PART : CHEMISTRY

1. 3 gm of 'X' dissolve in 100 gm of CCl_4 which increases the boiling point by 0.6. Find molar mass of 'X'. Given K_b of CCl_4 = 5 K kg/mol.

Ans. 250

Sol. $\Delta T_b = K_b\, m$

$$= 5 \times \left(\frac{\text{Wt.} \times 1000}{\text{M.M} \times \text{Mass of solvent (g)}}\right)$$

$$= 5 \times \frac{3 \times 1000}{\text{M.M} \times 100}$$

$$0.6 = \frac{150}{\text{M.M}}$$

$$\text{M.M} = \frac{150}{0.6} = 250 \text{ g/mol.}$$

2. In the following ions, The spin only magnetic moment of Ti^{3+} ; Sc^{3+} ; V^{2+} respectively are

(1) 1.73, 0, 3.87 (2) 1.73, 3.87, 0 (3) 3.87, 0, 1.73 (4) 0, 1.73, 3.87

Ans. (1)

Sol. Ti^{3+} {Unpaired electron = 1}

Sc^{3+} {Unpaired electron = 0}

V^{+2} {Unpaired electron = 3}

$\mu = \sqrt{n(n+2)}$ B.M.

3. Heat given to a system is 150 joules and work done by the system is 200 joules. The magnitude of the change in the internal energy is :

Ans. (50)

Sol. q = 150 Joules

W = –200 Joules

4. The covalent radii of F^- = 1.33 Å, O^{2-} = 1.40 Å and for N = 0.74 Å. Then which of the following in correct:

(1) Ionic radius of N^{3-} is in between F^- and O^{2-} but greater than 'N'.

(2) Ionic radius of N^{3-} is greater than both F^- and O^{2-} and greater than 'N'.

(3) Ionic radius of N^{3-} is less than both F^- and O^{2-} and less than 'N'.

(4) Ionic radius of N^{3-} is less than both F^- and O^{2-} but less than 'N'.

Ans. (2)

Sol. F^- = 1.33 Å N = 0.74 Å

O^{2-} = 1.40 Å N^{3-} = 1.46 Å

Ionic radius of N^{3-} is greater than F^- and O^{2-}

size of Anion $\propto$ Magnitude of –ve change

5. For the following ions correct order of their Bond order is :

O_2^-, O_2, O_2^{2-}, O_2^+

(1) $O_2^- > O_2^- > O_2^+ > O_2^{2-}$ (2) $O_2^+ > O_2 > O_2^- > O_2^{2-}$

(3) $O_2^+ > O_2 > O_2^- > O_2^-$ (4) $O_2^+ > O_2^{2-} > O_2 > O_2^-$

Ans. (2)

Sol. According to Molecular orbital theory

$$B.O. = \frac{1}{2}[N_b - N_a]$$

O_2 = 2.0

O_2^+ = 2.5

O_2^- = 1.5

O_2^{2-} = 1.0

6.

Colloid	Dispersion Medium
a) Pumice Stone	(i) Liquid in Liquid
b) Cloud	(ii) Gas in Solid
c) Cheese	(iii) Liquid in Gas

$O_2 = 2.0$

$O_2^+ = 2.5$

$O_2^- = 1.5$

$O_2^{2-} = 1.0$

6.

Colloid	Dispersion Medium
a) Pumice Stone	(i) Liquid in Liquid
b) Cloud	(ii) Gas in Solid
c) Cheese	(iii) Liquid in Gas
d) Hair Cream	(iv) Liquid in solid

The Correct option is

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

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

Ans. (3)

Sol.

Dispersed phase	Dispersion medium	Type of colloid	Examples
Solid	Solid	Solid sol	Some coloured glasses and gem stones
Solid	Liquid	Sol	Paints, cell fluids

Sol.

Dispersed phase	Dispersion medium	Type of colloid	Examples
Solid	Solid	Solid sol	Some coloured glasses and gem stones
Solid	Liquid	Sol	Paints, cell fluids
Solid	Gas	Aerosol	Smoke, dust
Liquid	Solid	Gel	Cheese, butter, jellies
Liquid	Liquid	Emulsion	Milk, hair cream
Liquid	Gas	Aerosol	Fog, mist, cloud, insecticide sprays
Gas	Solid	Solid sol	Pumice stone, foam rubber
Gas	Liquid	Foam	Froth, whipped cream, soap lather

7. In Ho^{3+} [Atomic No. = 67), number of 4f electron are :

Ans. 10

Sol. Holmium (Z = 67) : $4f^{11}$, $6s^2$

Ho^{+3} : $4f^{10}$

8.

