FIRST YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION, DECEMBER -2019.

CHEMISTRY - ANSWER KEY

1 a) $pH < 7$

2 c) Heat capacity

3 b) 1

4 c) CO_2

5 Intra molecular

6 Cu (II) O

7 D_2O

8 Mg

9 Inorganic benzene

10 Law of definite proportion states that a given compound always contains exactly the same proportion of elements by weight.

Cupric carbonate have natural and synthetic sample. The % of various elements are

	% Cu	% Oxygen	% Carbon
Natural Sample	51.35	9.74	38.91
Synthetic Sample	51.35	9.74	38.91

11 Be - $1s^2\ 2s^2$

B - $1s^2\ 2s^2\ 2p^1$

During first ionization, electron removed from 's' subshell for Be and 'p' subshell for B. The penetration of 2s orbital is more than 2p orbital.

12 a) The ratio of pV and nRT is known as compressibility factor (Z).

$$Z = \frac{pV}{nRT}$$

b) one

13 Given,

$V_1 = 120ml$ $\quad V_2 = 180ml$

$T_1 = 35 + 273 = 308K$ $\quad T_2 = 35 + 273 = 308K$

$P_1 = 1.2\ bar$ $\quad P_2 = ?$

We have

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

$$\frac{1.2 \times 120}{308} = \frac{P_2 \times 180}{308}$$

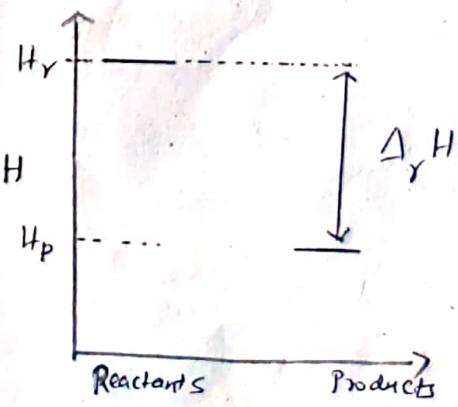
$$P_2 = \frac{1.2 \times 120}{180}$$

$$= 0.8\ bar$$

14 a) It is due to surface tension of the liquid. On the surface of liquid the moist soil grains are pulled inward.

b) It is due to viscosity. Glass is a supercooled liquid. So it has a tendency to flow very slowly.

15



16 a) Entropy (S) is a measure of degree of disordness or randomness of the system.

b) The entropy of any pure crystalline substance approaches zero as the temperature approaches absolute zero.

17 • If $Q_c < K_c$, the reaction shift towards forward direction

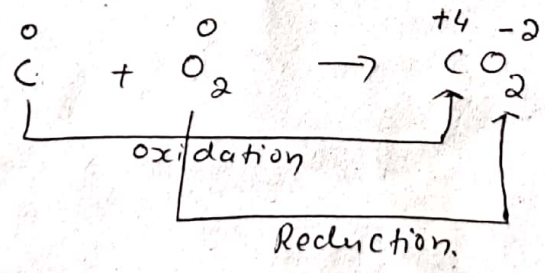
• If $Q_c > K_c$, the reaction shift towards backward direction

• If $Q_c = K_c$, no net reaction or equilibrium

18 Oxidation – Increase in oxidation number of an element

Reduction – Decrease in oxidation number of an element.

Eg:



19 $BaO_2 \cdot 8H_2O + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2 + 8H_2O$

(Barium peroxide)

20 i) CaO (d)

ii) $Ca(OH)_2$ (c)

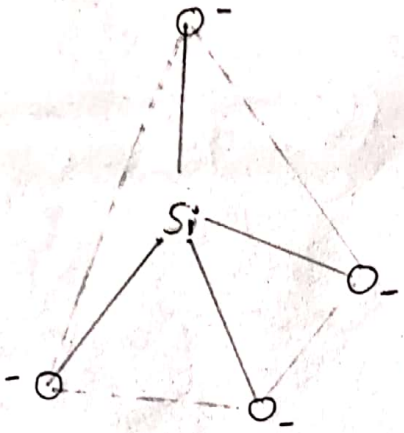
iii) $CaCO_3$ (a)

iv) $CaSO_4 \cdot 2H_2O$ (b)

