

1. (d) π is irrational number (please note that $\pi \neq 22/7$ as 22/7 is a rational number) and it means it has infinite number of significant figures.

2. (c) NCERT (XI) Ch - 1, Pg. 15

According to Avogadro's principle, ratio of volume of gases will be equal to the ratio of their number of moles

mole =
$$\frac{W}{M_w}$$

$$\begin{array}{rrrr} n_{H_2}: & n_{O_2}: & n_{CH_4} \\ \\ \hline 1 \\ 2 & : & \hline 1 \\ 32 & : & \hline 1 \\ 16 & \end{array} \Rightarrow 16 & : & 1 : 2 \end{array}$$

3. (b) Area = length \times width

=
$$(12.34 \text{ cm}) \times (1.23 \text{ cm}) = 15.1782 \text{ cm}^2$$

 $\simeq 15.19 \text{ cm}^2$

- 4. (c) Law of reciprocal proportion.
- 5. (b) Mass of 22.4 L gas at S.T.P. = $\frac{8 \times 22.4}{5.6}$ = 32 g (it is also equal to mol. mass)
 - Mol. mass = 32 g/mol

:. V.D. =
$$\frac{32 \times 1}{2} = 16$$

6. (a) Moles of sugar added = $\frac{1.71}{342} = 5 \times 10^{-3}$

Carbon atoms added = $12 \times 5 \times 10^{-3} \times 6.023 \times 10^{23}$

= 3.61×10^{22} atoms of carbon

- 7. (b) NCERT (XI) Ch 1, Pg. 15 & 20
 - 6.02×10^{23} number of molecules = 1 mole $6.02 \times 10^{20} = 0.001$ mole

Concentration =
$$\frac{\text{mole}}{V(\text{mL})} \times 1000$$

= $\frac{0.001}{100} \times 1000 \implies 0.01 \text{ M}$

8. (a) $\operatorname{CaCl}_2 + 2\operatorname{AgNO}_3 \rightarrow \operatorname{Ca}(\operatorname{NO}_3)_2 + 2\operatorname{AgCl}$ 111 g 2×143.5 g CaCl₂ require to produce 2×143.5 of AgCl = 111 g CaCl₂ required to produce 14.35 g of AgCl

$$=\frac{111\times14.35}{2\times143.5}=5.55$$
 g

9. (b) NCERT (XI) Ch - 1, Pg. 17

 $\begin{array}{rrrr} \mathrm{H_2} &+& \displaystyle\frac{1}{2}\mathrm{O_2} &\rightarrow \mathrm{H_2O} \\ 2 \mathrm{~g} && 16 \mathrm{~g} && 18 \mathrm{~g} \\ 1 \mathrm{~mol} && 0.5 && 1 \mathrm{~mol} \end{array}$

10 g of $H_2 = 5$ mol and 64 g of $O_2 = 2$ mol

... In this reaction, oxygen is the limiting reagent so,

amount of H_2O produced depends on the O_2 . Since 0.5 mol of O_2 gives 1 mol H_2O \therefore 2 mol of O_2 will give 4 mol H_2O .

- **10.** (c) $MCl_x + x AgNO_3 \rightarrow M(NO_3)_x + xAgCl$ Molar ratio: 1 x 1 x Molecules of AgNO₃ given = $\frac{0.6}{100} \times 500 = 3$ Moles of $MCl_x = 0.1$ ∴ The value of x = 3 **11.** (c) $SO_2Cl_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$
 - $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + H_2O$
 - \therefore 1 mol of SO_2Cl_2 in aqueous solution requires 3 moles of NaOH and 2 moles Ca(OH)_2
- 12. (a) NCERT (XI) Ch , 1 Pg. 20

Molarity
$$=\frac{W \times 1000}{Mol. wt. \times V_{sol(mL)}} \Rightarrow 2 = \frac{W}{63} \times \frac{1000}{250}$$

$$W = \frac{35}{2}g$$

Mass of acid $\times \frac{70}{100} = \frac{63}{2}$

Mass of acid = 45 g

13. (a) NCERT (XI) Ch - 1, Pg - 15

Converting 200 mg of CO₂ into moles Number of moles of CO₂ = $\frac{w}{m} = \frac{200 \times 10^{-3}}{44}$ Converting 10²¹ molecules into moles Number of moles of CO₂ removed = $\frac{10^{21}}{6 \times 10^{23}}$ Number of moles of CO₂ left = $\frac{200 \times 10^{-3}}{44} - \frac{10^{21}}{6 \times 10^{23}}$

$$= 2.88 \times 10^{-3}$$

14. (c)
$$CH_2O = 12 + 2 + 16 = 30$$

 $n = \frac{M.m(molecular mass)}{E.m(empirical mass)} = \frac{180}{30}$

So
$$C_6H_{12}O_6 = \frac{18}{3} = 6$$

15. (a) C : H : N = 9 : 1 : 3.5
∴ mole ratio = C : H : N =
$$\frac{9}{12}$$
 : $\frac{1}{1}$: $\frac{3.5}{14}$
= 3 : 4 : 1
(C₃H₄N)_x ⇒ x = 2 & C₆H₈N₂
16. (d) (i) 14 g (ii) 40 g
(iii) $\frac{108}{6.022 \times 10^{23}} = 1.79 \times 10^{-22} g$

1

(iv) 32 g (v) 1.99 g (vi) 1 g

Hence, the correct order of increasing masses is (iii) < (vi) < (v) < (i) < (iv) < (ii)

17. (c) For 1 molal aqueous solution of water = 1000 g or 1 kg Mole fraction of water = $\frac{1000}{18}$ = 55.55

Mole fraction of solute in water $=\frac{1}{55.5}=0.018$

18. (c)
$$x_{CH_{3}COOH} = \frac{n_{CH_{3}COOH}}{n_{CH_{3}COOH} + n_{H_{2}O}}$$

 $\Rightarrow 0.1(given) = \frac{1}{1+9}$
 $W_{A} = 9 \times 18 = 162 \text{ g}$
 $= \frac{162}{1000} \text{ kg}$

Molality = $\frac{n_B}{W_A (kg)} = \frac{1 \times 1000}{162} = 6.17 \text{ mol kg}^{-1}$ Alternatively, $x_{CH_3COOH} = 0.1$ $x_{H_2O} = 1 - 0.1 = 0.9$ Molality = $\frac{1000 \times x_B}{x_A \times M_A} = \frac{1000 \times 0.1}{0.9 \times 18} = 6.17 \text{ mol kg}^{-1}$ **19. (a)** $m = \frac{1000 \text{ M}}{1000d - \text{MM}_B} = \frac{1000 \times 4}{(1000 \times 1.6) - (4 \times 40)}$ $= \frac{4000}{1600 - 160} = \frac{4000}{1440} = 2.77 \text{ mol kg}^{-1}$ **20. (b)** 1 mol = 6.022 × 10²³ molecules $H_2 = 2 \text{ g} = 6.022 \times 10^{23} \text{ molecules}$

Ch - 2 Structure of Atom

1. (b) Because they both have 2 electrons



2. (d) NCERT (XI) Ch - 2, Pg. 53

The total number of orbital present in n = 4 is n^2 . = $(4)^2 = 16$

Shell	No. of orbital
S	1
р	3
d	5
f	7

- 3. (b) Isoelectronic species have same number of electrons.
 - $_{19}$ K⁺: Number of electrons = 19 1 = 18
 - $_{17}$ Cl⁻ : Number of electrons = 17 + 1 = 18
 - $_{20}$ Ca²⁺: Number of electrons = 20 2 = 18

hence, K⁺, Cl⁻ and Ca²⁺ are isoelectronic species.

4. (d) In 1885, Balmer for the first time showed that the wave numbers of spectral lines present in the visible region in hydrogen spectrum are given by:

$$\overline{v}(cm^{-1}) = 109677 \left(\frac{1}{(2)^2} - \frac{1}{n_2^2}\right)$$

Hence; $n_2 = 3, 4, 5$

Hence; the Balmer spectrum of hydrogen was discovered first and it lies in visible region.

5. (a) NCERT (XI) Ch - 2, Pg. 58

According to Aufbau's rule of increasing order of energy for filling up of electron.

$$Ti(22) = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$$

3s < 3p < 4s < 3d

6. (c) Ionisation energy of an atom of atomic number, Z is given by

I.E. =
$$\frac{(I.E)_{H} \times Z^{2}}{n^{2}} = 13.6 \times \frac{Z^{2}}{n^{2}} eV$$

Thus, second ionisation energy for He-atom is given by

I.E. =
$$\frac{13.6 \times (2)^2}{(1)^2}$$
 eV \Rightarrow 54.4 eV

7. (c) Second Bohr orbit of hydrogen atom, i.e., n = 2.

Atomic number of hydrogen
$$(Z) = 1$$

by using
$$r = \frac{0.529n^2}{Z} = \frac{0.529 \times (2)^2}{1}$$

= 2.116 Å \Rightarrow 0.2116 nm

$$E = \frac{hc}{\lambda}$$

$$E = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{45 \times 10^{-9}} = 4.42 \times 10^{-18} \text{ J}$$

9. (d) According to Heisenberg's uncertainty principle

$$\begin{split} m\Delta v \times \Delta x &\geq \frac{h}{4\pi} \\ m &= 6.626 \times 10^{-28} \text{ kg} \\ \Delta v &= 10^{-6} \text{ m/sec} \\ h &= 6.626 \times 10^{-34} \text{ Js} \\ 6.626 \times 10^{-28} \times 10^{-6} \times \Delta x &= \frac{6.626 \times 10^{-34}}{4\pi} \\ \Delta x &= \frac{6.626 \times 10^{-34}}{4\pi \times 6.626 \times 10^{-34}} = \frac{1}{4\pi} \end{split}$$

10. (a)
$$\lambda = \frac{h}{\sqrt{2mE}} = \frac{6.626 \times 10^{-34}}{\sqrt{2 \times 1 \times 0.5}}$$

= 6.626 \times 10^{-34} m.

11. (c) According to Heisenberg's uncertainty principle

$$\Delta x. \Delta p \ge \frac{h}{4\pi}$$

But Δp (momentum) = m Δv
 $\Delta x. m\Delta v \ge \frac{h}{4\pi}$
 $\Delta x = \frac{h}{4\pi m \Delta v}$

12. (d) Electronic configuration of

Thus, outer orbital diagram for Ni^{2+} is $3d^8$

$$\boxed{1} 1 1 1 1$$

$$\Rightarrow n = 2$$

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

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

$$\mu = \sqrt{8}$$

$$\mu = 2.83 B M$$

13. (c) Total no. of orbital in a shell is n^2 .

14. (a) NCERT (XI) Ch - 2, Pg. 45

$$n_2 = 6, n_1 = 5$$
 as $\mathbf{E} \propto \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

When $n_2^2 > n_1^2$, hydrogen will give rise to least energised photon.

15. (d) NCERT (XI) Ch - 2, Pg - 36

(Fact Based)

16. (c)
$$n=2$$

 $2s$ $2p$
 \downarrow \downarrow
 Q

17. (c) The energy of violet line is highest. Hence the violet line spectra is obtained where ΔE is maximum

Violet line $\Rightarrow \lambda_{min} \Rightarrow E_{max} = 4 \rightarrow 1$

18. (a) Correct graph will be



19. (b) (ii), (iv), and (v) are not possible

(ii)	<i>n</i> = 2	<i>l</i> = 2	<i>m</i> = 1	s = +1/2	l not equal to n not possible
(iv)	<i>n</i> = 1	l = 0	m = -1	s = -1/2	Not possible because $m = -1$ where $l = 0$
(v)	<i>n</i> = 3	<i>l</i> = 2	<i>m</i> = 3	s = +1/2	Not possible because $m = 3$ is not for $l = 2$

20. (d) NCERT (XI) Ch - 2, Pg. 97

Highest ionisation energy will be of Ne[$3s^23p^3$], it has half-filled 3p orbitals which are most stable than partially filled orbitals.

 \therefore It will be very difficult to extract electron from a stable system.

- 1. (a) Refers to NCERT Page No. 75 (Class-XI, Part 1), and according to periodic table.
- **2.** (c) Noble gases that are group 18 elements are naturally occurring diamagnetic *p*-Block element. eg: He, Ne, Ar, Kr, Xe).
- 3. (c) NCERT (XI) Ch 3, Pg. 77

Carbon family: [Rn] $5f^{14}6d^{10}7s^27p^2$

- **4.** (b) Refers to NCERT Page No. 81 (Class-XI, Part 1) and electronic filling configuration.
- 5. (d) Radii are in the following order $O^{2-} > F^- > O > F$

 $\mathrm{O}^{2\text{-}}$ and $\mathrm{F}\text{-}$ are isoelectronic and O,F belong to the same period

6. (c) Zn^{2+} : $[Ar]^{18} 3d^{10}$; Ag^+ : $[Kr]^{36} 4d^{10}$

 Cu^+ : $[Ar]^{18} 3d^{10}$; Ni^{2+} : $[Ar]^{18} 3d^{8}$

As such Ni²⁺ has two unpaired electrons and is paramagnetic.

7. (a) NCERT (XI) Ch - 3, Pg. 84

 $Be^{2+} = 1e^{-}$ $Li^+ = 1e^{-}$

Isoelectronic species means ions with same number of electron.

8. (c) On increasing effective nuclear charge ionic size decreases.

$$r_{ionic} \propto \frac{1}{Z_{eff}}$$

9. (b) NCERT (XI), Part-I, Pg. 82

10. (b) NCERT (XI), Ch - 3, Pg. 86

Cations lose electrons and are smaller in size than the parent atom, whereas anions add electrons and are larger in size than the parent atom.

Hence, the order is $H^- > H > H^+$.

For isoelectronic species, the ionic radii decreases with increase in atomic number i.e., nuclear charge.

Hence, the correct orders are:

 $O^{2-} > F^- > Na^+$ and $N^{3-} > Mg^{2+} > Al^{3+}$

11. (d) $(15)P^{3-}$, $(16)S^{2-}$, $(17)Cl^{-}$, belong to 3^{rd} period whereas $(20)Ca^{2+}$ belong to 4th period.

These are isoelectronic ions and therefore size depends on nuclear charge. More is the nuclear charge, smaller is the size.

12. (c) NCERT (XI), Part-I, Pg. 87

- 13. (b) The most electronegative element is Fluorine.
- 14. (d) Along a period size decrease while down the group size increases.

Grp 14	Grp 15
Ν	_
Р	S
	Grp 14 N P

15. (c) NCERT (XI) Ch - 3, Pg. 87

As the atomic number increases from group 16 to 17. The electron gain enthalpy becomes more negative, also it is greatest for group 17 members followed by group 16.

Group $17 \rightarrow Cl > F > Br > I$

Group $16 \rightarrow S > Se > Te > Po > O$

- 16. (a) $Ca^{2+} < K^+ < Ar < C\Gamma < S^{2-}$ Smaller size due to more effective nuclear charge and more the positive charge smaller will be the size
- **17. (b)** For isoelectronic more is the positive charge smaller will be the size
- **18.** (a) Size of positive charge atom i.e., cation is always lesser than parent atom due to increase in effective nuclear

charge i.e., $Al > Al^{\oplus} > Al^{2+}$

- **19.** (d) Last electrons enters in d-subshell
 - : It is d-block elements.

		Cl		
	Se	Br	Kr	
20. (a)	Te	Ι	Xe	

Chlorine has high electron affinity.