Column - I	Column - II
a) Li	(i) I^- is least soluble
b) Na	(ii) Bicarbonate is used in fire extinguisher
c) K	(iii) Carbonate easily decomposed on heating
d) Cs	(iv) Has vital role in biological system

The Correct option is :

(1) a-(iv) b-(iii) c-(ii) d-(i)

(2) a-(iii) b-(ii) c-(iv) d-(i)

(3) a-(i) b-(iv) c-(ii) d-(iii)

(4) a-(iv) b-(ii) c-(iii) d- (i)

Ans. (2)

Sol. (i) $Li_2CO_3 \xrightarrow{\Delta} Li_2O + CO_2$

(ii) $NaHCO_3$ is used in dry fire extinguishers.

(iii) Potassium has vital role in biological systems

8.

Column - I	Column - II
a) Li	(i) I^- is least soluble
b) Na	(ii) Bicarbonate is used in fire extinguisher
c) K	(iii) Carbonate easily decomposed on heating
d) Cs	(iv) Has vital role in biological system

The Correct option is :

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

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

Ans. (2)

Sol. (i) $Li_2CO_3 \xrightarrow{\Delta} Li_2O + CO_2$

(ii) $NaHCO_3$ is used in dry fire extinguishers.

(iii) Potassium has vital role in biological systems.

(iv) CsI is least soluble due to smaller hydration enthalpy of its two ions.

9. The concentration of H_3O^+ ions in 0.005 M solution of $Ba(OH)_2$ at 298 K is $[x] \times 10^{-12}$. Assume that $Ba(OH)_2$ is completely ionized under given conditions.

Ans. 1

Sol.

$Ba(OH)_2$	$\rightleftharpoons$	Ba^{+2}	+	$2OH^-$
0.005 M		—		—
—		0.005 M		0.010 M

$[OH^-] = 0.01 = 10^{-2}$ M

Now $[H^+][OH^-] = K_w$

$$[H_3O^+] = \frac{K_w}{[OH^-]}$$

$$= \frac{10^{-14}}{10^{-2}} = 10^{-12} \text{ M}$$

10. Which form interstitial hydride easily ?

(1) Fe (2) Cr (3) Ni (4) Co

Ans. (2)

Sol. These are formed by many d-block and f-block elements. However, the metals of group 7, 8 and 9 do not form hydride. Even from group 6, only chromium forms CrH.

11. Match List-I with List-II

Column-I	**Column-II**
(a) Froth Floatation	(i) Sulphide ore
(b) Bessemer convertor	(ii) Pig iron
(c) Blast furnance	(iii) Ag
(d) Leaching	(iv) Blister copper

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

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

Ans. (2)

12. In which of the following reaction oxidation state changes by 5.

(1) $Cr_2O_7^{2-} \rightarrow Cr^{+3}$ (2) $MnO_4^- \rightarrow Mn^{2+}$

(3) $C_2O_4^{2} \rightarrow CO_2$ (4) $CrO_4^{2-} \rightarrow Cr^{+3}$

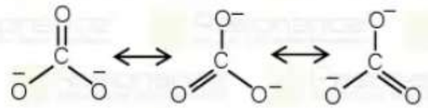
Ans. (2)

13. In which of the following compounds one π bond is present and maximum canonical structures possible.

(1) SO_3 (2) CO_3^{2-} (3) O_2 (4) SO_2

Ans. (2)

Sol.



3 canonical structures

14. An e^- moving with a velocity of 2×10^6 m/s. If the speed can be measured with an accuracy of 0.02% calculate the uncertainty in its position is 1.45×10^{-x}. The value of x :

Ans. (7)

Sol. $\Delta x \, \Delta p = \frac{h}{4\pi}$

$\Delta x . m\Delta V = \frac{h}{4\pi}$.