21 a) Lithium is harder than other alkali metals.

b) · Li is very small in size
· Highest polarizing power $\left(\frac{\text{charge}}{\text{size}}\right)$

22



23 a) i) $n=0$, $l=0$, $m=0$, $s=+1/2$ and iii) $n=1$, $l=1$

b) i) n values indicates principal Q.n which means shell. It values 1, 2, 3, ... and can not be zero.

ii) For $n=1$, 'l' must be zero.

24 a) sp^2 hybridisation

b) Ethene ⇒ $CH_2 = CH_2$

In ethene both carbon atoms undergo sp^2 hybridisation. There are '3' sp^2 hybrid orbitals produced by each carbon. Two of them overlap with 's' orbital of hydrogen. One sp^2 hybrid orbital from each 'c' overlap each other to form C – C σ bond. The unhybridised 'p' orbital from each carbon overlap sidewise to form C – C π bond.

25 i) London Forces or Dispersion Forces

The force of attraction between two temporary dipoles.

ii) Dipolo - Dipole forces

The attractive forces act between the molecules having permanent dipole.

iii) Dipole - Induced dipole forces

The attractive forces act between the polar molecule and having permanent dipole and the non polar molecule.

26. a) $CH_3COONa \xrightarrow{H_2O} CH_3COOH + NaOH$

(Sod. acetate)

The product are acetic acid (weak) and Sodium hydroxide (strong base). Therefore it is basic in nature.

b)

pka $CH_3COOH = 4.76$

pK_b $NH_4OH = 4.75$

pH $CH_3COONH_4 = ?$

we have

$$pH = 7 + \frac{1}{2}[pka - pK_b]$$

$$= 7 + \frac{1}{2}[4.76 - 4.75]$$

$$= 7 + \frac{1}{2}[0.01]$$

$$= 7.005$$

27@ Le Chatelier's Principle.

It states that a change in any of the factors that determine the equilibrium conditions of a system, will cause the system to reduce the effect of the change

b) Temperature increases, the reaction shift in the backward direction

28 Oxidation number method

Step 1:

$$MnO_4^- + SO_2 \longrightarrow Mn^{2+} + HSO_4^-$$

Step 2:

$$\overset{+7}{Mn}O_4^- + \overset{+4}{S}O_2 \longrightarrow \overset{+2}{Mn}^{2+} + \overset{+6}{H}SO_4^-$$

Step 3:

$$\overset{+7}{Mn}O_4^- + \overset{+4}{S}O_2 \longrightarrow \overset{+2}{Mn}^{2+} + \overset{+6}{H}SO_4^-$$

Decreased by 5 x ③

Increased by 2 x ⑤

So we can write

$$2\,MnO_4^- + 5\,SO_2 \longrightarrow 2\,Mn^{2+} + 5\,HSO_4^-$$

Step 4:

$$2\,MnO_4^- + 5\,SO_2 + H^+ \longrightarrow 2Mn^{2+} + 5\,HSO_4^-$$

Step 5:

$$2\,MnO_4^- + 5\,SO_2 + H^+ + 2H_2O \longrightarrow 2Mn^{2+} + 5\,HSO_4^-$$

29 3 types Covalent hydrides

- Electron-deficient - Hydrides of 13 group elements

  eg:- B_2H_6

- Electron precise - Hydrides of 14 group elements

  eg:- CH_4

- Electron rich - Hydrides of 15-17 group elements

  eg:- H_2O, NH_3, HF.

30 a) In Diamond each Carbon atom undergoes sp^3 hybridisation and linked to 4 other Carbon atoms. It produce a rigid 3 dimensional network structure. Therefore diamond has high melting point

b) CO has ability to form a complex with haemoglobin which is about 300 times more stable than the O_2 - heamoglobin complex. Therefore it reduces the O_2 carrying capacity of the blood.

c) Boric acid is a weak acid because it is not able to release H^+ ions on its own. It receives OH^- from water and releases H^+ ions.