- (c) Ionic character increases as; BeCl₂ < MgCl₂ < CaCl₂
 BaCl₂ because larger the size of the cation, higher is the ionic character.
- 2. (d) NCERT (XI) Ch 4, Pg. 120

 $[Cu(NH_3)_4]^{2+}$ is not tetrahedral. It is a square planar complex.



- **3.** (a) As the electronegativity of the central atom decreases and the size increases, the bond angle decrease in similar molecules.
- **4. (d)** (O–O bond length in O₂ is 120.7 pm, O₃ is 127.8 pm, H₂O₂ is 147.5 pm
- **5.** (d) Sn has 2 b.p and 1 l.p around it. The arrangement of electron pairs is trigonal planar.

6. (d) NCERT (XI) Ch - 4, Pg. 104

O, Se, Se, Te belong to Group 16.

On moving down the group, size of atom increases.



'O' is most electronegative and lone pairs lie close to the atom electron cloud. This causes repulsion in lone pairs of oxygen and bond pairs of hydrogen.

 \therefore Angle maximum due to $l_p - b_p$ repulsion.



Te has maximum size: lone pair lie far away from the atom electron cloud. Lone pair - bond pair repulsion is the least.

7. (d) In AlCl₂ molecule, central Al-atom is sp^2 hybridised.

$$H = \frac{1}{2}[3 + 3 - 0 + 0] = 3$$

- (b) Polarity of molecule decreases with decrease in dipole moment. The dipole moment of HF, H₂O, SO₂ and NH₃ are 1.92 D, 1.84 D, 1.60 D, and 1.4 D respectively.
- 9. (c) Bond angle of hydrides of group 16 elements are

$$H_2O > H_2S > H_2Se > H_2Te$$

10. (d) In XeOF,

Number of σ – bonds = 3

Number of lone pairs = 2

- \therefore Total number of pairs of electrons = 3 + 2 = 5
- **11.** (c) Total number of electrons in $N_2^- = 7 + 7 + 1 = 15$

Total number of electrons in N_2^{2-} 7 + 7 + 2 = 16

Total number of electrons in $O_2^{2-} = 8 + 8 + 2 = 18$

Total number of electrons in $O_2^- = 8 + 8 + 1 = 17$

Total number of electrons in $O_2^+ = 8 + 8 - 1 = 15$

Configuration will be same if as N_2^- and O_2^+ contain the same total number of electrons. Thus $\,N_2^-$ and $\,O_2^+$ has the same bond order.

12. (a) Given electronic configuration of anion X is-

 $\sigma 1s^2$, $\sigma^* 1s^2$, $\sigma 2s^2$, $\sigma^* 2s^2$, $\pi 2p_x^2 \approx \pi 2p_y^2$, $\sigma 2p_z^2$, $\pi^* 2p_x^{-1}$

 \therefore Total number of electron of anion X = 15

Hence; the anion X is N_2^{-1}

13. (c) NCERT (XI) Ch - 4, Pg. 118



Coplanar are in a plane or where all C atoms are sp^2 hybridised.

14. (b)

15. (a) NCERT (XI) Ch - 4, Pg - 126

 KO_2 has O_2^- ion, Bond order = 1.5

 O_2 (AsF₆) has O_2^+ ion, Bond order = 2.5

 O_2 has Bond order = 2

 Na_2O_2 has O_2^{2-} (peroxide ion), Bond order = 1

16. (c) NCERT (XI) Ch - 4

Hybridisation state = Number of σ bond + number of lone pair or

Hybridisation state \rightarrow from steric number rule

Hybridisation state =
$$\frac{1}{2}$$
 (V.E + MA - C + a)

For, NO₂⁺ =
$$\frac{1}{2}(5+0-1)$$

=2 \rightarrow sp

$$NO_3^- = \frac{1}{2} [5+0+1]$$
$$= 3 \rightarrow sp^2$$

$$NH_4^+ = \frac{1}{2} [5 + 4 - 1]$$

18. (c) O_2 have two unpaired electron, O_2^+ have one unpaired

 $\begin{array}{c} \bigcirc & \bigcirc \\ \mathbf{F} - \mathbf{X} \mathbf{e} - \mathbf{F} \\ \parallel \end{array}$

electron, O_2^{2-} have zero unpaired electron. As number of unpaired electrons increases paramagnetic character increases.

19. (a) The order of bond angles

 $BF_3 > SiH_4 > NH_3 > H_2S$ 120° 109°28' 107° 92.5°

20. (b) Symmetrical molecule with linear structure will have zero dipole moment.

Ch - 5 States of Matter

- **1.** (a) The vapour density of a gas = 11.2
 - \therefore Molecular weight = 2 × vapour density
 - \therefore Molecular weight of a gas = 2 × 11.2 = 22.4 g
 - \therefore 22.4 g of a gas occupies = 22.4 L volume

$$\therefore$$
 1 g of a gas occupied = $\frac{22.4}{22.4} \times 1 = 1L$

2. (b) NCERT (XI) Ch - 5, Pg. 147

Gas shows ideal behaviour when temperature is very high and pressure is low because of these two conditions gas molecules are less attracted towards each other.

3. (c) Volume of 1 mole of an ideal gas at 273 K and 1 atm is 22.42 L. Volume at 373 K and 1 atm P will be-

$$V = \frac{RT}{P} = \frac{0.082 \times 373}{1} = 30.6 L$$

4. (a) NCERT (XI) Ch - 5, Pg. 134

Dipole-induced dipole interaction present between one polar and one non-polar species

 $HCl \rightarrow M \neq 0$ (polar)

 $He \rightarrow M = 0$ (Non polar)

So between HCl and He dipole-induced dipole interaction is present

- 5. (c) n = 1 + 2 = 3 mole
 - \therefore Volume of 3 mole gas at NTP = 3 × 22.4 L

V = 67.2 L

6. (a)
$$v_{rms} : v_{avg} : v_{mp} \Rightarrow \sqrt{\frac{3RT}{M}} : \sqrt{\frac{8RT}{\pi M}} : \sqrt{\frac{2RT}{M}}$$

7. (c) NCERT (XI) Ch - 5, Pg. 138 $\frac{P_1 V_1}{T} = \frac{P_2 V_2}{T}$

$$=\frac{1.5 \times V_1}{288} = \frac{1 \times V_2}{298}$$

$$V_2 = 1.55 V_1 \implies V_2 \sim 1.6 V_2$$

Volume will become greater by a factor of 1.6.

- 8. (a) Compressibility factor; $Z = \frac{V_{obs}}{V_{calc}}$ For ideal gas, $V_{ob} = V_{cal}$; So Z = 1
- 9. (a) Boyle's temperature; $T_b = \frac{a}{Rb}$ Boyle's temperature (T_b) is the temperature at which a real

gas tend to behave ideally over a wide range of pressure.

$$T_{b} = \frac{a}{R.b} = \left[\frac{\partial (PV)}{\partial P}\right]_{\text{limit } p \to 0}$$

At this temperature the effect of size of molecular and intermolecular forces roughly compensate each other.

- **10. (a)** Water fills a smaller volume when it is liquid rather than solid, it will go to a lower melting point, on increasing pressure, allowing more solid to become liquid.
- **11. (a)** Surface tension is determined by single capillary method.
- **12.** (c) Greater the value of Vander Waal's constant 'a', greater are the intermolecular forces of attraction and greater is the ease of liquefaction.
- 13. (c) The gas which shows higher value of 'a' will have higher value of critical temperature as Vander Waals' constant 'a' is directly proportional to critical temperature i.e.

$$T_c = \frac{8a}{27 \text{ Rb}}$$

- **14.** (d) Equal volumes of all the gases under the same conditions of temperature and pressure contain equal number of molecules.
- **15.** (d) At constant temperature, decrease in molecular mass causes flattening of the graph. For same molecular mass of gas, increase in temperature causes flattening of the graph. $(V_{mp})T_1 < (V_{mp})T_2$

16. (d) NCERT (XI) Ch - 5, Pg. 145

Hydrogen bonding is the strongest of all interactions, and holds the molecule tightly.

- 17. (d) Rate of diffusion $\propto \frac{1}{\sqrt{d}} \propto \frac{1}{\sqrt{M}}$ these gases have same molecular mass.
- **18. (a)** $a = 3p_C V_C^2$ = 3 × 218 × (0.057)² = 2.12 L² atm mol⁻²
- 19. (b)
- **20. (a)** Hydrogen bonding $\propto \frac{1}{\text{Surface tension}}$

More the hydrogen bonding, less will be the surface tension. Among all the options, H_2O has least number of hydrogen bonds.

.:. Maximum surface tension.

- 1. (b) Refers to NCERT Page No. 156 (Class-XI, Part 1)
- 2. (d) NCERT (XI) Ch 6, Pg. 178

According to 3rd law of thermodynamics:

$$\Delta S_{\text{syst.}} = \frac{\Delta H}{T}$$
$$\Delta S = \frac{1.435 \times 10^3}{273} = 5.26 \text{ cal/k mol.}$$

3. (c) Refers to NCERT Page No. 160 (Class-XI, Part - 1)

4. (d) NCERT (XI) Ch - 6 Pg. 160

For free expansion of ideal gas,

- $q = 0, \Delta T = 0$ and w = 0
- 5. (a) Internal energy of one mole of a gas is $\frac{3}{2}$ RT
- 6. (c) At A, temperature = 300 K, volume = 10 L, Pressure = P_1 ,

At C, Temperature = 600K, volume = 20L, Pressure = P_2

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Longrightarrow \frac{P_1 \times 10}{300} = \frac{P_2 \times 20}{600}$$
$$P_1 = P_2$$

Thus; the process is isobaric.

- 7. (c) Because ΔE is a state function.
- **8.** (b) $\Delta H_{\text{combustion}} = -393.5 \text{ kJ/mol},$

i.e., 1 mole of CO_2 on combustion release = -393.5 kJ

$$\frac{35.2}{44} \text{ moles of CO}_2 \text{ will release}$$
$$= \frac{-13851.2}{44} = -314.8 \text{ kJ}$$

9. (d) $\Delta G^\circ = -RT \ln K_c$

- **10.** (d) Mass/volume = density is a intensive property.
- **11. (b)** For perfectly crystalline solids at 0 K, all molecular motion cases and particles are closed packed. Thus;

randomness and hence entropy is minimum.

12. (b) According to second law of thermodynamics.

13. (a)
$$\Delta S = \frac{q_{rev}}{T} = \frac{J \text{ mol}^{-1}}{K} = JK^{-1}\text{mol}^{-1}$$

14. (a) At eqm. $\Delta G = 0$ Since standard conditions prevail at eqm, then $\Delta G = \Delta^{\circ}G = 0$ Now, $\Delta^{\circ}G = -2.303$ RT log K 0 = -2.303RT log K log K = 0 K = 1

15. (d) NCERT (XI) Ch - 6, Pg. 178

For any spontaneous process, $\Delta G = (-ve)$ and $\Delta S = (+ve)$ that is increase in entropy So, at $\Delta H < 0$ and $\Delta S > 0$ at all temperatures according the reaction will be spontaneous.

16. (b) $\Delta G < 0$, $\Delta S > 0$

17. (d)

$$\Delta S = nRln \ \frac{P_i}{P_f} + nCPln\frac{T_i}{T_f}$$

For isothermal process $T_i = T_f = 0$

$$\therefore \Delta \mathbf{S} = nR \ln \frac{P_i}{P_f}$$

19. (a)

20. (c) NCERT (XI) Ch - 6, Pg. 179

Gibbs free energy for transformation = 0

$$\Delta G = \Delta H - T\Delta S = 0$$
$$T = \frac{\Delta H}{\Delta S}$$
$$\Delta T = \frac{40.63 \times 10^3}{108.8} = 373.4 \text{ K}$$

Ch - 7 Equilibrium

1. (d) NCERT (XI) Ch - 7, Pg. 195 $K_{p} = K_{c} (RT)^{\Delta n}$ $K_{c} = \frac{K_{p}}{(RT)^{\Delta n}} = \frac{5.8 \times 10^{5}}{(0.08314 \times 298)^{2-4}}$ $= \frac{5.8 \times 10^{5}}{(0.08314 \times 298)^{-2}}$

$$= 3.56 \times 10^{-10}$$

2. (a)

- **3. (c)** 3 moles of gaseous reactants change to 2 moles of gaseous products
- 4. (b) NCERT (XI) Ch 7, Pg. 195

 $CO(g) + Cl_{2}(g) \implies COCl_{2}(g)$ $\Delta n = -1$ $K_{p} = K_{c}(RT)^{\Delta n}$ $\frac{K_{p}}{K_{c}} = \frac{1}{RT}$

5. (c) $K_p = K_c (RT)\Delta n_g$ For equation ; $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$, $\Delta n_c = 1$ T = 800 + 273 = 1073 K

$$K_{c} = \frac{K_{p}}{(RT)^{\Delta n_{g}}} = \frac{167}{(0.0821 \times 1073)^{1}} = 1.89$$

6. (b)
$$K_p \longrightarrow (atm)^{\Delta n_g} = (atm)^{-2}$$

- **7.** (c) K_p will remain same as inert gas at constant volume. The total pressure but the partial pressures will increase of individual components will be unaltered.
- **8.** (c) The strength of oxyacids can decide oxidation number of central atom. Higher the oxidation number of central atom, more acidic is the oxyacid.

$$\% \alpha = 0.013\%$$

$$H_2 SO_4$$
, $HC IO_4$, $H_2 SO$

Since; in HClO_4 oxidation number of Cl is highest, So; HClO_4 is the strongest acid among the given.

9. (d) NCERT (XI) Ch - 7, Pg. 214

Pyrimidine is a very weak base so $K_{h} = c\alpha^{2}$

+4

$$\alpha = \sqrt{\frac{K_b}{c}}$$
$$= \sqrt{\frac{1.7 \times 10^{-9}}{0.9}}$$

$$= 1.3 \times 10^{-4}$$

10. (c) Strong acid have a weak conjugate base and vice-versa.

 $H_2O< CH_3OH<OH^-< CH_3O^-$ Increasing order of basic strengh

11. (a) The Bronsted base is NO_3^- because a bronsted base is the

one that receives a proton.

- 12. (a) *NCERT (XI) Ch 7, Pg. 179* $\therefore \Delta G = \Delta G^{\circ} + 2.303 \text{ RT log Q}$ At equilibrium $\Delta G = 0$ $Q = K_{eq}$. So, $\Delta G^{\circ} = (-) 2.303 \text{ RT log } K_{eq}$.
- 13. (d) Acid $H^+ \rightarrow \text{conjugate base}$

 \therefore H₂PO₄⁻ + H⁺ \rightarrow HPO₄²⁻

- So; HPO_4^{2-} is the conjugate base of $H_2PO_4^{-}$
- 14. (a) An example of acidic buffer solution is a pair of HNO₂ and NaNO₂. This pair constituents a buffer because HNO₂ is weak acid and NaNO₂ is a salt of weak acid (HNO₂) with strong base (NaOH).
- **15.** (b) The removal of PO_4^{3-} ions is done by Buffer solution.
- **16.** (c) Since; NH₄OH is a weak electrolyte whereas NH₄Cl is a strong electrolyte.