$\Delta v = 2 \times 10^6 \times \frac{0.02}{100}$

$\Delta v \rightarrow 400$ m/s

$$\Delta x = \frac{h}{4\pi \times m.\,\Delta V} = \frac{6.63 \times 10^{-34}}{4 \times 3.14 \times 9.1 \times 10^{-31} \times 400\ m/s} = 1.45 \times 10^{-7} s$$

15. $A \longrightarrow B$

In this reaction, concentration of B changes by 0.2 in 30 minutes. The average rate of the reaction is $x \times 10^{-1}$ moles per litre hour. The value of x is :

Ans. 4

Sol. $\text{Rate} = \frac{d[B]}{dt} = \frac{0.2 mole^{-1}}{0.5 \text{ hours}}$

$\Rightarrow$ 0.4 mole/L hr.

16. Which among the following compounds is most stable :

dt 0.5 hours

$\Rightarrow$ 0.4 mole/L hr.

16. Which among the following compounds is most stable :

(1) $[Cr(en)_2(NH_3)_2]Cl_3$ (2) $[Cr(en)_3]Cl_3$ (3) $[Cr(en)(NH_3)_4]Cl_3$ (4) $[Cr(NH_3)_6]Cl_3$

Ans. (2)

Sol. Chelation due to bidentateligand. Greater the chelation greater is the stability.

17. In Kjeldahl's method, 0.8g of organic compound is used. The percentage of Nitrogen came out to be 42%. The _____ ml of 1M H_2SO_4 used to neutralize ammonia.

(1) 17 (2) 20 (3) 30 (4) 12

Ans. (4)

Sol. $\% N = \frac{1.4\,N.V}{W}$

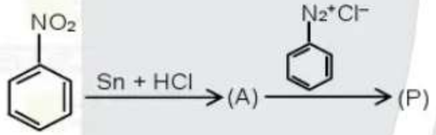
$42 = \frac{1.4 \times (1 \times 2) \times V}{0.8}$

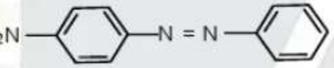
$V = 12$ ml

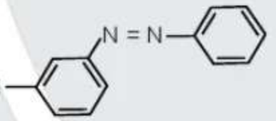
$$42 = \frac{1.4 \times (1 \times 2) \times V}{0.8}$$

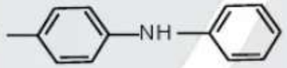
V = 12 ml

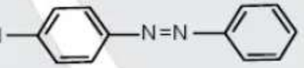
18. Find the product 'P'.



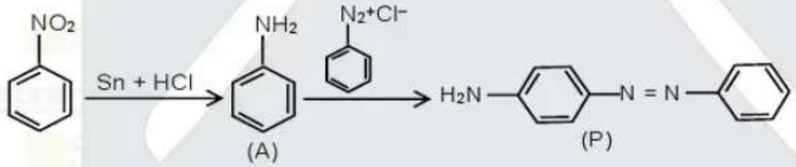
(1) 

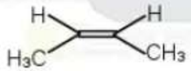
(2) 

(3) 

(4) 

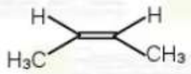
Ans. (1)

Sol. 

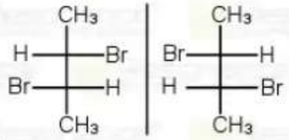
19. 

$\xrightarrow[CCl_4]{Br_2}$ Total no. of stereo isomeric products :

Ans. (2)

Sol. 

$\xrightarrow[CCl_4]{Br_2}$ (Anti addition)



(Racemic mixture)

20. Biodegradable polyamide is formed by-

(1) Glycine + isoprene (2) Glycine + Aminocaproic acid

(3) Alanine + chloroprene (4) Acrylonitrile + Aminocaproic acid

Ans. (2)

Sol. Nylon 2-Nylon 6 (Polyamide copolymer) is biodegradable polymer.