31 a) Carbon (CO_2)

b) In CO_2 carbon undergoes sp hybridisation which gives a linear shape. but in SiO_2 silicone has sp3 hybridisation giving 3-dimensional network structure. Therefore CO_2 is a gas and SiO_2 is a solid.

32 a) Bond order $= \frac{1}{2}[N_b - N_a]$

where N_b := No. of bonding electrons

N_a = No of antibonding electrons

3 b) Bond length is inversely proportional to bond order.

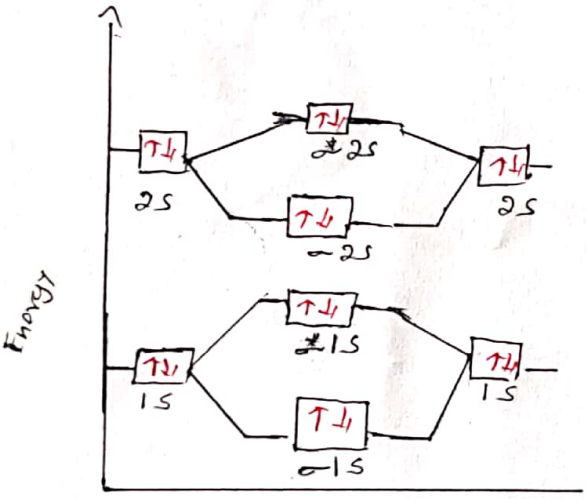
c) Be_2

No. of e^n = 8

M.O electron config:- $\sigma 1s^2 \; \sigma^* 1s^2 \; \sigma 2s^2 \; \sigma^* 2s^2$

B.O $= \frac{1}{2}[4 - 4]$

$= 0$



33 a) Hess's law states that if a reaction takes place in several steps then its standard reaction enthalpy is the sum of the standard enthalpies of different steps involved in the reaction.

b) Given

$C + O_2 \rightarrow CO_2, \quad \Delta_f H^\circ = -393.5 \text{ kJ/mol}$ — ①

$H_2 + \frac{1}{2} O_2 \rightarrow H_2O, \quad \Delta_f H^\circ = -286 \text{ kJ/mol}$ — ②

$C + 2H_2 + \frac{1}{2} O_2 \rightarrow CH_3OH, \quad \Delta H_f^\circ = -239 \text{ kJ/mol}$ — ③

We have to get,

$$CH_3OH + O_2 \rightarrow CO_2 + H_2O + H_2 \quad , \Delta_f H^\circ = ?$$

To get above eqn

① + ② + reverse of ③

$$\Rightarrow \Delta_r H = -393.5 + -286 + 239$$
$$= -679.5 + 239$$
$$= \underline{\underline{-440.5 \text{ kJ/mol}}}$$

34 a) Water which does not give lather with soap.

b) Water which consist of soluble salt of Calcium and Magnesium in the form of Chloride, Sulphate and hydrogen carbonate.

c) i) Boiling - During boiling the soluble $Mg(HCO_3)_2$ is converted into insoluble $Mg(OH)_2$ and $Ca(HCO_3)_2$ is changed into $CaCO_3$.

ii) Clark's method - In this method calculated amount of lime is added. It precipitates out Calcium carbonate and $Mg(OH)_2$.

35 a) i) $NH_3 + H_2O + CO_2 \rightarrow (NH_4)_2CO_3$

ii) $(NH_4)_2CO_3 + H_2O + CO_2 \rightarrow NH_4HCO_3$

iii) $NH_4HCO_3 + NaCl \rightarrow NH_4Cl + NaHCO_3$

iv) $NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + CO_2 + H_2O$

b) Because Potassium hydrogen carbonate is too soluble to be precipitated by the addition of NH_4HCO_3 to a saturated solution of KCl.