17. (d)
$$Pb(OH)_2 \Longrightarrow Pb^{2+} + 2OH^-$$

Solubility of Pb(OH)₂ in water is 6.7×10^{-6} M

$$\begin{split} \mathbf{K}_{sp} &= (s) \ (2s)^2 \\ \mathbf{K}_{sp} &= [Pb^{2+}][OH^-]^2 = (6.7 \times 10^{-6})(2 \times 6.7 \times 10^{-6})^2 \\ &= 6 \times 10^{-6} \times 144 \times 10^{-12} \\ &= 1.203 \times 10^{-15} \,\mathrm{M} \end{split}$$

Let solubility of $Pb(OH)_2$ in buffer solⁿ = s mol/L

$$\therefore [Pb^{2+}] [OH^{-}]^2 = K_{sp}$$

$$[Pb^{2+}] (10^{-6})^2 = 1.203 \times 10^{-15}$$
So, $[Pb^{2+}] = (1.203 \times 10^{-15})/10^{-12}$

$$[Pb^{2+}] = 1.203 \times 10^{-3}M$$

18. (c) Na₂CO₃ is a salt of Weak Acid and Strong Base.

19. (c) NCERT (XI) Ch - 7, Pg. 209

Lewis base species are those which are electron deficient and does require electron to complete their octet. BF_3 is an electron deficient species and is a Lewis acid.

20. (b) At equilibrium, low pressure favours those reaction which are accompanied by increase in total number of moles and high pressure favours those reaction which takes place with decrease in total number of moles. However; pressure is not dependent on an equilibrium reaction which proceeds with no change in total number of moles. Hence; the reaction

 $PCl_{5(g)} \rightleftharpoons PCl_{3}(g) + Cl_{2(g)} \qquad \Delta_{ng} - n_{p} - n_{R} = 2 - 1 = 1$ is favored by low pressure.

- 1. (a) F_{2} , being most electronegative, is the most powerful oxidising agent with standard oxidation potential 2.87 V.
- 2. (b) NCERT (XI) Ch 8, Pg. 259
 - CrO₅ has a very famous butterfly structure

$$x + 4(-1) + 1(-2) = 0$$

$$x = +6$$

3. (a)

$$2 \operatorname{CuSO}_4 + 4 \operatorname{KI}^{-1} \xrightarrow{+1} \operatorname{Cu}_2 \operatorname{I}_2 + 2 \operatorname{K}_2 \operatorname{SO}_4 + \operatorname{I}_1 \xrightarrow{0} \operatorname{Oxidation}$$

- 4. (a) $M_{eq.}$ of oxalic acid = $M_{eq.}$ of KMnO₄ $V \times 0.1 = \frac{250 \times 8}{100 \times 31.6} \times 1000 = 6.3$ litre
- 5. (a) NCERT (XI) Ch 8, Pg. 270

$$E^{\circ} \text{ cell} = E^{\circ}_{\text{cathode}} - E^{\circ}_{\text{anode}}$$
$$= 0.76 - (-0.34)$$
$$= 1.1 \text{ V}$$

- **6.** (c) 5 mole I^- gives 3 mole I_2 .
- 7. (a) Let the oxidation state of P in the given compounds be x. H P O + 2x + 4 - 10 = 0 H P O + 2x + 4 - 12 = 0

$$H_{4}P_{2}O_{5}: 2x + 4 - 10 = 0, \qquad H_{4}P_{2}O_{6}: 2x + 4 - 12 = 2x = 6 \qquad 2x = 8 \qquad x = +3 \qquad x = +4$$

$$H_{4}P_{2}O_{7}: 2x + 4 - 14 = 0 \qquad 2x = 10 \qquad x = +5$$
(c) Out below data of Line IO =

8. (c) Oxidation state of I in $IO_3^$ x + (-2)3 = -1 \Rightarrow x = + 5 Oxidation state of I in IO⁻

$$x + (-2) 4 = -1 \implies x = +7$$

$$x + (-2) 4 - -1 \implies x =$$

Oxidation state of I in KI

$$+1 + x = 0 \Longrightarrow x = -1$$

Oxidation state of I in $I_2 = x = 0$

Hence; the oxidation number of iodine in IO_{3}^{-} , IO_{4}^{-} , KI and I₂ are respectively + 5, + 7, -1 and 0.

9. (d)
$$\operatorname{Na}_{2}^{2.5} \operatorname{Sd}_{4} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Na}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Na}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{3} \circ \operatorname{Sd}_{8}$$

 $\operatorname{H}_{2} \overset{+6}{\operatorname{SO}}_{4} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{H}_{2} \overset{-2}{\operatorname{S}} \circ \operatorname{H}_{2} \overset{+7}{\operatorname{S}} \circ \operatorname{Sd}_{8}$
 $\overset{+6}{\operatorname{SO}}_{2}^{++} \circ \operatorname{Sd}_{4}^{++} \circ \operatorname{Sd}_{3}^{--} \circ \operatorname{H} \overset{+6}{\operatorname{S}} \circ \operatorname{Sd}_{4}^{--}$
 $\operatorname{H}_{2} \overset{+6}{\operatorname{SO}}_{4} \circ \operatorname{H}_{2} \overset{+4}{\operatorname{S}} \circ \operatorname{Sd}_{3} \circ \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{2} \circ \operatorname{Sd}_{4} \circ \operatorname{Sd}_{4}$

10. (d) a. Oxidation state of C in CO_2

$$\mathbf{x} + 2 (-2) = 0 \Longrightarrow \mathbf{x} = +4$$

b. Oxidation state of C in
$$CF_4$$

- $x + 4(-1) = 0 \Longrightarrow x = +4$
- c. Oxidation state of C in CCl_4 x + 4 (-1) = 0
- d. Oxidation state of C in CH_4 x + 4 (+1) = 0 \Rightarrow x = -4

11. (d)

12. (d) NCERT (XI) Ch - 8, Pg. 260

 ClO_{3}^{-} change to Cl^{-} oxidation state changes from +5 to -1.

13. (c) The balanced chemical reaction is

14 H⁺ + Cr₂ O₇²⁻ + 6I⁻
$$\rightarrow$$
 2Cr³⁺ + 3I₂ + 7H₂O

Thus; when KI reacts with 1 mole of potassium dichromate, 3 moles of I_2 are evolved.

14. (b) In alkaline medium, following reaction occurs,

$$2KMnO_4 + H_2O \xrightarrow{alkaline} 2MnO_2 + 2KOH + 3[O]$$

$$2MnO_4^- + H_2O \xrightarrow{alkaline} 2MnO_2 + 2OH^- + 3[O]$$

So; equivalent mass = $\frac{Molar mass}{3}$

15. (d) NCERT (XI) Ch - 8, Pg. 271

More negative the reduction potential more will be its reducing power, so among this Z being the most powerful reducing agent, Z > X > Y.

16. (a)

17. (a) The oxidation number of an element is zero. Therefore; its covalency is 2 as oxidation number of S in S_8 is zero. Further in the S_8 molecule, each sulphur atom is connected to two other sulphur atoms, therefore covalency is 2.

n-factor = 5
18. (c) As₂O₃ + MnO₄⁻ → 2AsO₄³⁻ + Mn²⁺
n-factor = 4
Let, molarity of KMnO₄ solution be M
∴ Eq. of As₂O₃ = Eq. of KMnO₄ solution

$$\frac{0.1097}{198} \times 4 = \frac{36.10 \times M \times 5}{1000}$$

(Equivalent weight As₂O₃ = $\frac{198}{4}$)
Molarity = 0.0122 M
19. (a) M_{eq} of Acid = M_{eq} of NaOH
 $\frac{0.52}{E} \times 1000 = 100 \times 0.2$
∴ E = 26
20. (c) E°_{cell} = E°_{cathode} - E°_{anode}
Fe²⁺ + 2e⁻ → Fe E° = 0.441V
Fe³⁺ + e⁻ → Fe²⁺ E° = 0.771V
For Fe + 2Fe³⁺ → 3Fe²⁺

$$E^{\circ} = 0.771 - (-0.441) = 1.212 V$$

Ch - 9 Hydrogen

H,

1. (b) D₂O

2. (a,b) NCERT (XI) Ch - 9, Pg. 227 & 279

Hydrogen acts as a reducing agent.

Hydrogen has 3 isotopes – tritium, protium & deuterium, where protium is its most abundant form.

- **3.** (b) $CO + H_2$ is known as synthesis gas
- **4. (a)** Coal gasification is a process of producing 'syngas' from coal
- 5. (b) NCERT (XI) Ch 9, Pg. 286

 H_2O molecule is formed of 2σ bond & does not contain any π bond.

6. (a) Reduction

$$Ca + H_2O \longrightarrow Ca(OH)_2$$

Reducing agent

$$2A1 + 6H_2O \longrightarrow 2Al(OH)_3 + 3H_2$$

Reducing agent

7. (c) $2H_2O_2 \rightarrow 2H_2O + O_2$

$$= 2 \times 34 = 68 \text{ g}$$
 22400 ml

- \therefore At STP, 68 g H₂O₂ produced O₂ = 22400 ml
- \therefore At STP, 0.68 g H₂O₂ will produce

$$O_2 = \frac{22400 \times 0.68}{68} = 224 \text{ mI}$$

- 8. (c) Dihydrogen is not used in preparation of sodium bicarbonate.
- 9. (d) Bond angle of O O H in H_2O_2 is 97°
- **10.** (d) Except H₂O, all hydrides act as reducing agent. The reducing nature increases as the atomic number of the central atom increases. This is due to weakening of M-H bond as the bond length increases with increase in size of M-atom.

11. (d) Fluorine being a good oxidising agent, oxidises H₂O to O₂

$$2F_2 + 2H_2O \rightarrow O_2 + 4HF$$

- \therefore Water is oxidised to O₂ by F₂
- **12.** (c) Proton (H⁺) ion being very small in size would have very large hydration energy.
- 13. (c) Hoope's process \rightarrow Purification of Al

Le- Blanc process \rightarrow Manufacture of Na₃CO₃

Lane's process \rightarrow Manufacture of H₂

 $3Fe + 4 H_2O \rightarrow Fe_3 O_4 + 4H_2$

- **14. (c)** Tritium (3H) is the radioactive isotope of hydrogen. It has n/p ratio = 2.0, so it is unstable.
- **15.** (a) Perhydrol means 30% solutions of H_2O_2
 - H₂O₂ decomposes as

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Volume strength of 30% solution is 100 that means 1ml of this solution on decomposition gives 100 ml oxygen.

$$\begin{aligned} &\mathrm{SO}_2 + 1/2 \ \mathrm{O}_2 \to \mathrm{SO}_3 \\ &\mathrm{1L} \quad 1/2 \ \mathrm{L} \quad 1 \mathrm{L} \\ &\mathrm{2L} \quad 1 \mathrm{L} \quad 2 \mathrm{L} \end{aligned}$$

Since; 100 ml of oxygen is obtained by = 1 ml of H_2O_2

: 1000 ml of oxygen will be obtained by

$$= \frac{1}{100} \times 1000 \text{ ml of } H_2O_2$$

= 10 ml of H_2O_2

- 16. (d)
- 17. (c) NCERT (XI) Ch 9, Pg 285

 H_2O_2 will reduce O_3 to O_2 . Rather, O_3 is a stronger oxidising agent than H_2O_2 .

18. (c)

19. (d) When H_2O_2 acts as a reducing agent, O_2 is always produced, i.e., option (d) is correct.

- 1. (d) Hydration enthalpy decreases as the size increases, $Be^{2^+} > Mg^{2^+} > Ca^{2^+} > Sr^{2^+} > Ba^{2^+}$
- 2. (b) NCERT (XI) Ch 10, Pg. 298

 K^+ & Na⁺ form the pump (channels), for diffusion of materials under ion concentration gradient.

3. (b) As the size of alkali metal ion increases, ease of adsorption of the hydrated alkali metals ions on an ion-exchange resin decreases

Since the order of size of alkali metals ions are

 $Li^+ < Na^+ < K^+ < Rb^+$

Thus; the ease of adsorption follows the order

 $Rb^+ < K^+ < Na^+ < Li^+$

4. (b) Smaller the size of the ion, more highly it is hydrated and hence its hydrated ionic radius will be greater and its ionic mobility is lesser in aqueous solution.

Thus, the order of ionic mobility is

 $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$

5. (d) NCERT (XI) Ch - 10, Pg. 301

Solubility of group II elements decrease down the group.

Order: Mg > Ca > Sr > Ba

- **6.** (c) In general, on moving downward in group, density increases but density of potassium (K) is lesser than that of the sodium (Na). This is because of the abnormal increase in atomic size on moving from Na (86pm) to K (227pm).
- 7. (c) In confined quarters like submarines and space vehicles, LiOH is used to remove CO₂ from exhaled air.
- **8.** (d) When heated to about 200°C plaster of paris or gypsum is converted into anhydrous calcium sulphate which is known as dead burnt plaster because it does not set like plaster of paris when moistened with water.

 $\begin{array}{c} \text{CaSO}_{4} \cdot \frac{1}{2} \text{H}_{2} O \xrightarrow{200^{\circ}\text{C}} \text{CaSO}_{4} + \frac{1}{2} \text{H}_{2} O \\ \text{Plaster} & \text{Dead burnt} \\ \text{of paris} & \text{plaster} \end{array}$

9. (d) Small anion with small cation forms stable compounds. Since; the size of cation increases as

 $Li^{\scriptscriptstyle +} \! < \! Na^{\scriptscriptstyle +} \! < \! K^{\scriptscriptstyle +} \! < \! Rb^{\scriptscriptstyle +} \! < \! Cs^{\scriptscriptstyle +}$

Therefore; the thermal stability of alkali metal hydrides decrease as

LiH > NaH > KH > RbH > CsH.

10. (a) $AgBr + 2Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaBr$

Sodium argento thiosulphate

(Sodium complex)

In photography $Na_2S_2O_3$ (hypo or sodium thiosulpahte) is used as complexing agent, It dissolves unreduced silver bromide by forming complex.

11. (d) Na_2SO_4 is most soluble because alkali metal sulphates are more as compared to alkaline earth metal sulphates. Among alkaline earth metal sulphates, $BeSO_4$ is most soluble. This is because on moving downward, the magnitude of lattice energy remains almost constant (due to large sized sulphate ion) but hydration energy decreases. Hence, the order of solubility is

 $Na_2SO_4 > BeSO_4 > MgSO_4 > BaSO_4$

- **12.** (d) MF is ionic in nature due to small size of anion. MI is covalent in nature because of large size of anion.
 - \therefore The order of covalent character is

 $MI \ > MBr > MCl > MF$

- 13. (b) Mg²⁺ is smaller than other ions of the group. So; Mg²⁺ is readily hydrated. Thus; MgSO₄ has higher hydration energy than lattice energy. Hydration energy of sulphates decreases from top to bottom in a II A group.
- **14. (c)** Barium metal is used to scan the X-ray of the human digestive system.
- **15.** (d) Washing soda is sodium carbonate decahydrate $(Na_2CO_3. 10H_2O)$. It is an efflorescent substance i.e., gives out nine water molecules crystallization on keeping in air.

$$Na_2CO_3.10H_2O \xrightarrow{air} Na_2CO_3.H_2O + 9H_2O$$

Sodium carbonate monohydrate

But on heating it loses all the water molecules to form anhydrous sodium carbonate or soda ash

 $Na_2CO_3.10H_2O \xrightarrow{\Delta} Na_2CO_3 + 10H_2O$

Soda ash

16. (d) Solubility of fluorides of IIA

$$BeF_2 > BaF_2 > SrF_2 > CaF_2 > MgF_2$$

(BeF, is most soluble)

- 17. (b) MgCl₂ . $6H_2O \xrightarrow{\Delta} MgO + 2HCl + 5H_2O$
- **18.** (d) As we go down the group dissociation enthalpy & hydration energy of elements decreases. Thus, Rb^+ will be the most mobile followed by $K^+ > Na^+ > Li^+$.

In group 1, Li⁺ will have highest hydration enthalpy, most hydrated in aqueous solution & will thus be least mobile.

