 1$

$$k = \frac{1}{t}\ln\left[\frac{100}{1}\right]$$

$$k = \frac{2.303\log_{10}100}{t}$$

$$k = \frac{2.303\times 2}{t}$$

$$k = \frac{4.606}{t}$$

$$t = \frac{4.606}{k}$$

24. Identify the **incorrect** statement related to PCl_5 from the following :-

(1) Three equatorial P–Cl bonds make an angle of 120° with each other

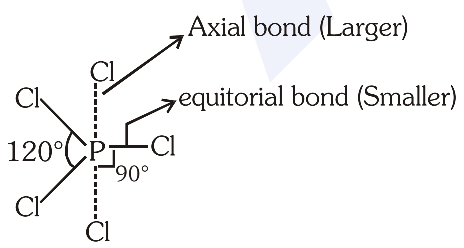
(2) Two axial P–Cl bonds make an angle of 180° with each other

(3) Axial P–Cl bonds are longer than equatorial P–Cl bonds

(4) PCl_5 molecule is non–reactive

Ans. (4)

Sol.



PCl_5 is reactive molecule

25. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The **correct** option is :-

(1) 5f > 6p > 5p > 4d (2) 6p > 5f > 5p > 4d

(3) 6p > 5f > 4d > 5p (4) 5f > 6p > 4d > 5p

Ans. (1)

Sol. According to (n+l) rule, correct order of energy is 5f > 6p > 5p > 4d

For same value of (n+l); higher is the value of n, higher will be the energy.

26. The biodegradable polymer is :-

(1) nylon–6,6 (2) nylon 2–nylon 6 (3) nylon–6 (4) Buna–S

Ans. **(2)**

Sol. Nylon 2–nylon 6

It is an alternating polyamide copolymer of glycine ($H_2N–CH_2–COOH$) and amino caproic acid [$H_2N(CH_2)_5COOH$] and is biodegradable.

27. Match the Xenon compounds in **Column–I** with its structure in **Column–II** and assign the **correct** code:-

	Column–I		**Column–II**
(a)	XeF_4	(i)	pyramidal
(b)	XeF_6	(ii)	square planar
(c)	$XeOF_4$	(iii)	distorted octahedral
(d)	XeO_3	(iv)	square pyramidal

Code :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iii)	(iv)	(i)	(ii)

Ans. **(2)**

Sol. (a) $XeF_4 – sp^3d^2$, $\ell p = 2$, square planar

(b) $XeF_6 – sp^3d^3$, $\ell p = 1$, Distorted octahedral

(c) $XeOF_4 – sp^3d^2$, $\ell p = 1$, Square pyramidal

(d) $XeO_3 – sp^3$, $\ell p = 1$, Pyramidal

28. Which is the **correct** thermal stability order for H_2E (E=O, S, Se, Te and Po) ?

(1) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$ (2) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

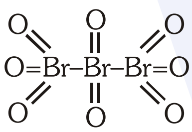
(3) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$ (4) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

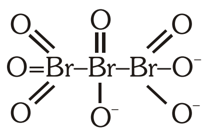
Ans. **(3)**

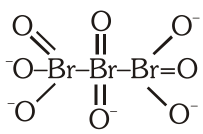
Sol. H_2O H_2S H_2Se H_2Te H_2Po

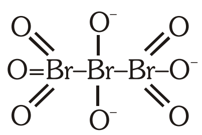
$\longrightarrow$ Size of central atom increases, thermal stability decreases

29. The **correct** structure of tribromooctaoxide is :-

(1) 

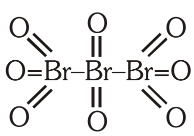
(2) 

(3) 

(4) 

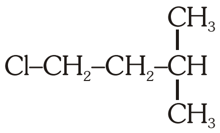
Ans. **(1)**

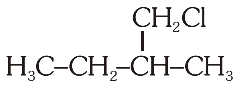
Sol. The correct structure is :-

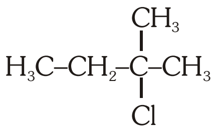


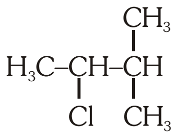
other options are anionic

30. An alkene "A" on reaction with O_3 and $Zn–H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is :-

(1) 

