HALF YEARLY EXAMINATION -2018

XI - STD

Chemistry answer key

1. a) NO
2. b)(A) - 2, (B) - 3 , (C) -4 (D) - 1
3. c) 4.42 X 10^{-18}J
4. b) Na < Al < Mg < Si < P
5. c) amphoteric oxide
6. c) $Ca(CN)_2$
7. d) 3.25 atm
8. c) 1,2,3
9. a) 73 %
10. b) largely towards reverse reaction
11. d) ethanol + water
12. d) both a & c
13. c) Assertion is correct. Reason is false
14. a) sp^2, sp , sp^2
15. b) $C_6H_6Cl_6$:insecticide

Section - II

16. The reaction involving loss of electron is termed oxidation and gain of electron is termed reduction.

For example, $Fe^{2+} \rightarrow Fe^{3+} + e^-$ (loss of electron-oxidation).

$Cu^{2+} + 2e^- \rightarrow Cu$ (gain of electron-reduction)

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17. Isoelectronic species have the same number of electrons but different nuclear charges. In case of isoelectronic species as the nuclear charge increases, their size decreases.

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18. Combustion of n- hexane :$2C_6H_{14} + 19\,O_2 \rightarrow 12CO_2 + 14H_2O$

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19. The largest use of Plaster of Paris is in the building industry as well as plasters. It is used for immobilising the affected part of organ where there is a bone fracture or sprain.

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20. **Ideal gas :**
1) Obeys gas laws under all condition of P and T.
2) Obeys ideal gas equation

Real gas:
1) Obeys only at low P and high T.
2) Does not obey ideal gas equation

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21. The para-form can be catalytically transformed into ortho-form using platinum or iron. Alternatively, it can also be converted by passing an electric discharge, heating above 800°C and mixing with para magnetic molecules such as O_2, NO, NO_2 or with nascent/atomic hydrogen.

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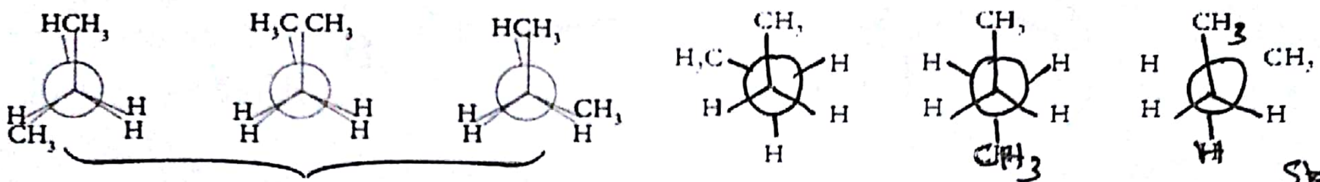
22. x = 0.6 % , y = 1.8% , M_x = urea (60 g mol-1), M_y = ?

$$\frac{x}{100}\times\frac{1000}{M_x}=\frac{y}{100}\times\frac{1000}{M_y}=\frac{x}{M_x}=\frac{y}{M_y}, \quad M_y=\frac{y\times M_x}{x}=\frac{1.8\times 60g\ mol^{-1}}{0.6}=180g\ mol^{-1}$$

23. **Oxidation test:** The organic substances are fused with a mixture of KNO_3 and Na_2CO_3. The sulphur, if present is oxidized to sulphate. $Na_2CO_3 + S + 3O \rightarrow Na_2SO_4 + CO_2$

24.



eclipsed conformations — Gauche — Planar — Gauche — Staggered conformations

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SECTION - III

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

To produce 2 moles of ammonia, 3 moles of hydrogen are required

To produce 10 moles of ammonia =

$$\frac{3\ moles\ of\ H_2}{2\ moles\ of\ NH_3} \times 10\ moles\ of\ NH_3 = 15\ moles\ of\ hydrogen\ required$$

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26. "No two electrons in an atom can have the same set of values of all four quantum numbers."

