MS-CIT
World-class Comprehensive Computer Course

Model AnswerSet- I

Std. – 12th

Sub:- Chemistry

MKCL KLiC Courses
Gateway to Knowledge Lit Careers

SECTION A

Q.1. Select and write correct answer: 10.

1. D) $(CH_3)_3CBr$
2. C) 100.26^0C
3. C) CCI_4
4. C) 10^{-4}M
5. B) Mn
6. B) $[Xe]4f^{1-14}5d^{0-1}6s^2$
7. D) CH_4
8. A) 0.54
9. A) 0.74
10. D)CH_3OH

Q.2 Answer the following: 8.

1. K_H Henry's law constant is the solubility of the gas in a liquid when its pressure over the solution is 1 bar. Unit of K_H=$molL^{-1}bar^1$ or mol dm^{-3} atm^{-1}
2. (i) In a rate law equation, the constant of proportionality (K) is called the rate constant.
   (ii) The rate constant is independent of concentration and changes with temperature.
3. The high density of polymers is due to strong intermolecular force of attraction such as hydrogen bonding (as in case of nylons), dipole-dipole interaction (as in case of polyesters and poly-acrylonitrile)
4. 2 to 3% solution of iodine in alcohol and water is called tincture of iodine and it is used for cleaning wounds.
5. 3,3-dimethyl butanoic acid
6. Frankel defect.
7. In tetrahedral geometry all the positions are adjacent to one another. Hence tetrahedral complexes do not show geometrical isomerism.
8. Every system has certain measurable thermodynamic properties such as temperature, pressure and volume. These properties are called state variables'

SECTION B

Attempt Any Eight: 16.

Q.3. Solution : Data: Electric current = I=6A, Time = t = 15 min = 15 * 60 = 900s

Mass of AI produced =0.504g,

Molar mass of AI =?

Reduction reaction

$AI^{3+}_{(aq)} + 3_{e-} \rightarrow AI_{(aq)}$

Quantity of electricity passed = Q = I × t

= 6 × 900

= 5400 C

Number of moles of electrons = $\frac{Q}{F}$= $\frac{5400}{96500}$ = 0.05596 mol

From reaction,

3 moles of electrons deposit 1 mole AI

∴ 0.05596 moles of electrons will deposit, $\frac{0.05596}{3}$=0.01865 mol AI.

Now,

0.0865 mole AI weighs 0.504 g

∴ 1 mole AI will weigh = $\frac{0.504}{0.01865}$

= 27g

Molar mass of AI is 27$gmol^{-1}$.

Q.4. (I) consider a salt NaCI, of strong acid HCI and strong base NaOH. When it is dissolved in water it dissociates completely into ions.

$NaCI_{(aq)} \rightarrow Na^+_{(aq)} + CI^-_{(aq)}$

(ii) The ions of Na^+ and CI^-have in tendency to react with water because the products NaOH and HCI are strong electrolytes and dissociate completely in aqueous solution.

(iii) $Na^+_{(aq)} + CI^-_{(aq)} + H_2O \rightarrow HCI_{(aq)} + NaOH_{(aq)}$

$HCI_{(aq)} + NaOH_{(aq)} + H_2O \rightarrow H_3O^+_{(aq)} + CI^-_{(aq)} + Na^+_{(aq)} + OH^-_{(aq)}$

Thus the reactants and products are the same.

(iv) This implies that neither action nor anion of the salt reacts with water due to which there is no hydrolysis. Since)$[H_3O^+] = [OH^-]$, solution is neutral.

Q.5. In solutions of non-volatiles solutes, the law is applicable only to the volatile solvent.

(ii) According to Raoul's law$P_1 = P_1^\circ.x_1$

(iii) For a binary solution containing one solute.

$x_1 = 1 - x_2$

It therefore follows that,

$P_1 = P_1^\circ.x_1$

$= P_1^\circ(1- x_2)$

$= P_1^\circ = P_1^\circ.x_2$

Or$P_1^\circ - P_1 = P_1^\circ.x_2$

P_1° - P_1 is Δp lowering of vapour pressure.

Hence.$\Delta p = P_1^\circ .\ x_2$

As $\overline{\Delta p}$ depends on x_2, that is no number of solute particulars. Thus,Δp the lowering of vapour pressure is a colligative property.

Q.6.