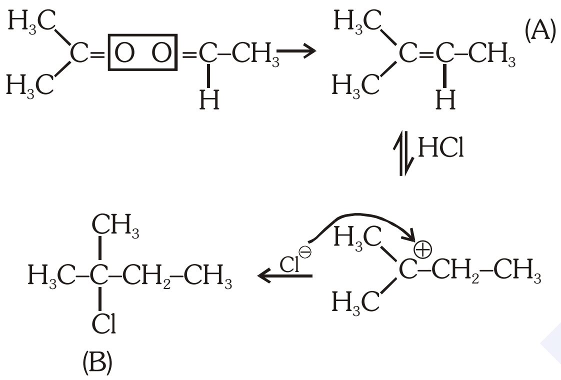
(2) 

(3) 

(4) 

Ans. **(3)**

Sol.



31. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is :

(1) Be (2) Mg (3) Ca (4) Sr

Ans. **(2)**

Sol. All enzymes that utilize ATP in phosphate transfer required magnesium as the cofactor.

32. Which one is malachite from the following ?

(1) $CuFeS_2$ (2) $Cu(OH)_2$ (3) Fe_3O_4 (4) $CuCO_3.Cu(OH)_2$

Ans. **(4)**

Sol. malachite $\Rightarrow CuCO_3.Cu(OH)_2$

33. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ?

(1) Lyman series (2) Balmer series

(3) Paschen series (4) Brackett series

Ans. **(2)**

Sol. In spectrum of hydrogen atom, spectral lines of Balmer series lie in visible region.

34. The mixture that forms maximum boiling azeotrope is :

(1) Water + Nitric acid (2) Ethanol + Water

(3) Acetone + Carbon disulphide (4) Heptane + Octane

Ans. **(1)**

Sol. Maximum boiling azeotrope are formed by solutions which show negative deviation from ideal behaviour.

Water + Nitric acid shows negative deviation.

35. For the cell reaction

$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

$E^{\ominus}_{cell} = 0.24V$ at 298 K. The standard Gibbs energy $(\Delta_r^{\circ}G^{\ominus})$ of the cell reaction is :

[Given that Faraday constant F = 96500 C mol^{-1}]

(1) – 46.32 kJ mol^{-1} (2) – 23.16 kJ mol^{-1} (3) 46.32 kJ mol^{-1} (4) 23.16 kJ mol^{-1}

Ans. **(1)**

Sol. $2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

$n = 2$

$\Delta G^{\circ} = -nFE^{\circ}$

$= -2 \times 96500 \times (0.24)$

$= -46320$ J

$= -46.32$ kJ mol^{-1}

36. In which case change in entropy is negative ?

(1) Evaporation of water

(2) Expansion of a gas at constant temperature

(3) Sublimation of solid to gas

(4) $2H(g) \rightarrow H_2(g)$

Ans. **(4)**

Sol. $2H(g) \rightarrow H_2(g)$

Due to bond formation, entropy decreases.

37. Match the following :

(a) Pure nitrogen (i) Chlorine

(b) Haber process (ii) Sulphuric acid

(c) Contact process (iii) Ammonia

(d) Deacon's process (iv) Sodium azide or Barium azide

Which of the following is the **correct** option ?

	(a)	(b)	(c)	(d)
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

Ans. **(4)**

Sol. (a) Pure nitrogen ⇒ Thermal decomposition of sodiumazide or Bariumazide

$(2NaN_3 \xrightarrow{\Delta} 2Na + 3N_2)$

$(Ba(N_3)_2 \xrightarrow{\Delta} Ba + 3N_2)$

(b) Haber process ⇒ Formation of Ammonia

$(N_2 + 3H_2 \rightleftharpoons 2NH_3)$

(c) Contact process ⇒ manufacture of H_2SO_4

(d) Deacon's process ⇒ Formation of Cl_2 gas

$(HCl + O_{2(Atmosphere)} \xrightarrow{CuCl_2} H_2O + Cl_2)$

38. Which of the following is **incorrect** statement ?

(1) PbF_4 is covalent in nature

(2) $SiCl_4$ is easily hydrolysed

(3) GeX_4 (X = F, Cl, Br, I) is more stable than GeX_2

(4) SnF_4 is ionic in nature

Ans. **(1)**

Sol. PbF_4 is an ionic compound due to large size of cation and small size of anion. Rest all are correct options