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27. i) $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$ $\quad K_p = K_c(RT)^{\Delta ng}$

$\Delta ng = 4 - 2 = 2$, $\quad K_p = K_c(RT)^2$, $K_p > K_c$

ii) $N_2 + O_2 \rightleftharpoons 2NO$; $\quad K_p = K_c(RT)^{\Delta ng}$

$\Delta ng = 2 - 2 = 0$, $\quad K_p = K_c(RT)^0$, $K_p = K_c$

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28. Steam passed over red hot iron results in the formation of iron oxide with the release of hydrogen.

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$$

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29. The critical constants can be calculated using the values of van.der waals constant of a gas and vice versa.

$$a = 3V_C^2P_C \quad , \quad b = \frac{V_C}{3}$$

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30. **At cathode** : $Na^+ + e^- \rightarrow Na$ (amalgam)

At anode : $Cl^- \rightarrow \frac{1}{2}Cl_2 \uparrow + e^-$

$2Na(amalgam) + 2H_2O \rightarrow 2NaOH + 2Hg + H_2 \uparrow$

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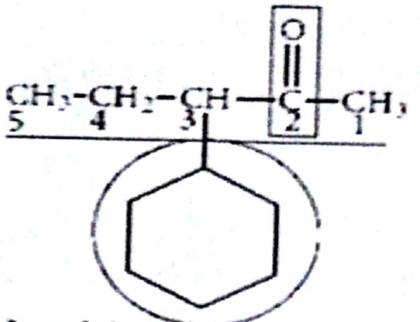
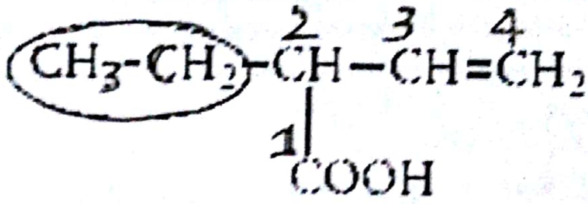
31. **Henry's law** "The partial pressure of the gas in vapour phase (vapour pressure of the solute) is directly proportional to the mole fraction(x) of the gaseous solute in the solution at low concentrations".

32.

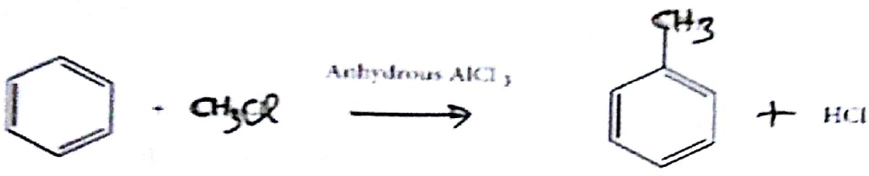


3-cyclohexylpentan-2-one



2-ethylbut-3-enoic acid

33.



Toluene

Section - IV

34. i) $n = \frac{mass}{molar\ mass} = \frac{22g}{16g\ mol^{-1}.} = 1.374\ mole$

ii) $(Z)_{eff} = Z - S$

$= 11 - (1s)^2(2s,2p)^8$

$= 11 - (n-1)\ (n)$

$= 11 - 0.85 \times 2 + 0.35 \times 7$

$= 11 - 4.15 = 6.85$

OR

Bohr atom model

1. The energies of electrons are quantised
2. The electron is revolving around the nucleus in a certain fixed circular path called stationary orbit.
3. Electron can revolve only in those orbits in which the angular momentum (mvr) of the electron must be equal to an integral multiple of $h/2\pi$

i.e. $mvr = nh/2\pi$ ——— (2.1)

where n = 1,2,3,...etc.,

4. when an electron jumps from higher energy state (E_2)to a lower energy state (E_1), the excess energy is emitted as radiation.

$$E_2 - E_1 = h\nu$$

$$\upsilon = \frac{E_2 - E_1}{h}$$

when suitable energy is supplied to an electron, it will jump from lower energy orbit to a higher energy orbit.