- **19.** (a) Initial setting of cement is mainly due to hydration and gel formation.
- **20.** (b) Calcium hydroxide or slaked lime $(Ca(OH)_2)$ reacts with Cl_2 to give bleaching powder, $CaOCl_2$. Bleaching on auto oxidation gives calcium chlorate, $(Ca(ClO_2)_2)$

$$\underset{\substack{(Dry)\\Calcium}}{Calcium} Ca(OH)_2 \xrightarrow[(A)]{Cl_2} \xrightarrow{Cl_2} CaOCl_2 \xrightarrow[(A)]{Auto-oxidation} 5CaCl_2 + Ca(ClO_3)_2$$

1. (b) The basic building unit of all silicates is the tetrahedral SiO₄⁴. It is represented as



Structure of SiO₄⁴⁻ ions

2. (b) NCERT (XI) Ch - 11, Pg. 316

 Sn^{2+} is reducing while Pb⁴⁺ is oxidising. This is because of absence of *f*-orbital (fully filled) in Sn^{2+} and presence in Pb⁴⁺ due to which Pb⁴⁺ show inert pair effect but Sn^{2+} not.

- 3. (c) Si is a semiconductor and used in transistors .
- **4. (c)** Inorganic benzene is borozine, B₃N₃H₆ due to its resemblance in structure and some physical and chemical properties with benzene.



- 5. (c) The lewis acid strength increases as the extent of $p\pi p\pi$ back bonding decrease with increase in the size of halogen, deficiency increase.
- 6. (a) NCERT (XI) Ch 11, Pg. 313

Boric acid is a Lewis acid, it accepts a pair of electron in aqueous solution to complete its octet because it is an electron deficient compound.

$$B(OH)_3 + H_2O \rightleftharpoons B(OH)_4]^- H^+$$

7. (d) The stability of dihalides increase down the group

because inert pair effect becomes more predominant down the group.

8. (c) NCERT (XI) Ch - 11, Pg. 310

Order of oxidation state in group 13 is Al < Ga < In < Tl

(+1) oxidation state stability increases down the group because of inert pair effect.

9. (d) Due to inert pair effect the reducing character (M²⁺ species) in dihalides decrease in order:-

$$\text{GeCl}_2 > \text{SnCl}_2 > \text{PbCl}_2$$

- **10.** (b) The hybridization of carbon in fullerene is sp^2 .
- **11.** (b) pK_a values decreases or acidity increases as the H–H bond strength decrease from O to Te.
- **12.** (c) A mineral ore of aluminum: Al_2O_3 . $2H_2O$ is bauxite.
- **13.** (c) Electron density on the N-atom is maximum due to small size, and hence NH_3 is most basic. However, as the size of the element increases from P to Sb, the electron density decrease and hence the basic character decreases accordingly, i.e., basic character decreases in the order: $SbH_3 < ASH_3 < PH_3 < NH_3$
- 14. (c) For the extraction of organic compound from their natural sources, super critial CO₂ is used as a solvent.

15. (d) NCERT (XI) Ch - 11, Pg. 182

Order for acidity is $H_2S < H_2Se < H_2Te$, as we move down the group atomic radius of atom increases because of which size also increases & bond dissociation enthalpy decreases & such atoms can easily furnish H^+ in aqueous medium.

- **16.** (c) sp^3 hybridization
- **17.** (c) Graphite is the lead of lead pencils which has a high m.p of 3170°C
- **18.** (d) O_2F_2 is an oxidising agent & XeF₄ is a reducing agent.
- 19. (b) Diborane contains 4B-H and 2 B-H-B bonds only
- **20.** (a) B_2H_6 (diborane) is an electron deficient molecule. It forms banana bond but 2 orbitals remains empty.

1. (d)
$${}^{5}_{CH_{3}} - {}^{4}_{C} - {}^{3}_{C} - {}^{2}_{C} - {}^{0}_{C} - {}^{0}_{C} - {}^{0}_{H}$$

1UPAC name :

2,3 - dimethyl - 4 - oxo - pent - 2 - en - 1 - oic acid.

2. (d) NCERT (XI) Ch - 12, Pg. 344

In toluene CH, group is attached which is donating in nature. So, electrophilic substitution becomes easier. Therefore; it can easily be sulphonated.

3. (d)
$$\int_{5-4}^{2} \int_{4}^{3}$$

The 1UPAC name for the hydrocarbons is 3,3 diethylpentane.

- 4. (c) Ether and alcohols both have same general formula which is given as $C_n H_{2n+2} + O$ but the functional group present in ethers is -O and in alcohols is -OH. So; they are functional isomers.
- 5. (a) NCERT (XI) Ch 12, Pg. 345

 $\stackrel{\Theta}{O}$ —C \equiv $\stackrel{\Theta}{O}$ is less stable than O=C=O, as charge separation

6. (b) Conformations or conformational isomers are the different arrangement of atoms in space that results from the carbon - carbon single bond free rotation by 360°, the phenomenon is known as conformational isomerism.

7. (b) NCERT (XI) Ch - 12, Pg. 342

Nucleophiles are positive charge loving species or electron rich compounds. Lewis acids are those species which are electron deficient so nucleophiles cannot act as Lewis acids, they instead are Lewis bases.

8. (d) Chiral molecule is the one having asymmetric carbon atom and is not superimposable on its mirror image while if it is not superimposable on its mirror image, it is known as achiral.

9. (c)
$$CH_3$$
 $- \begin{array}{c} H \\ I \\ C \\ - C \\ I \\ OH \end{array} \begin{array}{c} H \\ C \\ - C$

2, 3 dihydroxy butanal

Number of optical isomers = $(2)^n = (2)^2 = 4$

10. (a)
$$\underset{H}{\overset{H_3C}{\longrightarrow}}C=C=C \underset{CH_3}{\overset{H}{\longrightarrow}}C=C=C \underset{H}{\overset{CH_3}{\longrightarrow}}C=C=C \underset{H}{\overset{CH_3}{\longrightarrow}}$$

These molecules doesn't contain any asymmetric carbon atom but these molecules are enantiomers. The two forms are non - super imposable mirror image and are optically active.

11. (a) $3Na_4 [Fe(CN)_6] + 4Fe^{3+} \rightarrow Fe_4 [Fe(CN)_6]_3 + 12Na$ Iron (III) hexacyanoferrate (II) (Prussian blue)

- 12. (a) For the detection of halogens, nitrogen and sulphur Lassaigne's test is used.
- 13. (b) NCERT (XI) Ch 12, Pg. 356

According to Duma's method:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Longrightarrow V_1 = \frac{P_2 V_2 T_1}{P_1 T_2}$$

$$\frac{(725 - 25) \times 40}{300} = \frac{760 V_2}{273}$$

$$V_2 = 33.53 \text{ ml}$$

$$Mass = \frac{33.53}{22400} \times 28 = 0.042 \text{ g}$$
% N = $\frac{28 \times V \times 100}{22400 \times m}$
% of nitrogen = $\frac{0.042}{0.25} \times 100 = 16.76 \%$

14. (b) Lassaigne's test for nitrogen in sodium extract, add fresh and saturated solution of FeSO, followed by NaOH. Now boil and cool the content. Then, add dil H₂SO₄ and FeCl₂ solution. Formation of Prussian blue precipitate shows the presence of nitrogen.

$$FeSO_4 + 2NaOH \rightarrow Fe (OH)_2 \downarrow + Na_2SO_4$$

$$Fe(OH)_2 + 6NaCN \rightarrow Na_4 [Fe(CN)_6] + 2NaOH$$
From sodium
extract

 $2Na_4 [Fe (CN)_6] + 4FeCl_3 \rightarrow Fe_4 [Fe(CN)_6]_3 + 12NaCl_6$

Iron (III) hexacyano ferrate (II)

15. (c) Sulphur of organic compound is detected by using sodium nitroprusside with sulphur forms a voilet colour complex called sodium thionitro prusside.

$$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$$

Sodium nitropresside Sodium thionitropresside (violet)

- 16. (d) On the basis of electronic effect.
- 17. (c) B.P. \propto Polarity

m.p. ∞ Packing efficiency

Trans isomer more stable than cis.

18. (c) NCERT (XI) Ch - 12, Pg - 342 & 346





Effective (2p-2p) overlap occurs between vacant 2p orbital

of carbocation & 2p orbital of N containing the lone pair.

20. (a) NCERT (XI) Ch - 12

In option a, resonance does occur but positive charge rests more on electronegative atom i.e. O which decreases the extent of stabilisation.

In option c, there is no resonance. Rather, O exerts - I effect and destablilises the carbocation.

19. (d) Stability of carbanion $\propto \frac{1}{+H \text{ effect}}$



1. (c) Due to hyper conjugation and resonance, the stability order of free radicals is $3^{\circ} > 2^{\circ} > 1^{\circ}$

 $CH_3CHC_6H_5$ is most stable.

CHCH₃ shows both resonance and hyper conjugation

2. (b) NCERT (XI) Ch - 13, Pg. 387

 $H_2SO_4 =$ Provide acidic medium.

$$HgSO_{4} = Act as a solvent$$

 $H_{3}C-C \equiv C-H \xrightarrow{H_{2}O, H_{3}SO_{4}}{HgSO_{4}} CH_{3}-C = CH_{2}$ $\downarrow (According to Markonikov rule)$ $OH \\ CH_{3}-C = CH_{2} \xrightarrow{Rearrangment} CH_{3}-C - CH_{3}$ $\bigcup \\ OH \\ OH$

- **3.** (d) Compounds containing two or more carbon atoms are prepared by Wurtz reaction. Thus; methane, CH₄ cannot be prepared by Wurtz reaction.
- **4. (d)** Methane is called marsh gas, it is found in swamps or marshy places and can be obtained by bacterial decomposition of fossil of plants and animals.
- 5. (c) NCERT (XI) Ch 13, Pg. 386

 $CH \equiv CH > CH_3 - C \equiv CH > CH_2 = CH_2 > CH_3 - CH_3$ \rightarrow Alkanes, alkenes and alkynes follow the following trend in their acidic behaviour:-

(i) $HC \equiv CH > H_2C = CH_2 > CH_3 - CH_3$

(ii)
$$HC \equiv CH > CH_3 - C \equiv CH \gg CH_3 - C \equiv C - CH_3$$

- **6.** (a) The group, iodide is bigger in size down as the size of the halogen increases. Thus, it is a better leaving group.
 - \therefore Iodide > Bromide > Chloride.

7. (d) CH₃CH=CH₂ + HOBr
$$\longrightarrow$$

OH
CH₃-CH-CH₂-Br
1-Bromo-2-propanol

8. (c) NCERT (XI) Ch - 13, Pg. 381 - 382

Gaseous bromine reacts with alkenes to give allyl substituted alkyl halides via free radical mechanism.

$$CH_{3}CH = CH_{2} \xrightarrow{Br_{2}(g)} CH_{2} - CH = CH_{2}$$

9. (c) Due to the presence of acidic hydrogen ammoniacal

 Cu_2Cl_2 will give red copper acetylide ppt. with Cu_2Cl_2 , whereas C_2H_4 will be neutral to ammoniacal Cu_2Cl_2 .

10. (a)
$$CH_3 - C \equiv C - CH_2 - CH_3 + O_3 \longrightarrow$$

2-Pentyne

$$CH_{3} - C - C - CH_{2} - CH_{3}$$

$$CH_{3} - C - C - CH_{2} - CH_{3}$$

$$CH_{3} - C - C - CH_{2}CH_{3} + \frac{H_{2}O_{2}}{O}$$

$$CH_{3} - C - C - CH_{2}CH_{3} + \frac{H_{2}O_{2}}{O}$$

$$CH_3COOH + CH_3CH_2COOH$$

11. (c) Only alkynes react with $AgNO_3$ to give white precipitate while alkene and alkynes both react with $KMnO_4$ and decolorise it.



 \therefore C₂H₄ (an alkene) reacts with KMnO₄ and decolorises it but does not react with AgNO₃. whereas C₂H₆ and CH₄ are alkanes they do not react with both KMnO₄ and AgNO₃

12. (b) NCERT (XI) Ch - 13, Pg. 386

$$CH \equiv CH \xrightarrow{NaNH_2} CH \equiv \stackrel{(-)}{C} - Na + CH_3 - CH_2Br$$

$$\downarrow$$

$$CH_3 - CH_2 - C \equiv CH$$

$$\downarrow NaNH_2 / NH_3$$

$$CH_3 - CH_2 - C \equiv \stackrel{(-)}{C} - Na + CH_3CH_2 - Br \rightarrow$$

$$CH_3 - CH_2 - C \equiv C - CH_2 - CH_3$$

$$Hex - 3 - vne$$

- 13. (b) Due to greater +M effect of –OH group.
- (b) Alkylation and acylation of benzene in the presence of anhydrous aluminum chloride are known as friedel - crafts reaction.

15. (c)
$$Br_2 + hv \longrightarrow Br + Br$$





16. (a) *NCERT (XI)* Ch - 13, Pg - 372



(Free radical halogenation occurs)



17. (a) NCERT (XI) Ch - 13, Pg - 379

 $CH_{3}-CH_{2}-C \equiv C-H \xrightarrow[(Amide ion acts as base)]{} CH_{3}-CH_{2}-C \equiv C^{-}Na^{+}$

$$CH_3 - CH_2 - C \equiv C^- Na^+ + CH_3 - CH_2 - Br \xrightarrow{S_N 2}$$

$$CH_3 - CH_2 - C \equiv C - CH_2 - CH_3$$

18. (d) NCERT (XI) Ch - 13, Pg - 381

This reaction occurs via cyclic halonium ion formation.





19. (b) NCERT (XI) Ch - 13, Pg - 381

СН—СООН ∥

ён—соон

(Maleic acid)

reacts with Br₂ (via anti addition) to form racemic mixture.

20. (d) NCERT (XI) Ch - 13



- **1. (c)** The gases responsible for photochemical smog are hydrocarbons, oxides of nitrogen and carbon monoxide.
- 2. (c) NCERT (XI) Ch 14, Pg. 400

Micro-organisms present in the soil is a sink of CO.

- **3.** (c) Freons are CFCs; causes ozone layer depletion.
- 4. (a) NCERT (XI) Ch 14, Pg. 412

For dry cleaning of clothes instead of tetrachloroethane, petrol can be used as a solvent.

- **5.** (b) CO_2 does not harm lungs.
- 6. (a) Skin cancer caused by UV radiation.

7. (c) NCERT (XI) Ch - 14, Pg. 404

Photochemical smog or London smog contain mixture of smoke from industries that is (CFC's) chloroflourocarbons is not a component of photochemical smog.

8. (**b**,**d**) To form carboxygaemoglobin, carbon monoxide binds tightly to hemoglobin. Carboxyhaemoglobin lowers oxygen saturation of blood and also causes hemoglobin to bind more tightly to oxygen. Therefore, carbon basically blocks oxygen transport to tissues.

The antidote of carbon monoxide poisoning involves having the patient breathe 100% oxygen or carbon with 95% of O_2 , 5% CO_2 and SO, more oxygen will be available to displace the carbon monoxide from haemoglobin. Hence, both carbogen and pure O_2 acts as antidote of carbon monoxide.

NOTE : Both option (b) and (d) are correct.

- **9. (b)** Pollution is the addition of any toxic and undesirable material in environment and the added material is known as pollutant.
- 10. (c) Textiles cause "white lung cancer".
- **11. (a)** Gas released during Bhopal tragedy was methyl isocyanate (MI).