Its monomer units are : Glycine + Aminocaproic acid

$[H_2N-CH_2-COOH + NH_2(CH_2)_5-COOH]$

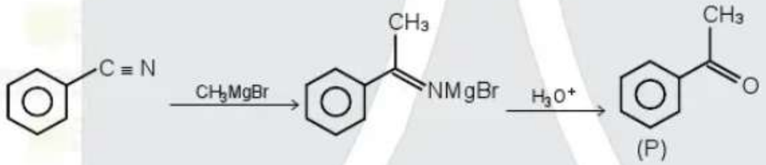
Glycine Aminocaproic acid

21. Benzenenitrile with grignard reagent form product (P), which of the following chemical test given by product (P)

(1) Schiff's reagent (2) Iodoform (3) Ninhydrin (4) Tollen's test

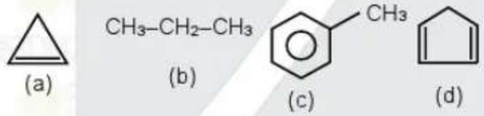
Ans. (2)

Sol.



(P)

22. Correct order of acidic strength form following compounds :



(a) (b) (c) (d)

(1) a > b > c > d (2) d > c > b > a (3) b > c > d > a (4) c > b > a > d

Ans. (2)

Sol. Acidic strength ∝ stability of conjugate base.

23. Structure of cytosine is :

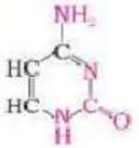
(a) (b) (c) (d)

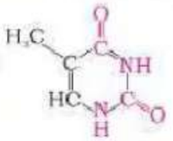
(1) a > b > c > d (2) d > c > b > a (3) b > c > d > a (4) c > b > a > d

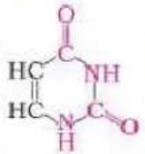
Ans. (2)

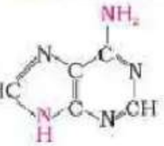
Sol. Acidic strength ∝ stability of conjugate base.

23. Structure of cytosine is :

(1) 
Cytosine (C)

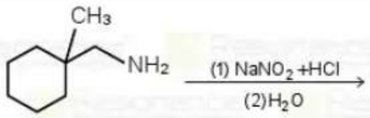
(2) 
Thymine (T)

(3) 
Uracil (U)

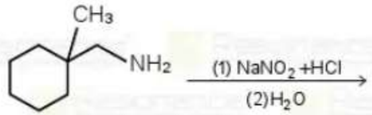
(4) 
Adenine (A)

Ans. (1)

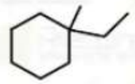
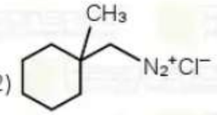
Sol. NCERT

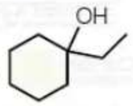
24. 

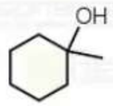
Product (P) is :

24. 

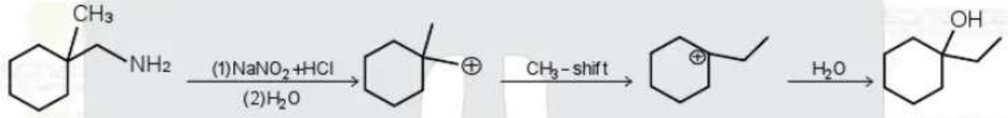
Product (P) is :

(1)  (2) 

(3) 

(4) 

Ans. (3)

Sol. 

25. **S_1 :** CFCs are dissociated with to Cl radical by radiation of visible region.

S_2 : O_3 reacts with nitric oxide to form N_2 & O_2

(1) False, True (2) False, False (3) True, False (4) True, True

Ans. (2)

Sol. $CFCs + UV \longrightarrow Cl^{\bullet}$

$O_3 + NO \longrightarrow NO_2 + O_2$

26. Increasing order of density :

(I) Benzene (II) 1,3-Dichlorobenzene

(III) Chloro benzene (IV) 1-Bromo-3-chlorobenzene

(1) IV > II > III > I (2) IV > III > II > I (3) III > II > IV > I (4) I > II > III > IV

Ans. (1)

Sol. Higher the molecular weight higher will be density.

27. Maleic anhydride can be prepared by.

(1) Treating cis but-2-ene-1,4-dioic acid with alcohol.

(2) Heating cis but-2-ene-1,4-dioic acid

(3) Treating trans but-2-ene-1,4-dioic acid with alcohol and acid

(4) Heating trans but-2-ene-idiric acid

Ans. (2)