SN^1**reaction mechanism**	SN^2**reaction mechanism**
SN^1 Reaction is a first order reaction.	SN^1 Reaction is a second order reaction.
The rate of reaction depends only upon the concentration of the halo alkanes (alkyl halides).	The rate of reaction depends upon the concentration of the halo alkanes and the nucleophile.
It involves the formation of a harmonium ion intermediate	It does not involves the formation of a harmonium ion intermediate
It is a two-step reaction with transition states.	It is a single step reaction with transition states.
The nucleophile can attack the carbocation from both the side.	The nucleophile attack the substrate from the side opposite (backside) to that of the leaving group.
It leads to racemization of the product	It involves inversion of the configuration. If is called Walden inversion.
It is favored by polar solvent like water.	It is favored by non-polar solvents like benzene.
This reaction takes place in presence of weak bases.	This reaction takes place in presence of strong bases.
Inversion of configuration only 50%	Inversion of configuration is 100%.

Order of reaction of alkyl halides: tart > sec > pri	Order of reactivity of alkyl halides : pri > sec > tart

Q.7. Given : $E^0_{(Zn/Zn^{2+})} = 0.76V$
$E^0_{(co/co^{2+})} = 0.28V$
To find : change in Gibbs free energy (ΔG^0)
Formula: I. $E^0_{cell} = E^0_{(cathode)} - E^0_{(Anode)}$
ii $\Delta G^0 = -nFE^0_{Cell}$
Calculation:
From formula (I),
$E^0_{Cell} = E^0_{(zn/Zn^{2+})} - E^0_{co/co^{2+}}$
= 0.76-0.28
=+0.48V
From formula (I),
Change in Gibbs free energy (ΔG^0)
=-2×96500×0.48
=-92.640kJ

Q.8. 1. Magnetic properties of complexes and it's variation with temperature is explained by CFT but not by VBT.
2. Kinetic and thermodynamic stabilities are explained by CFT but not VBT.
3. CFT explains spectroscopic properties, d-d transition and color of complexes byte not be explained by VBT.
4. Quantitative measure of stability of complexes is explained by CFT but not by VBT.

Q.9. Date : $V_1 = 1m^3$
$V_2 = 10m^3$
$P = 2.026 \times 10^2 Nm^{-2}$
To find: W = ?
W = $-P\Delta V$
W = $-2.026 \times 10^2 (10 - 1)$
= $-2.026 \times 10^2 \times 9$
= - 1823.4J

Q.10. (I) similar to lanthanides, they appear silvery white in color.
(ii) These are highly reactive radioactive elements.
(iii) Expect promethium (pm), all are nonradioactive in nature
(iv) They experience decrease in the atomic and ionic known as actinium (Ac) to lawrencium (Lw), known as actioned contraction.
(v) They usually exhibit +3 oxidation state. Elements of first half of the series usually exhibit higher oxidation states.

Q.11. (I) Oxidation of I^- from aq. Solution of KI by acidified $K_2Cr_2O_7$ givenI_2. Dichromate is reduced to chromic sulphate. Liberated I_2 turns the solution brown.
$K_2Cr_2O_7 + 6KI + 7H_2SO_4 \rightarrow 4K_2SO_4 + Cr_2(SO_4)3 + 7H_2O + 3I_2$.
(ii) When H_2S gas is passed through acidified $K_2Cr_2O_7$. Solution, H_2S is oxidized to pale yellow precipitate is reduced to chromic of sulphate, which is reflected as colour change of solution from orange to green.
$K_2Cr_2O_7 + 4H_2SO_4 + 3H_2S \rightarrow K_2SO_4 + Cr_2(SO_4)3 + 7H_2O + 3S$.

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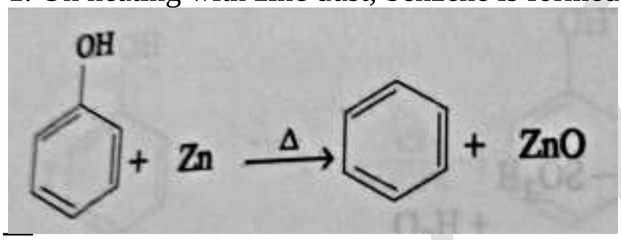
Sub:- Chemistry