12. (b)
$$CF_2Cl_2 \xrightarrow{UV} Cl + CF_2Cl$$

 $Cl^{\bullet} + O_{3} \longrightarrow ClO^{\bullet} + O_{2}$ $ClO^{\bullet} + O \longrightarrow {}^{\bullet}Cl + O_{2}$

13. (a) NCERT (XI) Ch - 14, Pg. 404-405

Photochemical smog is harmful because it causes irritation in eyes & throat. The main components of photochemical smog are nitrogen oxides, volatile organic compounds (VOCs), tropospheric ozone, and PAN (peroxyacytyl nitrate).

- **14. (c)** Global warming may result in increase in average temperature of the earth and melting of glaciers.
- **15.** (d) With every trophic level in the food chain, the concentration of DDT increases.
- **16. (b)** Green chemistry involve such reactions which reduce the use and production of hazardous or toxic chemical to reduce pollution from environment.
- 17. (d)
- 18. (c) In addition to fluorine & carbon, freons often contain hydrogen, chlorine or bromine thus freons are types to CFC_s . Its chlorine molecule deplete ozone layer.
- **19.** (b) Photochemical smog is initiated by the photochemical dissociation of NO₂ that result in the formation of NO. This NO rapidly reacts with O₃ to give NO₂ (brown gas), responsible for causing haze if its concentration is very high.

$$NO_{2(g)} \xrightarrow{h\nu} NO_{(g)} + [O]$$
nascent oxygen
(very reactive)

$$[O] + O_2 \underbrace{\longrightarrow} O_3 \text{ [reacts rapidly with NO]}$$

$$O_3 + NO \underbrace{\longrightarrow} NO_2 + O_2$$
(Brown gas)
[In high conc. from haze]

20. (d) Stratosphere extends from 18 km to 50 km from earth's surface.

CLASS XII

- 1. (b) Anisotropy is shown only by crystalline solids.
- 2. (d) NCERT (XII) Ch 1, Pg. 15

 $Mg^{+2} = 1$, $Al^{3+} = 2$, $O^{2-} = 4$

- \therefore The formula of the compound is MgAl₂O₄.
- **3. (c)** Metallic solids conduct electricity in molten state as well as solid state and are malleable, ductile and have fairly high melting point.
- **4. (d)** The ability of some materials to create an electric potential in response to applied mechanical stress is known as piezoelectrie effect.

The commonly used piezoelectric materials are quartz (SiO₂), zinc oxide, etc.

5. (c) NCERT (XII) Ch - 1, Pg. 18

In this structure, Ca^{2+} ions are in the FCC arrangement. Each Ca^{2+} is connected to $4F^{-}$ ions above it, i.e., Ca^{2+} has a C.N. = 8 and F^{-} has a C.N. = 4

- **6.** (c) Dry ice is a molecular crystal as in dry ice (solid CO₂), constituents are molecules. The various molecules are held together through weak forces like dipole-induced dipole interaction etc.
- **7.** (c) There are four atoms per unit cell which is maximum in face centred cubic cell (fcc).

Number of atoms per unit cell

$$= \left(6 \times \frac{1}{2}\right) + \left(8 \times \frac{1}{8}\right) = 3 + 1 = 4$$

8. (a) NCERT (XII) Ch - 1, Pg. 11

Packing fraction of BCC lattice = 68%

Vacant space = 32%

9. (a) For cubic, a = b = c, $\alpha = \beta = \gamma = 90^{\circ}$

Tetragonal, $a = b \neq c$, $\alpha = \beta = \gamma = 90^{\circ}$

Orthorhombic, $a \neq b \neq c$, $\alpha = \beta = \gamma = 90^{\circ}$

- Hexagonal, $a = b \neq c$, $\alpha = \beta = 90^{\circ}$, $\gamma = 120^{\circ}$
- 10. (a) Each Cs ion is surrounded by 8 Cl⁻ ions and each Cl⁻ ion is surrounded by 8 Cs⁺ ions. CsCl has a bcc type structure. Thus, the structure has 8 : 8 coordination number.

11. (c)
$$a = 2(r^{+}+r^{-}) = 2(95+181) = 552 \text{ pm}$$

12. (a) In bcc lattice, $r = \frac{\sqrt{3a}}{4}$

$$r = \frac{1.732 \times 287}{4} = 124.27 \text{ pm}$$

13. (d) SCC : a = 2r; BCC : $\sqrt{3}a = 4r$; FCC: $\sqrt{2}a = 4r$

14. (c) Some of the lattice points are unoccupied creating holes in the crystal. This defect is known as Schottky defect.

15. (c) NCERT (XII) Ch - 1, Pg. 20

According to formula

$$d = \frac{Z.M}{N_A \times a^3}$$
$$2.72 = \frac{4 \times \text{Molecular Mass}}{6.022 \times 10^{23} \times (4.04 \times 10^{-3})^3}$$
$$M = 27 \text{ g mol}^{-1}$$

- **16.** (c) Group 13 elements contain 3 valance electrons. When Si or Ge are doped with group 13 elements the fourth valence electron is missing, the hole created is called electron hole. The electricity flows through this hole. This type of semiconductors are known as p-type semiconductors.
- 17. (c) In ZnS like structure



18. (d) NCERT (XII) Ch - 1, Pg. 18

As per FCC structure

$$4r = \sqrt{2} a$$

 $r = \frac{\sqrt{2} \times 361}{4}$
=128 pm

19. (a)
$$Fe_{0.94}O$$

Let no. of Fe^{2+} ions = x

No. of Fe^{3+} ions = (0.94 - x)

 $2x + 3(0.94 - x) = +2 \implies x = 0.82$

So, number of $Fe^{2+} = 0.82$

number of $Fe^{3+} = 0.12$

- 2 Fe^{3+} balance the charge carried by 3 Fe^{2+} ions
- \therefore 2 Fe³⁺ ions create cation vacancy = 1

 0.12 Fe^{3+} ions will create cation vacancy =

$$\frac{1}{2} \times 0.12 = 0.06$$

Total octahedral sites = 0.82 + 0.12 + 0.06 = 1

% age of octahedral sites occupied by vacancies

$$=\frac{0.06}{1}\times100=6\%$$

20. (c)
$$\frac{r^+}{r^-} = \frac{80}{200} = 0.4 \Rightarrow ZnS$$
 type packing
 $2r^+ = \frac{\sqrt{2a}}{2}$ (for centres of alternate 8 sub-cubes)
 $= \frac{1.414}{2} \times 497.73 = 351.9 \text{ pm}$

Ch - 2 Solutions

1. (a) Molarity = Normality $\times \frac{\text{equivalent weight}}{\text{molecular weight}}$

Given, normality of Na₂CO₂ solution = 0.2 N

Equivalent weight = M

Molecular weight = 2 M (:: Na₂CO₃ is dipositive)

$$\therefore$$
 Molarity = $0.2 \times \frac{M}{2M} = 0.1 M$

2. (c) NCERT (XII) Ch - 2, Pg. 37

Molarity will depend upon temperature as molarity will depend upon the volume of the solution which change with temperature.

3. (b) According to Raoult's law

 $P_{A} \propto x_{A}$ and $P_{B} \propto x_{B}$ for a binary solution of A and B

4. (b) A solution of acetone in ethanol shows a positive deviation from Raoult's law with difference of polarity and length of hydrocarbon chain. This is due to miscibility of these liquids.

5. (b) NCERT (XII) Ch - 2, Pg. 45

In case of an ideal solution $\Delta H_{mix} = 0$

$$\Delta U_{mix} = 0$$
 but $\Delta S_{mix} \neq 0$

According to 3rd law of thermodynamics:

 $\Delta G = \Delta H - T \Delta S$

 $\Delta G_{mix} \neq 0$

6. (a) For an ideal solution ΔH and ΔV for mixing should be zero. $P_{Total} = P_A + P_B$ and A-A, B-B and A-B interactions are nearly same.

7. (a) NCERT (XII) Ch - 2, Pg. 45

 $\Delta S_{\rm mix} > 0$

As entropy increases after mixing.

8. (a) In (A) Para-nitrophenol intermolecular (between two molecules) H-bonding exists, while in (B) orthonitrophenol, intramolecular H-bonding exists. The boiling point of (B) is lower than (A) and, thus, (B) is more volatile, i.e., (B) has higher vapour pressure as compared to (A).

9. (d)
$$M = \frac{K_b \times W_B}{\Delta T_b \times W_A} = \frac{0.52 \times 12.5}{0.80 \times 0.185}$$

 $= \frac{52 \times 125}{0.80 \times 185} = 43.92 \text{ g mol}^{-1}$
 $(185 \text{ g} = 0.185 \text{ Kg})$

10. (b)
$$\Delta T_{f} = \frac{K_{f} \times W_{2} \times 1000}{M_{2} \times W_{1}} \Longrightarrow W_{2} = \frac{\Delta T_{f} \times M_{2} \times W_{1}}{k_{f} \times 1000}$$

$$W_2 = \frac{10 \times 92 \times 600}{1.86 \times 1000} = 296.77g$$

Molarity =
$$\frac{W \times 1000}{M \times V_{(m\ell.)}}$$

 $2 = \frac{W}{63} \times \frac{1000}{250}$
 $W = \frac{63}{2}$
Because 70% HNO₃;
Mass of acid $\times \frac{70}{100} = \frac{63}{2}$
Mass of acid = 45 g

- **12.** (c) Properties of dilute solutions of non-volatile solutes whose values depend upon the concentration and number of solute particles in the solution but not on the individuals identity of the solute. These can be known as colligative pressure. Various colligative properties are
 - (i) Relative lowering of vapour pressure
 - (ii) Elevation in boiling point
 - (iii) Depression in freezing point
 - (iv) Osmotic pressure

So; optical activity is not a colligative property.

- **13. (b)** The freezing point of a pure solvent decreases on addition of solute.
- **14. (c)** Depression in freezing point is a colligative property. Thus, the compound which produces maximum ions has the least freezing point.
 - : Concentration is same

Sucrose \rightarrow No ions

$$NaCl \rightarrow \underbrace{Na^{+} + Cl^{-}}_{Two ions}$$
$$CaCl_{2} \rightarrow \underbrace{Ca^{2+} + 2Cl}_{Three ions}$$

Glucose \rightarrow No ions.

Thus; 1% CaCl₂ has the least freezing point.

15. (a) Amount of AgNO₃ added in 60 mL of solution =

$$60 \times 0.03 = 1.8 \text{ g}$$

16. (d) i =

Total number of particles after association / dissociation Total number of particles before association / dissocition

17. (b) When benzoic acid dissolves in benzene it will be dimerise due to the inter molecular hydrogen bonding

$$2C_6H_5COOH \Longrightarrow (C_6H_5COOH)_2$$

Von't Hoff factor =

number of particles after dissociation / association
$$= \frac{1}{1}$$

number of particles before dissociation / association 2

18. (d) In case of dissociation, Van't Hoff factor $i > 1$.	20. (a)	HA _(aq)	$\rightleftharpoons H^{\scriptscriptstyle +}$	$+ A^{-}$	
In case of association, Van't Hoff factor $i < 1$.		(aq.)	(aq.)	(aq.)	
19. (b) Apply $\Delta T_f = i k_f m$	At $t = 0$	С	0	0	
$\Delta T_{f} = i \times 1.86$	At $t = t$	C - Cα	Сα	Сα	
$\frac{W \times 1000}{W}$	pH = 2				
W _{water} × Molar mass	∴ (H ⁺) =	10 ⁻² m			
$\frac{3}{100} \times \frac{100}{100}$	\therefore C $\alpha = 1$	$0^{-2} \implies 1 >$	$\alpha = 10^{-10}$	2	
60 500	$\alpha = 0.01$				
$\Delta T_{\rm f} = 1.23 \times 1.86 \times \frac{3}{60} \times \frac{1000}{500}$	$\alpha = \frac{i-1}{n-1}$	⇒ 0.01 =	$\frac{i-1}{2}$		
$\Delta T_{f} = 0.228 \text{ K}$	n - 1 i = 1.01		2-1		

- 1. (c) $E_{cell} = E_{Cathode}^0 E_{Anode}^0$ = -0.40 - (-0.74) = -0.40 + 0.74 = 0.34 V
- 2. (c) NCERT (XII) Ch 3, Pg. 81

$$\Lambda_{m}^{\circ}(AgCl) = \Lambda_{m}^{\circ}(AgNO_{3}) + \Lambda_{m}^{\circ}(KCl) - \Lambda_{m}^{\circ}(KNO_{3})$$

= (133.4 + 149.9 - 144.9) S cm²
= 138.4 S cm²

3. (b) Higher the reduction potential, stronger is the oxidising agent.

4. (c)
$$\Delta G^0 = -nFE^0$$
 -----(i)

 $\Delta G^0 = -2.303 \text{ RT logK}$ -----(ii)

From eq (i) if E⁰ is positive

then ΔG^0 is negative

In equation (ii), ΔG^0 is negative

So; $\log K > 0 \Longrightarrow K > 1$

5. (c) Due to lower value of reduction potential, alkali metals get oxidised easily. Hence, they behave as good reducing agent.

6. (d) NCERT (XII) Ch - 3, Pg. 84

According to Faraday's first law:

$$w = z.i.t$$

 $z = \frac{E}{96500} (molar mass)$
 $0.1 \times 71 = \frac{35.5}{96500} \times 3 \times t$
 $t = 110 min$

7. (c)
$$\Lambda_{\rm m} = \frac{k \times 1000}{M} = \frac{0.0152 \times 1000}{0.15} = 101 \Omega^{-1} {\rm cm}^2 {\rm mol}^{-1}$$

8. (c)
$$\Lambda^0_{\text{Ba}(\text{OH})_2} = \Lambda^0_{\text{Ba}^{2+}} + 2\Lambda^0_{\text{OH}^-}$$

$$\begin{split} \Lambda^0_{BaCl_2} &= \Lambda^0_{Ba^{2+}} + 2\Lambda^0_{Cl^-} \\ \Lambda^0_{NH_4Cl} &= \Lambda^0_{NH_4^+} + \Lambda^0_{Cl^-} \end{split}$$

After substituting the above in

$$\begin{split} \Lambda^0_{\mathrm{NH}_4\mathrm{OH}} = & \frac{\Lambda^0_{\mathrm{Ba}(\mathrm{OH})_2} + 2\Lambda^0_{\mathrm{NH}_4\mathrm{Cl}} - \Lambda^0_{\mathrm{Ba}\mathrm{Cl}_2}}{2} \\ \text{we get, } \Lambda^0_{\mathrm{NH}_4\mathrm{OH}} = \Lambda^0_{\mathrm{NH}_4^+} + \Lambda^0_{\mathrm{OH}^-} \end{split}$$

9. (b) Number of ions per unit volume decreases results in decrease of conductivity.

10. (a) NCERT (XII) Ch - 3, Pg. 84

According to Faraday's law Q = ne Q = it ne = it $n = \frac{1 \times 60}{1.6 \times 10^{-19}} = 3.75 \times 10^{20}$ electrons

11. (d) For H-electrode, R.P = $0.059 \times \text{pH}$ E = E° + $0.059 \times (\log 10^{-7})$

$$\mathbf{E} = \mathbf{E}^\circ + \frac{0.059 \times (-7)}{1} \Longrightarrow \mathbf{E}^\circ - 0.413 \text{ V}$$

12. (c) NCERT (XII) Ch - 3, Pg. 72

$$Cu^{2+} + e^{-} \rightarrow Cu^{+} \qquad G_{1} = -n \ 0.15 \ F$$

$$Cu^{+} + e^{-} \rightarrow Cu \qquad G_{2} = -n \times \ 0.50 \ F$$

$$Cu^{2+} + 2e^{-} \rightarrow Cu \qquad G_{3} = ?$$

$$\Delta G_{3} = \Delta G_{1} + \Delta G_{2}$$

$$-2FE^{o} = -1F \times \ 0.15 \times (-1F \times \ 0.5)$$

$$E^{o} = \frac{0.65}{2} = 0.325 \ V$$

13. (b)

14. (d) The overall reaction for lead storage battery during discharging is

 $Pb(s) + PbO_2(s) + 2H_2SO_{4(aq)} \rightarrow 2PbSO_{4(s)} + 2H_2O_{(l)}$ Hence; H_2SO_4 is consumed when lead storage battery is consumed.