35. i) Hydrogen bonds can occur within a molecule (*intramolecular hydrogenbonding*) and between two molecules of the same type or different type (*intermolecular hydrogen bonding*).

Intramolecular hydrogenbonding) : Ortho-Nitrophenol , Salicilaldehyde

Intermolecular hydrogen bonding :For example, intermolecular hydrogen bonds can occur between ammonia molecule themselves or between water molecules them selves or between ammonia and water.

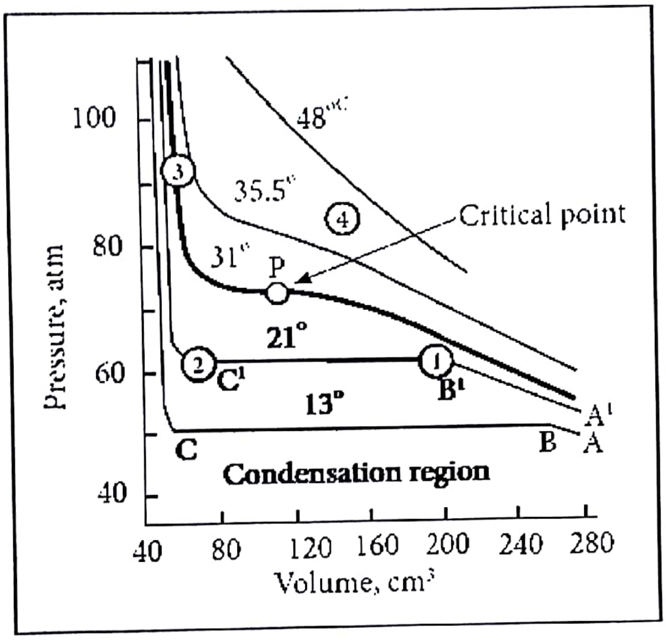
ii) $4\ Li + O_2 \rightarrow 2Li_2O$ (simple oxide)

$2\ Na + O_2 \rightarrow Na_2O_2$ (peroxide)

$M + O_2 \rightarrow MO_2$ (M= K, Rb,Cs; MO_2 -superoxide)

OR

Thomas Andrew gave the first complete data on pressure-volume temperature of a substance in the gaseous and liquid states. He plotted isotherms of carbon dioxide at different temperatures



At low temperature isotherms, for example, at 13°C as the pressure increases, the volume decreases along AB and is a gas until the point B is reached.
At B, a liquid separates along the line BC,both the liquid and gas co-exist and the pressure remains constant.
At C, the gas is completely converted into liquid.
If the pressure is higher than at C, only the liquidis compressed so, there is no significant change in the volume.
The successive isotherms shows similar trend with the shorter flat region. i.e. The volume range in which the liquid and gas coexist becomes shorter.
At the temperature of 31.1°C the length of the shorter portion is reduced to zero at point P.
In other words, the CO_2 gas is liquefied completely at this point.
This temperature is known as the liquefaction temperature or critical temperature of CO_2.
At this point the pressure is 73 atm.
Above this temperature CO_2 remains as a gas at all pressure values. It is then proved that many real gases behave in a similar manner to carbon dioxide.

36. Relation between enthalpy 'H' and internal energy 'U'

$H = U + PV$

In the initial state $H_1 = U_1 + PV_1$

In the final state $H_2 = U_2 + PV_2$

Change in enthalpy is

$$(H_2-H_1) = (U_2-U_1) + P(V_2-V_1)$$
$$\Delta H = \Delta U + P\Delta V$$

As per first law of thermodynamics, $\Delta U = q + w$

$$\Delta H = q + w + P\Delta V$$
$$w = -P\Delta V$$
$$\Delta H = q_p - P\Delta V + P\Delta V$$
$$\Delta H = q_p$$

q_p" is the heat absorbed at constant pressure and is considered as heat content.