39. The non-essential amino acid among the following is :

(1) valine (2) leucine (3) alanine (4) lysine

Ans. **(3)**

Sol. non-essential amino acid – alanine

Essential amino acid – valine, leucine, lysine

40. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The **correct** option about the gas and its compressibility factor (Z) is :

(1) Z > 1 and attractive forces are dominant

(2) Z > 1 and repulsive forces are dominant

(3) Z < 1 and attractive forces are dominant

(4) Z < 1 and repulsive forces are dominant

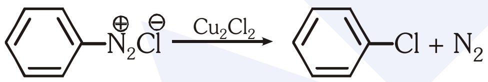
Ans. **(3)**

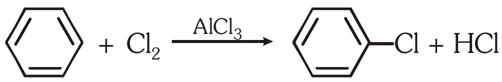
Sol. $(V_m)_{real} < (V_m)_{ideal}$

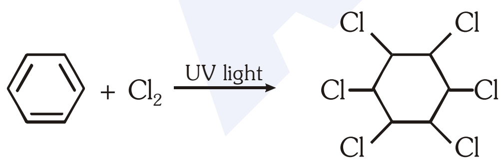
$$Z = \frac{(V_m)_{real}}{(V_m)_{ideal}}$$

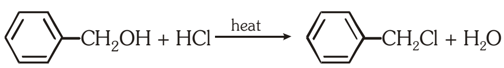
Z < 1 and attractive forces are dominant.

41. Among the following, the reaction that proceeds through an electrophilic substitution is :

(1) 

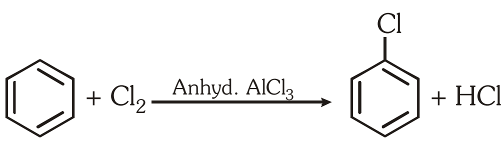
(2) 

(3) 

(4) 

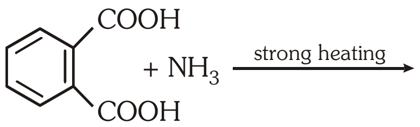
Ans. **(2)**

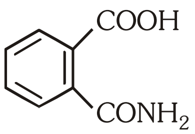
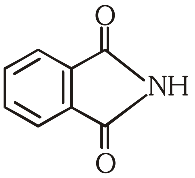
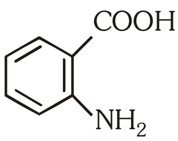
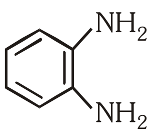
Sol. **Halogenation (Electrophilic substitution reactions)** : Arenes react with halogens in the presence of a Lewis acid like anhydrous $AlCl_3$



Chlorobenzene

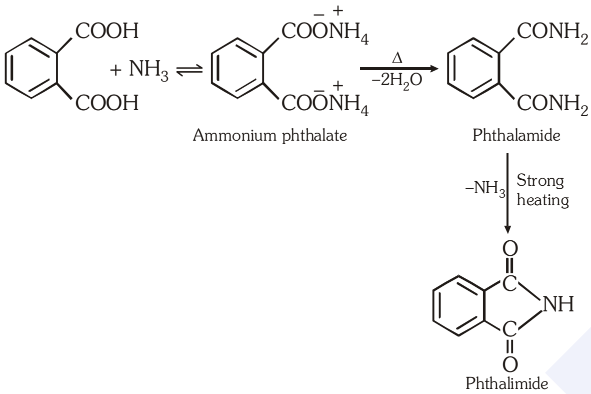
42. The major product of the following reaction is :



(1)  (2)  (3)  (4) 

Ans. (2)

Sol.



43. For the chemical reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

the **correct** option is :

(1) $-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$ (2) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$

(3) $-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$ (4) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

Ans. (3)

Sol. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

$$-\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$$

44. What is the **correct** electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory?

(1) $t_{2g}^4 e_g^2$ (2) $t_{2g}^6 e_g^0$ (3) $e^3 t_2^3$ (4) $e^4 t_2^2$

Ans. (2)

Sol. In $K_4[Fe(CN)_6]$

$Fe(26) = 3d^6\ 4s^2$

$Fe^{+2} = 3d^6$

in presence of SFL $3d^6 \rightarrow t_{2g}^6 e_g^0$

45. The method used to remove temporary hardness of water is :

(1) Calgon's method (2) Clark's method (3) Ion-exchange method (4) Synthetic resins method

Ans. (2)

Sol. Clark's method used to remove temporary hardness of water

$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3 + 2H_2O$