- **15.** (c) The chemical formula of rust is Fe_2O_3 . xH₂O.
- **16.** (b) The weight of a substance deposited by 1C is termed as electrochemical equivalent.

$$\omega = ZIt$$

 $\omega = Z$; if I = 1A, T = 1 sec i.e., Q = 1C

1C deposits weight = 0.0006735 g

96500C deposits weight = $0.0006735 \times 96500 = 65$

1F (i.e. 96500 C) deposits weight equal to its equivalent weight.

17. (b) NCERT (XII) Ch - 3, Pg. 72

$$\Delta G^{o} = -n E^{o} F$$

$$n = 2 \qquad Cu + 2Ag^{2+} \rightarrow Cu^{2+} + 2Ag$$

$$= -2 \times 96500 \times 0.46$$

$$= -89 \text{ kJ}$$

18. (a) Since pH = 14

$$\Rightarrow pOH = 0 \Rightarrow [OH^{-}] = 1 M$$

$$Cu (OH)_{2} \rightleftharpoons Cu^{2+} + 2OH^{-}$$

$$K_{sp} = [Cu^{2+}] [OH^{-}]^{2}$$

$$10^{-19} = (Cu^{2+})1^{2}$$

$$[Cu^{2+}] = 10^{-19} M \Rightarrow Cu^{2+} + 2e^{-} \rightarrow Cu$$

$$E_{red} = 0.34 - \frac{0.0591}{2} \log \frac{1}{(Cu^{2+})}$$

$$= 0.34 - \frac{0.0591}{2} \log \frac{1}{10^{-19}} \Rightarrow 0.34 - \frac{0.0591}{2} \log 10^{19}$$

$$= 0.34 - \frac{0.0591}{2} \times 19 \Rightarrow E_{red} = -0.22 V$$

- **19. (d)** $E_{R.P(Cu)}^{o} > E_{R.P(Al)}^{o}$
- **20. (b)** The oxidation potential of Zn is high as compared to oxidation potential of iron.

1. (a) Rate =
$$\frac{\mathrm{Id}[\mathrm{x}]}{2 \,\mathrm{dt}} = \frac{(3-2)}{2 \times 5} = 0.1 \,\mathrm{mol}^{-1} \,\mathrm{L}^{-1} \,\mathrm{min}^{-1}$$

2. (a) Integrated rate law for a first order reaction is

$$K = \frac{2.303}{t} \log \frac{R_o}{R}$$

$$K = \frac{2.303}{t} \log \frac{a}{a - x}$$
For half-life, $t = t_{1/2}$, $x = \frac{a}{2}$

$$K = \frac{2.303}{t_{1/2}} \log \frac{a}{a - \frac{a}{2}} = \frac{2.303}{t_{1/2}} \log \frac{a}{t_{1/2}}$$

$$K = \frac{2.303 \times 0.301}{t_{1/2}} = \frac{0.693}{t_{1/2}}$$

3. (d) NCERT (XII) Ch - 4, Pg. 100

 $R = K [Cl_2][NO]^2$

- Hence, order reaction = 1 + 2 = 3
- \therefore order with respect to NO = 2

4. (d)

5. (a) NCERT (XII) Ch - 4, Pg. 104

Reaction is of zero order as the unit of rate constant is mol L^{-1} s⁻¹.

2a a

- :. Concentration of B = k × t = $0.6 \times 10^{-3} \times 20 \times 60 = 0.72$ M
- 6. (a) It is independent of initial concentration as $t_{\frac{1}{2}} = \frac{0.0693}{k}$

7. (c)
$$k = \frac{2.303}{10} \log \frac{100}{100 - 20}$$

 $k = \frac{2.303}{10} \log \frac{100}{80}$
 $k = \frac{2.303}{10} \log \frac{10}{8} = \frac{2.303}{10} [\log 10 - \log 8]$
 $k = \frac{2.303}{10} [1 - 0.903]$
 $k = \frac{2.303}{10} \times \frac{0.097}{10} = 0.00223 \min^{-1}$

8. (a) NCERT (XII) Ch – 4, Pg. 108

$$t_{1/2} = \frac{0.693}{k} \sec k$$

Ist order reaction is independent of concentration of reactant.

9. (c)
$$R - C - OH + HO - R^{1} - H^{+} R - C - OR^{1} + H_{2}O$$

Carboxylic Alcohol Ester
acid

Rate of reaction = K[carboxylic acid] [alcohol]

So; order of reaction = 2

10. (d) The difference in energy of intermediate complex and the average energy of reactants.

11. (c) NCERT (XII) Ch - 4, Pg. 115

Enthalpy(ΔH) = E_f activation energy of forward – E_b of activation energy of backward reaction

When
$$E_f = E_t$$

 $\Delta H = 0$

12. (d)
$$k = Ae^{-Ea/RT}$$

$$\log k = \log (1.45 \times 10^{11}) - \frac{35 \times 10^3}{2 \times 2.303 \times 573}$$
$$\log k = \log (1.45 \times 10^{11}) - \frac{35 \times 10^3}{2 \times 2.303 \times 573}$$
$$\log k = 11.16 - 13.26 = -2.1$$
Taking antilog, k = 7.94 × 10⁻³ s⁻¹

13. (c) NCERT(XII) Ch - 4, Pg. 111

According to Arrhenius factor for every 10°C change in the temperature the rate of reaction get doubled. Mathematically

$$10^{\circ}C \rightarrow 100^{\circ}C$$

 $\frac{r_{n}}{r_{r}} = 2^{\frac{\Delta t}{10}} = 2^{10} = 512$ times

14. (c) Activation energy of forward reaction = a

Activation energy of backward reaction = b

$$\therefore$$
 Heat of reaction = b - a = c (b > a)

- : Reaction is exothermic
- 15. (b) Arrhenius equation is

$$k = Ae^{-Ea/RT}$$

In the presence of catalyst,

Rate constant $k' = Ae^{-Ea/RT}$

On dividing eg (ii)by eq (i), we get

$$\frac{\mathbf{k'}}{\mathbf{k}} = \mathbf{e}^{\left(\text{Ea/Ea}^{1}\right)} / \text{RT}$$
$$\frac{\mathbf{k'}}{\mathbf{k}} = \mathbf{e}\left(\frac{2000}{3 \times 300}\right) = \mathbf{e}^{3.33}$$

: on taking log both sides,

$$Log \frac{k'}{k} = \frac{3.33}{2.303}$$

 $\frac{k'}{k} = antilog 1.446 = 27.92 \approx 28$

we know that, rate (R) α K

$$\therefore \frac{R^1}{R} = \frac{k^1}{k} 28$$
$$\therefore R^1 = 28R$$

- **16.** (b) Collision frequency increases as the concentration of reactants increase, the probability of collisions increase.
- 17. (a) NCERT (XII) Ch 4, Pg. 106

Fall of concentration from 1.28 mg L^{-1} to 0.04 mg L^{-1} requires 5 half-lives.

- \therefore Time required = 5 × t_{1/2} = 5 × 138 = 690 s
- **18.** (c) Catalyst provides an alternate pathway or reaction mechanism by reducing the activation energy between reactants and products and hence, lowering the potential energy barrier.

19. (b)
$$R \rightarrow P$$

Rate₁ = k (R)¹, 0.04 = K (R)¹_{initial} Rate₂ = k (R)¹, 0.03 = K (R)¹_{final}

4
$$(R)_{initial}$$

$$\frac{1}{3} = \frac{(R)_{\text{initial}}}{(R)_{\text{final}}}$$

Now, apply integrated equation for Ist law for the time gap of 10 second (i.e., between 10 seconds and 20 seconds)

$$kt = 2.303 \log \frac{(A)_0}{(A)}$$

$$k \times 10 = 2.303 \log \frac{4}{3}$$

$$k = \frac{2.303}{10} \times 0.1250$$

$$t_{1/2} = \frac{0.693}{k} = \frac{0.693 \times 10}{2.303 \times 0.1250} = 24.1 \text{ sec.}$$
20. (d) K = Ae^{-Ea/RT}
if T $\rightarrow \infty$

$$k = Ae^0 \Rightarrow K = A$$

2 & 3 options are facts

1. (d) Adsorption is a spontaneous, exothermic process with decrease in entropy, hence $\Delta G = -ve$, $\Delta H = -ve$ and $\Delta S = -ve$

2. (b) As
$$\frac{x}{m} = kP^{\frac{1}{m}}$$

At low pressure $\frac{x}{m} \propto P$ (graph in nearly straight line)

Thus the reaction follows first order kinetics.

- **3. (a)** Physical adsorption by low temperature favours with increase of temperature. It decreases and vice versa while decrease of pressure cause desorption. Further, physical adsorption varies directly with surface area, i.e higher the surface area, more will be the adsorption.
- **4.** (b) TiCl₄ and Al R₃ [R = ethyl], represents Ziegler-Natta catalyst which acts as a catalyst in polymerisation of ethene.
- **5.** (a) All substances have average energy and before the reaction occurs, energy of the reactant should be higher than the average energy. The rate of reaction is increased as catalyst lowers the activation energy.
- 6. (d) Ostwald process

 $4NH_3 + 5O_2 \xrightarrow{Pt} 4NO + 6H_2O + \Delta$ $2NO + O_2 \xrightarrow{50^{\circ}C} 2NO_2(g)$ $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

- **7. (c)** Enzymes are effective only at optimum temperature. At very high temperature, they becomes ineffective.
- **8.** (c) Fog is an example of aerosol in which dispersed phase is liquid and dispersion medium is gas.
- **9.** (c) Electrosmosis is the phenomenon when the movement of particles (electrophoresis) is prevented by some suitable means, it is observed that the dispersion medium begins to

move in an electric field.

- **10.** (c) Tyndall effect is due to the scattering of light by colloidal particles. But sugar solution is a true homogeneous solution, i.e., it will not show tyndall effect.
- **11.** (c) The size of colloidal particles is 10⁻⁵ to 10⁻⁷ cm which is intermediate between true solution and suspension.
- **12. (b)** The blue colour of sky is due to tyndall effect, i.e., the colloidal particles absorb light, causes to sky be luminous and then scatter light of different wavelengths in all possible directions.
- 13. (a) Lesser the gold number more is the protective power.

```
14. (c)
```

- 15. (d)
- **16. (a)** White of an egg whipped with water act as macromolecular colloids.
- **17.** (b) Due to their variable valancy, transition metals are able to form unstable intermediate compounds very readily.

However, these provide a large surface area for the reactant to be absorbed. Transition metals have good catalytic property due to both of these properties.

- 18. (b) In colloidal solution, the particles are suspended & are more dispersed than powdered form hence adsorption is higher.
- 19. (c) The enzymatic activity is destroyed at about 70°C. The favorable temperature range for enzymatic activity is (25 - 37)°C
- 20. (c) When excess of AgNO₃ is added, precipitate of AgI formed changes into positively charged colloidal particles due to adsorption of Ag⁺ ions (AgI : Ag⁺)

Ch - 6 General Principles and Processes of Isolation of Elements

- 1. (d) Bauxite : $Al_2O_3 \cdot 2H_2O$
- 2. (d) In froth flotation process, pine oil act as a frothing agent.
- **3.** (b) Only Al, Ag and Au are extracted by leaching.
- 4. (d) In the extraction of copper, the impurities of iron oxide combine with silica (flux) and form insoluble slag.
 FeO + SiO₂ → FeSiO₃ Slag
- 5. (a) Auto reduction is a process of extraction of Cu and Hg.
- **6.** (b) In metallurgical process Al, Na, K and Mg act as reducing agent.
- 7. (a) In the extraction of chromium and manganese, aluminium is mainly used.
- 8. (b) Thermite (oxide ore + Al power). as; oxides of Cr, Mn, Fe etc. are reduced by Al.
- **9. (b)** Annealing is the process of heating the steel to a temperature much below to redness and cooling it slowly.
- **10.** (c) Ni is purified by Mond's process in which impure nickel is treated with CO to form volatile complex called nickel tetracarbonyl. It decomposes to form pure nickel and CO at high temperature.
- 11. (a) The free energy of formation (ΔG°) of CO from C becomes lower at temperatures above 1180 K whereas that CO₂ form C becomes lower above 127 K than ΔG⁰ of ZnO. However, ΔG° of CO₂ from CO is always higher than of ZnO. Hence C can reduce ZnO to Zn but not CO.
- **12.** (c) Impure metal can be refined by the following methods

(i) Distillation	(ii) Electrolysis
------------------	-------------------

- (iii) Liquation (iv) Zone refining
- (v) Vapour phase refining

Thus; amalgamation process is not used for refining impure metal.

- 13. (a) Ore has lower density in froth floatation process
- 14. (a)
- 15. (d)
- 16. (d)
- 17. (a) Carbonate ores are
 - (1) Siderite : FeCO₃
 - (2) Malachite : CuCO₃.Cu(OH)₂
 - (4) Calamine : ZnCO₃

Sulphide ore is (5) Argentite : Ag_2S . Hydroxide ion is present in

- (2) Malachite : $CuCO_3$. $Cu(OH)_2$
- (3) Bauxite : $Al_2O_3 \cdot 2H_2O$ or $AlOx(OH)_{3-2x}$

where 0 < x < 1

Oxide ore is bauxite (3) only.

- **18.** (d) CuFeS₂ + Cu₂S $\xrightarrow{\Delta}$ No reaction
 - (b) 2CuO $\xrightarrow{\Delta}$ Cu₂O + 1/2 O₂
 - (c) $2Cu_2O + Cu_2S \longrightarrow 6Cu + SO_2$
 - (d) $CuSO_4 \xrightarrow{\Delta} CuO + SO_2 + 1/2 O_2$

Both CuO and $CuSO_4$ upon heating produces Cu_2O and CuO respectively and further Cu_2O and CuO on heating with Cu_2S gives Cu.

- **19.** (b) Zinc blende ore (froth floating method is used for concentration mostly used in case of sulphide ore).
- 20. (b) Because it is less electropositive than other metal $Fe_2O_3 + 3C \rightarrow 2 Fe + 3 CO$ $Fe_2O_3 + 3 CO \rightarrow 2 Fe + 3 CO_2$ iron

Ch - 7 The p-Block Elements

1. (c) NCERT (XII) Ch - 7, Pg. 179

$$\begin{array}{c} H_{3}PO_{2} \\ HO \\ HO \\ H \\ H \end{array}$$

Strong reducing behaviour of H_3PO_2 is due to presence of 1 –OH group and 2 P–H group.

2. (b) H₂O and NH₃ have abnormally high boiling points because of their tendency to form hydrogen bonds due to increase in size. NH₃ has higher boiling point which increases down the group. Hence, the order of boiling point will be

 $H_2O > NH_3 > SbH_3 > AsH_3 > PH_3$

3. (c) BaO₂ is barium peroxide, containing O_2^{2-} peroxide ion.