For reactants (initial state) : $PV_f = n_f RT$

For products (final state) : $PV_f = n_f RT$

$$P(V_f - V_i) = (n_f - n_i)RT$$
$$P\Delta V = \Delta n(g)RT$$
$$\Delta H = \Delta U + \Delta n(g)RT$$

OR

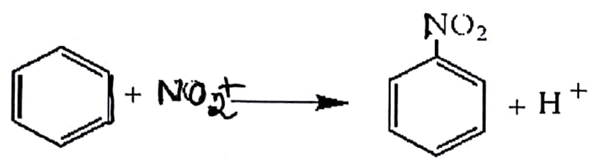
i) Kb = molal boiling point elevation constant or Ebullioscopic constant. $K_b = \frac{RT^2 M_{solvent}}{\Delta H_{vaporisation}}$

ii) Generally the trans isomer is more stable than the corresponding *cis* isomers. This is because in the cis isomer, the bulky groups are on the same side of the double bond. The steric repulsion of the groups makes the cis isomers less stable than the trans isomers in which bulky groups are on the opposite side.

37. **Substitution reaction (Displacement reaction)**

i) Nucleophilic substitution $CH_3Br \xrightarrow{\text{aqueous } OH^{\ominus}} CH_3OH + Br^{\ominus}$

ii) Electophilic substitution



iii) Free radical substitution $CH_4 + \dot{C}l \longrightarrow \dot{C}H_3 + HCl$

OR

I) It is defined as the imaginary charge left on the atom when all other atoms of the compound have been removed in their usual oxidation states that are assigned according to set of rules. A term that is often used interchangeably with oxidation number is oxidation state

II) An alkyne shows acidic nature only if it contains terminal hydrogen. This can be explained by considering sp hybrid orbitals of carbon atom in alkynes.

$$CH_3\text{-}CH_2\text{-}C\equiv CH + 2AgNO_3 + 2NH_4OH \longrightarrow CH_3\text{-}CH_2\text{-}C\equiv C\text{-}Ag\downarrow$$

1-butyne → Silver butynide

Reaction of hydrogen halides to symmetrical alkynes is electrophilic addition reaction. This reaction also follows Markovnikoff's rule.

$$CH_3\text{-}C\equiv C\text{-}CH_3 \xrightarrow{HCl} CH_3\text{-}CH=C(Cl)\text{-}CH_3 \xrightarrow{HCl} CH_3\text{-}CH_2\text{-}C(Cl)_2\text{-}CH_3$$

2-Butyne → 2-chlorobut-2-ene → 2,2-dichlorobutane

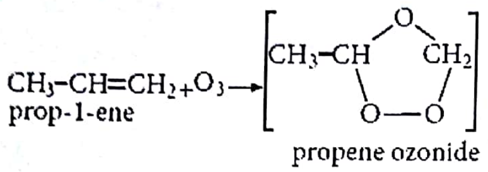
38. i) a) Calcium - Peiod no: 4, Group No: (2) or II A

b) Silver - Peiod no: 5, Group No: 11 or (I B)

ii) When a soap is used in hard water, a solid substance we call scum forms. This is because charged calcium and magnesium particles (called ions) present in the water react with soap to form an in soluble substance.

OR

An organic compound **A** is Propene (C_3H_6). A reacts with O_3 gives **B** and **C**



$\xrightarrow{Zn/H_2O}$ H-CHO + CH_3CHO

A reacts with HBr to give Compound D

CH_3-CH= CH_2 + HBr $\xrightarrow{Peroxide}$ CH_3 - CH_2 - CH_2 - Br --------(D)

(or) Anti-Markovnikoff's product

Markovnikoff's product

CH_3-CH= CH_2 + HBr → CH_3 - CH(Br) - CH_3 + CH_3 - CH_2 - CH_2 - Br

Major product minor product

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