4. (c) NCERT (XII) Ch - 7, Pg. 194

Since F is most electronegative, when it comes in contact with another F, high inter electronic-repulsion occurs between two F atoms.

 \therefore Least Bond dissociation enthalpy. Others follow the general trend of bond dissociation.

5. (b)
$$\begin{array}{c} 0 \\ \parallel \\ P \\ HO \end{array} \begin{array}{c} 0 \\ P \\ HO \end{array} \begin{array}{c} 0 \\ H \\ 0 \\ H \end{array}$$

 H_3PO_3 is dibasic because it has two P - OH bond and reducing due to the presence of one P-H bond.

6. (c) A in ground state $\rightarrow ns$ np





But, one corner of the octahedraon is occupied by lone pair. Hence; the molecule is square pyramidal.



7. (c) NCERT (XII) Ch - 7, Pg. 200

Correct order of acidity among oxo - acids of Cl is $HClO_4 > HClO_3 > HClO_2 > HClO$ because the oxidation

number of central atom increases, acidic nature increases.

8. (a) Because their is a greater electronegativity difference in NH₃

 $Cu + HNO_3 (conc.) \rightarrow Cu(NO_3)_2 + 2NO_2 + H_2O$ (Brown gas) With HNO₃ (dil) gives NO gas.

(b) Further oxidation is not possible in Mn because Mn in KMnO₄ has the highest oxidation state, i.e., +7.

KI,	KIO ₃
+1 + 3x = 0	+1+x+3(-2)=0
3x = -1	+1 + x - 6 = 0
x = -1/3	x - 5 = 0
	x = +5
KI	IF ₅
+1 + x = 0	x + 5(-1) = 0
x = -1	x - 5 = 0
	x = +5

12. (b) Oxidation states of nitrogen are

$$HNO_3 = +5$$
, $NO = +2$, $N_2 = 0$, $NH_4Cl = -3$

13. (a) $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$

Thus in this reaction, phosphorous acid (H₃PO₃) is produced.

- 14. (d) Due to its reducing property, SO₂ act as bleaching agent.
 SO₂ + 2H₂O → H₂SO₄ + 2H
- **15.** (a) All hydrogen halides are gases, Except HF is a liquid with boiling point 19.5° C. Thus behaviour is due to association of HF molecules through hydrogen bonding.

17. (c)
$$\operatorname{XeF}_{6} \xrightarrow{} \operatorname{XeF}_{5}^{+} + F^{-}$$

 \downarrow
 $\operatorname{sp^{3}d^{2}}(5\sigma + 1 \text{ LP})$

- **18.** (d) N₂O is relatively unreactive
- **19.** (b) FeSO₄ forms brown ring with NO
- 20. (a) As the size of halogen increases bond energy decreases

1. (c) NCERT (XII) Ch - 8, Pg. 226

 SO_2 is a gas that can readily decolourise acidified KMnO_4 solution.

2. (a) $Ti^{4+} = (22 - 4 = 18) = [Ar] 3d^0$

$$V^{4+} = (23 - 4 = 19) = [Ar] 3d^{1}$$

$$Mn^{2+} = (35 - 2 = 23) = [Ar] 3d^5$$

$$Fe^{3+} = (26 - 3 = 23) = [Ar] 3d^5$$

Hence; it is colourless in nature so; Ti⁴⁺ is not having any unpaired electron.

3. (b) Zn(30) : [Ar] $4s^23d^{10}$

4. (b) NCERT (XII) Ch - 8, Pg. 229

Ce have +4 oxidation state.

5. (d) Fe = $26 = [Ar] 3d^6 4s^2$

$$Fe^{3+} = [Ar] 3d^5$$

$$\mu = \sqrt{n(n+2)} = \sqrt{5(5+2)} = \sqrt{5(7)} = \sqrt{35}$$

$$=\sqrt{35} = 5.91 \approx 6$$
 B.M

6. (a) NCERT (XII) Ch - 8 Pg. 229

Electronic configuration of Eu, Gd and Tb:

Eu = [Xe]
$$4f^7 6s^2$$
 Gd = [Xe] $4f^7 5d^1 6s^2$

$$Tb = [Xe] 4f^9 6s^2$$

7. (c)
$$Fe^{+3} = 3d^5 = \boxed{1111111} = 5$$

 $Cr^{3+} = 3d^3 = \boxed{11111} = 3$
 $Ni^{2+} = 3d^8 = \boxed{111111} = 2$
 $Cu^{2+} = 3d^9 = \boxed{1111111} = 1$

8. (d) Increase in atomic number will generally decrease basic character.

9. (b) NCERT (XII) Ch - 8, Pg. 228

Zr (40) and Hf (72) will have same atomic size because of lanthanoid contraction and poor shielding effect.

10. (b) Zn has completely filled 3d-subshell hence, its oxidation

state is decided only by 4s electrons, i.e., +2

11. (b)
$$K_2MnO_4$$

$$2(+1) + x + 4(-2) = 0$$

 $2 + x - 8 = 0$
 $x - 6 = 0 \Rightarrow x = +6$

- 12. (b) $K_2Cr_2O_7 + 3Na_2SO_3 + 4H_2SO_4 \rightarrow 3Na_2SO_4 + K_2SO_4 + 4H_2O + Cr_2(SO_4)_3$
- **13.** (b) Across lanthanoid series, due to lanthanoid contraction, size of cation decreases, increase covalent character and decrease ionic character. So; basicity of hydroxides decreases.

14. (b) Na₂ [CuCl]
$$\Rightarrow$$
 Cu = +2 = Cu²⁺ = 3d⁹ [1 1 1 1 1 1 1 1]
Na₂ [CdCl₄] \Rightarrow Cd = +2 = Cd²⁺ = 4d¹⁰ [1 1 1 1 1 1]
K₄ [Fe(CN)₆] \Rightarrow Fe = +2 = Fe²⁺ = 3d⁶ [1 1 1 1 1 1]
K₃ [Fe(CN)₆] \Rightarrow Fe = +3 = Fe³⁺ = 3d⁵ [1 1 1 1 1 1]

15. (b) $Cr(24) \rightarrow [Ar] 3d^5 4s^1$

Cr has higher second ionisation enthalpy as after removing one electron from Cr, the resulting configuration, i.e., [Ar] 3d⁵ becomes more stable.

- **16. (c)** Isoelectronic species are those which contains same number of electrons
- 17. (a) Cr^{2+} acts as reducing agent because it is itself oxidised to Cr^{3+} giving it t_{eg}^{-3} configuration, whereas Mn^{3+} acts as oxidising agent giving it $3d^5$ configuration
- 18. (d)
- 19. (b)
- 20. (d) NCERT (XII) Ch 8, Pg. 221

Magnetic moment(μ) for Ni²⁺ = $\sqrt{n(n+2)}$

Ch - 9 Coordination Compounds

1. (b) NCERT (XII) Ch - 9, Pg. 251

The increasing order for the wavelengths of absorption in the visible region for the complexes of Co^{3+} is:-

 $[Co(en)]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(H_2O)_6]^{3+}$

As the spectro chemical series is:

$$\label{eq:rescaled} \begin{split} I^- &< Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{-2-} < H_2O < \\ NCS^- &< EDTA^{4+} < NH_2 < en < CN^- < CO. \end{split}$$

- **2.** (d) Total number of coordinate bonds through which central metal atom/ion is attached with ligand is coordination number.
- **3.** (d) Heteroleptic complex are those which has more than one kind of donor (s) are present
- 4. (c) The IUPAC name of this compound is

Triamminebromochloronitroplatinum (IV) chloride

5. (d) NCERT (XII) Ch - 9, Pg. 238

Complexes are respectively $[Co(NH_3)_6]Cl_3$, and $[Co(NH_3)_4Cl_2]Cl$.

6. (a) Solution containing conc. HCl and conc . HNO₃ in the ratio of 3:1 is Aqua - regia.

It dissolutes noble metals lilke Au, Pt etc.

$$HNO_3 + 3HCl \rightarrow 2H_2O + 2Cl + NOCl$$

$$Au + 3Cl \rightarrow AuCl_{3}$$

 $AuCl_3 + HCl \rightarrow AuCl_4$

- $AuCl_{4} = Tetra chloridoaurate (III)$
- 7. (c) The existence of two different coloured complexes is due to geometrical isomerism as cis and trans forms are present.

8. (c) NCERT (XII) Ch - 9, Pg. 249

In $[MnBr_4]^{2-}$

 $Mn^{2+} = [Ar]^{18} 3d^5 4s^0.$

[MnBr₄]²⁻ is tetrahedral complex

$$1 1 1 + e_g$$

$$1 1 1 + e_g$$

$$n = 5$$

$$\mu = \sqrt{n(n+2)} = \sqrt{5(5+2)} = \sqrt{5(7)} = \sqrt{35}$$

$$= 5.9 \text{ B.M}$$
9 (2) [NiCl]²⁻ $\Rightarrow x - 4 = -2$

10. (c)
$$[Fe(CN)_6]^{3-} \Rightarrow x - 6 = -3$$

$$x = -3 + 6$$

$$x = + 3$$
Fe³⁺ = 26 = 1 1 1 1 1 1
CN is strong ligand, it create pairing

 \therefore The hybridisation used is d^2sp^3

11. (c) E.A.N of
$$Cr = 24 + 2(6) - 3$$

= 24 + 12 - 3 = 36 - 3 = 33

12. (b) NCERT (XII) Ch -9

Jahn - teller distortion is usually significant for asymmetrically occupied e_g orbital. In case unevenly occupied t_{2g} orbital & Jahn-teller distortion is very weak.



13. (d))
---------	---

[Co(NH ₃) ₆] ³⁺	$[MnO_4]^-$	$[Fe(CN)_{6}]^{3-}$	[Cr(CN) ₆] ³⁻
x = + 3	x + 4 (-2) = -1	x - 6 = -3	x - 6 = -3
Co = [11 1 1 1 1]	x - 8 = -1	x = -3 + 6	x = -3 + 6
d = 6 electrons	x = -1 + 8 = + 7	x = + 3	x + + 3
	d = 0 electrons	$\frac{Fe^{3+}}{1 1 1 1 1 1} =$	$Cr^{3+} =$
		d = 5 electrons	d = 3 electrons

14. (c) $Fe^{3+} = 1 1 1 1 1$

 CN^{-} is a strong ligand. Therefore pairing of will takes place.

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

$$=\sqrt{(1)(1+2)} = \sqrt{3} = 1.738$$
 B.M

15. (c) Increasing order of ligand field strength

$$\begin{split} I^- &< Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-} < H_2O \\ &< NCS^- < EDTA^{4-} < NH_3 < en < NO_2^- < CN^- < CO \end{split}$$



Paramagnetism ∞ Number of unpair electrons

17. (b) Zeigler - Natta catalyst is $Et_3Al + TiCl_4$	20. (c) Metal carbonyds follow EAN rule
18. (a) Zeise's salt, K $[PtCl_3(C_2H_4)]$	$\left\lceil Mn(CO)_{6} \right\rceil \xrightarrow{-e^{-}} \left\lceil Mn(CO)_{6} \right\rceil^{+}$
 19. (a) NCERT (XII) Ch - 9, Pg. 242 Name of complex ion [Fe(CN)₆]³⁻ is Hexacyanidoferrate (III) ion 	$EAN = 37 \qquad EAN = 36$ $\left[V(CO)_{6}\right] \xrightarrow{+e^{-}} \left[V(CO)_{6}\right]^{-}$
Oxidation state of Fe is +3.	EAN = 35 EAN = 36

Ch - 10 Haloalkanes and Haloarenes

1. (b) NCERT (XII) Ch - 10, Pg. 294

The order of reaction in S_N^1 reaction is $3^0 > 2^0 > 1^0$. But in this case : $H_2C = CH - CH_2Cl$.

$$CH_2 = CH - CH_2$$
 is highly stable due to resonance.

2. (d)
$$CH_3 - CH_2 - CH_2 - CH_2CI_1$$

 $CH_3 - CH_2 - CH_2CI_2$

It is primary halide as Cl atom is attached to a primary carbon.

3. (d)
$$CH_3 - CH_3$$

|
C - CH_3
|
OH

The reactivity of lucas reagent : $3^\circ > 2^\circ > 1^\circ$

4. (a)
$$CH_2 = CH - CH_2 - CH_3 + HBr \rightarrow$$

Br
 $CH_3 - CH - CH_2 - CH_3$

5. (d) NCERT (XII) Ch - 10, Pg. 286

Reactivity of alcohol with Lucas reagent

$$3^{\circ} R - OH > 2^{\circ} R - OH > 1^{\circ} R - OH.$$

 CH_3
 $CH_3 - CH_3$ is tertiary in nature. Therefore they react fastly.
 OH

- **6.** (b) As we go down the group, due to the increase in size leaving the group property increases is the size of halide increases.
- 7. (c) When halogen get attached to benzene ring, it will deactivate the ring, as halogen is electron withdrawing in nature. Because it attached to benzene ring through σ bond and due to resonance, this effect is mainly observed at ortho and para position.
- 8. (c) $RX + Mg \xrightarrow{dry}{ether} RMgX$

9. (b)
$$C_2H_5Cl + RO^-Na^+ \rightarrow C_2H_5 - O - R + NaCl$$

10. (d) NCERT (XII) Ch - 10, Pg. 208

Optically active pairs are called enantiomers.



11. (b)
$$R - X + NaI \xrightarrow{acetone}{\Lambda} RI + NaX$$

$$X = (I, Br)$$

12. (b) NCERT (XII) Ch - 10, Pg. 297

Maleic acid does not have any chiral atom & does not exhibit any optical activity, it also have a plane of symmetry.

- 13. (c) Refers to NCERT Page No. 289 (Class-XII, Part 2).
- **14. (c)** Refrigerant in refrigerators and air conditioners are chlorofluorocarbon (CFC's) or freons.
- **15. (a)** Gammexane is chemically known as benzene hexachloride (BHC) through the later name is incorrect but the older name (BHC) is still use.



16. (d) Another name of chloropicrin is tear gas. It is obtained by reaction of chloroform with nitric acid.

$$CHCl_3 + HNO_3 \rightarrow CCl_3NO_2 + H_2O$$

Chloropicrin
(tear gas)

17. (b) Stability of carbocation is the major concern here.



Out of case I & case II, case III, carbocation is more stable because N shows more better +M (being less electro –ve)

- **18. (a)** The reaction occurs via formation of a carbanion. Presence of $-NO_2$ groups at ortho & para positions will stabilize the carbanion maximum with a M & I effect.
- **19.** (a) 2^{nd} option is neopentyl chloride which is least reactive towards $S_N 2$ & prefers to underges $S_N 1$. 3rd option i.e., methyl chloride prefers $S_N 2$ owing to least steric hindrance. Bridge head halides neither undergo $S_N 2$ (3° halide) nor $S_N 1$ (carbocation not stable).

20. (d) NCERT (XII) Ch - 10 CH_{3} CH_{3} CH_{2} CH_{2} CH_{2} CH_{2} CH_{2} CH_{2} CH_{3} CH_{2} CH_{3} CH_{3} CH_{3} CH_{2} CH_{3} CH_{3}

Ch - 11 Alcohols, Phenols and Ethers

1. (d) NCERT (XII) Ch - 11, Pg. 337



In phenyl methyl ether C–O bond is sp^2 hybridised. In spand sp^2 hybridisation ($C_{large} - O - C_{small}$) cleavage takes place but in sp^3 hybridisation ($C_{large} - O - C_{small}$) cleavage takes place.

 CH_3

3-Methyl butan-2-ol

2. (a)
$$C_5H_{12}O = C_5H_{11}OH$$

(i) $CH_3CH_2CH_2CH_2CH_2OH$
Pentan-1-ol
(ii) $CH_3CHCH_2CH_2CH_2OH$
(ii) $CH_3CHCH_2CH_2CH_3$
Pentan-2-ol
(chiral)

OH (iii) CH₃CH₂CHCH₂CH₃ (iv) CH₃-CHCH₂CH₂OH Pentan-3-ol

(v)
$$CH_3 - \begin{array}{c} CH_3 \\ - \\ C - \\ - \\ CH_3 \\ CH_3$$

$$CH_3 OH$$

 $| | |$
 $(vii) CH_3 - CH - CH - CH_3$
3-Methyl butan-2-ol
(chiral)



4. (a) Lower alcohols are soluble in water, but solubility of alcohol in water decreases as the number of carbon increase.

5. (c) NCERT (XII) Ch - 11, Pg. 335

Phenol + chromic acid = A conjugate diketone

6. (d) Lucas reagent fastest with tertiary alcohol. OH

$$CH_3 - C - CH_3$$

 $CH_3 - CH_3$

7. (b) NCERT (XII-II) Ch - 11, Pg. 339



Williamson ether synthesis

8. (a) Lucas reagent is Conc. HCl and anhydrous ZnCl₂.

9. (d) NCERT (XII) Ch - 11, Pg. 337

The above reaction is called Williamson synthesis of ether.

$$CH_{3} \xrightarrow{I} CH_{3} \xrightarrow{I} ONa + CH_{3}CH_{2}Cl \xrightarrow{- NaCl} \xrightarrow{CH_{3}} CH_{3} \xrightarrow{CH_{3}} CH_{3} \xrightarrow{CH_{3}} O-CH_{2}-CH_{3}$$

- 10. (b) Commonly known name of denaturated alcohol is methylated spirit.
- 11. (d) Drinking of methyl alcohol mainly causes blindness.
- 12. (c) $R X + RO^{-}Na^{+} \rightarrow R O R$

Represents a Williamson ether synthesis. It involves nucleophilic substitution of the halide ion from the alkyl halide by the alkoxide ion by S_{N}^{2} mechanism

13. (c) $CH_3 - CH_2 - O - CH_3$, $CH_3CH_2CH_2 - OH$ ether alcohol



(Stabilished anion because of -M and -I effect of -NO₂)

15. (a) The acidic order is

Paranitrophenol > Meta-nitrophenol > Phenol > Methyl Phenol

16. (a) The correct acidic order is,





Ch - 12 Aldehydes, Ketones and Carboxylic Acids

1. (c) NCERT (XII) Ch - 12, Pg. 355



"B" must be "acetophenone" gives cross aldol condenstation

2. (d) CH₃CH₂CH₂CH₂CH₂CHO

an aldehyde





4. (d)



5. (c)
$$| \stackrel{\text{CHO}}{|} \xrightarrow{\text{NaOH}} | \stackrel{\text{COONa}}{|} \xrightarrow{\text{COONa}} (X)$$

6. (b) NCERT (XII) Ch - 12, Pg. 358

Because Cl- is a better leaving group

Reactivity order during nucleophilic acyl substitution.

$$\begin{array}{cccc}
O & O & O \\
O & \parallel & \parallel & \parallel \\
R - C - Cl > R & O \\
\end{array} \xrightarrow{C} O \\
R > R & OC_2H_5 > R - C - NH_2
\end{array}$$

7. (b) On treatment with an excess of I_2 in the presence of NaOH with aldehydes and ketones containing $CH_3 - CO$ - group produce a haloform (iodoform)

 $CH_{3} - CHO + 3I_{2} \xrightarrow{\text{NaOH}} CI_{3}CHO + 3HI \xrightarrow{\text{NaOH}} CHI_{3} + HCOO^{-}NA^{+}$





9. (c) R-C is a resonance hybrid of resonating structures.

10. (c) NCERT (XII) Ch -12

Trans isomer does not react with acetone.



11. (a) –Cl increases the polarity of -C group because –Cl is electron withdrawing in nature.

Therefore; the acidic strength of the compounds are: Cl_3C . COOH > $Cl_3CHCOOH$ > $ClCH_2COOH$ > CH_3COOH

12. (c) Fluorine is more strongest electron withdrawing in nature. It will increases the polarity and acidic strength of the carboxylic acid.

13. (b) NCERT (XII) Ch - 12, Pg. 371

Sodium hydrogencarbonate (NaHCO₃) being an alkali solution will dissolve an acid not a base so o-nitrophenol being a very weak acid than NaHCO₃ will not get dissolve.

- 14. (c) HVZ reaction is given only by those acids which contain α hydrogen gen atoms which are replaced by halogen atoms.
- **15.** (b) In option (V) the conjugate base is stabilized by intramolecular H-bonding from 2 ends.



16. (d)



17. (c) Electron rich rings/groups increase the ease of hydride ion donation.

18. (c) It is an example of addition-elimination reaction via formation a carbanion. So, presence of EWG will stabilise the carbanion & accelerate the rate of reaction



Ch - 13 Amines

1. (a) NCERT (XII) Ch - 13



III is more basic as compared to other two because CH₃ is a donating group which increases the basic strength of the group.

2. (a) By Gabriel-phthalimide synthesis only pure 1⁰ amines can be prepared. Aniline is not formed as aryl halide is not formed by nucleophilic substitution with potassium phthalimide.



The above reaction is Hofmann bromamide reaction.

4. (c) NCERT (XII) Ch - 13, Pg. 386

Hoffmann bromamide reaction

$$R - C - NH_2 + Br_2 + 4NaOH \rightarrow R - NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

Hoffmann developed a method for preparation of primary amines by treating an amide with bromine in an aqueous or ethanoic solution, of sodium hydroxide. In this degredation reaction, migration of an alkyl or aryl group takes place from carbonyl carbon of the amide to the nitrogen atom. The amide so formed contains one carbon less than that present in the amide.



6. (b) $LiAlH_4$ convert C = O group into CH_2 group thus, it can be used to convert acetamide into ethanamine.



8. (a) NCERT (XII) Ch - 13, Pg. 392 NH_2 L_1 NH_2 NH_2

Synthesis of amides from amines from acyl halides or anhydrides in the presence of a base is known as Schotten-Baumen reaction.

9. (d) By carbylamine reaction isocyanides are prepared. In this, primary amine is treated with chloroform and NaOH or KOH to give isocyanide (unpleasant smelling compound).

$$\begin{array}{c} \text{CHCl}_3 + 3\text{KOH} + \text{R} - \text{NH}_2 \rightarrow \text{R} - \text{NC} + 3\text{H}_2\text{O} + 3\text{KCl} \\ \text{Primary} & \text{isocyanide} \\ \text{amine} \end{array}$$

10. (b) Ethylamine cannot react with dye but aniline give reaction with dye.



12. (b) Aniline \rightarrow N-phenyl derivative of an amide.

Benzanilide is a N-phenyl derivative of benzamide, $C_6H_5CONH_2$

Benzanilide structure is C₆H₅CONHC₆H₅:

13. (a) NCERT (XII) Ch - 13, Pg. 386



normal conditions.

14. (b) On reduction amine should be formed.







 $[\pi$ bond cannot be formed at bridge head location (violation of Bredt's rule)]

17. (a)





19. (c) $_{R_2}^{R_1} > N - R_3 =_{CH_3}^{H} > N - CH_3$ sec. Amine reacts with Nitrous acid to form nitroso amine yellow liquid.

20. (d) NCERT (XII) Ch - 13, Pg. 390 - 391

 \sim CH₂NH₂ is the most basic species among the four

as lone pair on N are not involved in resonance

& +I effect of $-CH_2$ group attached increases electron density at NH_2 . In rest all lone pair of N are in conjugation with benzene ring.

Ch - 14 Biomolecules

- **1. (b)** The formula of starch is $(C_6H_{10}O_5)_n$
- (b) Non-reducing sugars are the carbohydrates which do not reduced by Tollen's and Felhing's test.

3. (a) NCERT (XII) Ch - 14, Pg. 441

Glycine is not optically active as it does not have chiral carbon (H₂N–CH₂–COOH)

4. (c) Maltose
$$\xrightarrow{\text{Maltase}} \text{Glucose} + \text{Glucose}$$

5. (c) $\xrightarrow{\text{CHO}} \text{COONH}_4$
 $| (\text{CHOH})_4 + 2 [\text{Ag}(\text{NH}_3)_2]\text{OH} \longrightarrow (\text{CHOH})_4 + 2\text{Ag}\downarrow$
 $| (\text{CHOH})_4 + 2 [\text{Ag}(\text{NH}_3)_2]\text{OH} \longrightarrow (\text{CHOH})_4 + 2\text{Ag}\downarrow$
 $| \text{CH}_2\text{OH} \text{Tollen's reagent} | \text{Silver} \text{mirror}$
 glucose

6. (a) NCERT (XII) Ch - 14, Pg. 416

Denaturation will not make protein more active, but it can degenerate secondary, tertiary or quatarnary structure of protein but does not affect primary structure of the protein.

7. (d)
$$H - C - CH_2CH_2COOH$$

|
NH₂
(Glutamic acid)

It is acidic in nature because in this group, their are two carboxylic acid and one amino acid.

- **8.** (d) Keratin is a fibrous protein, it is present in different part of the body, eg: hair, wool, silk, muscles. etc.
- **9.** (c) Insulin contains two polypeptide chains with 21 and 30 amino acids which are joined together by sulphur bridges.

Hence, it is a peptide hormones.

- **10. (a)** In human body, there are 20 amino acids that are synthesised.
- **11.** (c) Zwitter ion is an ion with positive and negative charges at different point it.
- 12. (b) In an alkaline medium, glycine predominantly exists as anion.

13. (c) NCERT (XII) Ch - 14, Pg. 418

Vitamin B complex (B_3) is water soluble.

- 14. (b) Enzymes are made up of protein with specific structure.
- **15. (b)** Its a six membered ring (PYRANOSE) but not α -pyranose. It has β -orientation at C-1. Since there is one H & one OH at C-1, it is an aldohexose.
- **16.** (d) The reactions of glucose with Schiff's reagent, sodium bisulphite, 2, 4-DNP & ammonia are reversible & hence open chain form always remains in equilibrium with the two cylcic hemiacetal forms. As a result, these reagents cannot disturb the equilibrium to generate more of open chain form from the cyclic hemiacetal & so, do not react with glucose.
- 17. (d) It is actually lactose. It is made up of β -D-galactose & β -D-glucose. On the left hand side is galactose & on the right hand is glucose. There is free anomeric –OH.
- **18.** (b) Isoelectric point is high, solubility is low
- 19. (b) At higher pH, an amino acid exist as anion.

20. (c) NCERT (XII) Ch -14



Ch - 15 Polymers

1. (b) Nylon 6, 6 is a polymer of hexamethylene diamine & adipic acid:

HOOC —
$$(CH_2)_4$$
 — COOH + NH_2 — $(CH_2)_6$ — NH_2 \longrightarrow
Adipic acid Polymerisation

$$\stackrel{O}{\stackrel{\parallel}{\leftarrow}} \stackrel{O}{\stackrel{\scriptstyle}{\leftarrow}} \stackrel{O}{\stackrel{\scriptstyle}{\leftarrow}} \stackrel{O}{\stackrel{\scriptstyle}{\leftarrow}} \stackrel{O}{\stackrel{\scriptstyle}{\leftarrow}} \operatorname{NH}(\operatorname{CH}_2)_6 - \operatorname{NH}^{\stackrel{\scriptstyle}{\rightarrow}_n}$$

- **2.** (b) Butadiene + styrene \rightarrow Buna S
- 3. (c) Polyamide containing amides linkage -CONH- is Nylon.

4. (b) NCERT (XII) Ch - 15, Pg. 431

Natural rubber (Isoprene) has cis - configuration

5. (d) Thermoplastics can be remoulded while nylon 6,6 cannot be remoulded as it is not a thermoplastic.

6. (b) NCERT (XII) Ch - 15, Pg. 431

Caprolactum; Nylon 6 is obtained by heating caprolactum with water at high temperature.



This a linear polymer called Bakelite or novolac. It is a thermosetting polymer formed by the condensation reaction of phenol and formaldehyde.

8. (d) NCERT (XII) Ch - 15, Pg. 436

Glycine and aminocaproic acid are monomers of Nylon 2 – nylon 6, which is a biodegradable polymer.

- **9. (b)** The increasing order of intermolecular forces: Elastomer < plastic < fibre.
- 10. (d) Bakelite is an example of condensation polymer.
- **11. (b)** In vulcanization of rubber, sulphur forms cross links to make rubber more elastic.
- **12.** (a) Nylon 6,6 has amide linkage.
- 13. (a) Condensation polymer of α Glucose is starch.
- **14.** (a) In olefin polymerisation, Ziegler Natta catalyst $[(C_2H_5)_3Al + TiCl_4]$ is used.
- 15. (a) Nylon 6,6 is a polyamide. It has amide linkage.
- **16.** (d) Polytetrafluoroethylene (teflon) is used to make 'non stick' cookware.
- **17.** (d) Cationic, anionic & free radical polymerization are known to occur.
- **18.** (a) cis-polyisoprene is not a semisynthetic polymer while other three cellulose nitrate, cellulose acetate and vulcanised rubber are semisynthetic polymer made from cellulose, cellulose and natural rubber respectively.

19. (d) Factual

20. (c) NCERT (XII) Ch - 15, Pg. 432



Ch - 16 Chemistry in Everyday Life

- 1. (c) NCERT (XII) Ch 16, Pg. 448
 - Dettol = chloroxylenol + terpineol

Dettol is a antiseptic.

Antiseptic is a substance which is applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces.

- **2. (b)** The drug which act as anti allergic drugs are antihistamine.
- 3. (b) NCERT (XII) Ch 16, Pg. 450

Aspartame is methyl ester of dipeptide formed from aspartic acid and phenylamine. Use of it is limited to cold foods and soft drinks because it is unstable at cooking temperatures.

4. (c) NCERT (XII) Ch -16, Pg. 447

Streptomycin, chloromycetic and penicillin are antibiotics while novalgin is an analgesic.

- 5. (d) Salvarsan is an antibiotic.
- 6. (b) An effective antimalarial drug is chloroquine.
- 7. (c) Gammexane is not an antiseptic drug. It is a benzene hexachloride which is used as an insecticide.
- 8. (b) Aspirin can act as both analgesic and antipyretic.
- **9.** (b) Psychotherapeutic drugs are also known as tranquilizers which are the drugs used in relieve mental ailments as they acts on the central nervous system.
- 10. (c) Paracetamol can act as both analgesic and antipyretic.

- 11. (b) To reduce fever, antipyretics drugs are is used.
- **12.** (d) Chloroamphenicol is broad spectrum antibiotic.
- **13.** (c) Oral contraceptive drug contain mestranol and norethindrone.
- 14. (a) NCERT (XII) Ch 16, Pg. 447

Chloroamphenicol is a broad spectrum antibiotic.

- 15. (b) Sucralose is a derivative of sucrose
- 16. (d) An example of disperse dye is celliton fast pink B.
- 17. (c) $CH_3 \rightarrow CH_2 \rightarrow CH_2$ $CH_3 \rightarrow CH_3$ example of non - biodegradable detergent.
- 18. (c) Glycerol is added to soap. Its functions to prevent rapid drying.
- 19. (b) NCERT (XII) Ch 16, Pg 445



PARACETAMOL

20. (c) NCERT (XII) Ch - 16

Valium is popularly used as a tranquilizer drug.