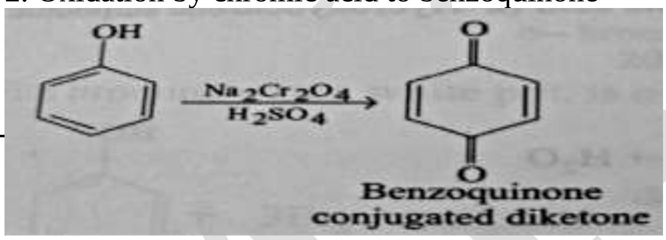
Q.12. Moll depression constant is defined as, the depression of freezing point, produced by 1 moll solution of a non-volatile solute.
As $\Delta T, \alpha\ m$(m is molality of solution)
$\therefore\ \Delta T_f = K_f . m$
Or $K_f \frac{\Delta T_f}{m}$
Where, K_f= molal depression constant or cryoscopic constant
Unit of K_f = K kg mol^{-1} or °C kg mol^{-1}

Q.13. 1. Transitions metal complexes show wide range of colors, which can be explained due to d-d transitions.
2. Energy difference between t_2g and eg orbitals is very small. Electrons from t_2g absorb light energy for the transition and are excited to eg orbitals.
3. As energy required for specific t_2g→ eg. Excitation is fixed, wavelength of light absorbed and wavelength of light emitted is fixed.

Q.14. 1. On heating with zinc dust, benzene is formed



2. Oxidation by chromic acid to benzoquinone

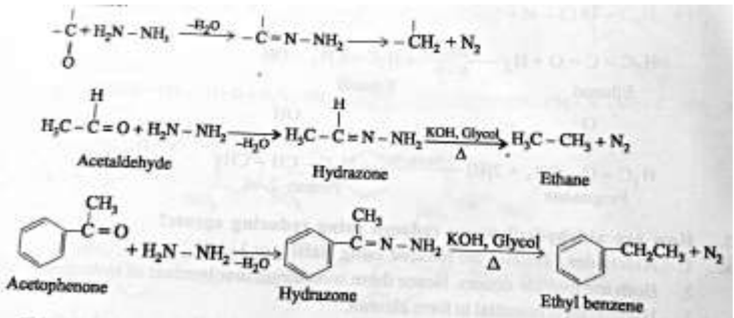


SECTION C
Attempt Any Eight 24.

Q.15. (I) $4AI + 3O_2 \rightarrow 2AI_2O_3$
(ii) Cu_2Se
(iii) Mg + Se → Mgs Magnesium selenite

Q.16. Decrease in atomic radii with increase in nuclear charge is called lanthanide contraction.
Causes
Nuclear charge increases as new electrons are added to 4f sub shell.
4f electron have poor shielding effect due to diffused nature.
Due to this effective changes of 4f electron increases.

Q.17. Aldehyde or ketone is boiled with hydrazine and conc. KOH or potassium tert-butoxide in solvent ethylene glycol to from alkane. Hydrazine derivative is formed first, which is converted to alkane.



Q.18. Given : $T_1 = 470K$

$T_2 = 508K$

$K_1 = 1.05 \times 10^{-3}/s$

$K_2 = 1.11 \times 10^{-2}/s$

R = 8.314 J/mol

To find: Activation energy (E_a) =?

Formula: $\log \frac{K_1}{K_2} = \frac{E_a}{2.303R} \times \frac{T_2 - T_1}{T_1 \times T_2}$

Calculation :

According to Arrhenius equation :

2.303 R log

$$2.303\ R \log\left(\frac{k_2}{k_1}\right) = E_a\left[\left(\frac{1}{T_1}\right) - \left(\frac{1}{T_2}\right)\right]$$

$$2.303 \times 8.314 \log\left(\frac{1.11 \times 10^{-2}}{1.05 \times 10^{-3}}\right) = E_a\left[\frac{1}{470} - \frac{1}{508}\right]$$

$$2.303 \times 8.314 \times \log(10.5714) = E_a[0.002128 - 0.001969]$$

$$\therefore \quad 2.303 \times 8.314 \times 1.02413 = E_a \times 0.000159$$

$$\therefore \quad E_a = \frac{2.303 \times 8.314 \times 1.02413}{0.000159}$$

$$= \frac{19.6092}{0.000159} = 123328.3\ J/mol$$

$$\therefore \quad E_a = \mathbf{123.32\ kJ/mol}$$

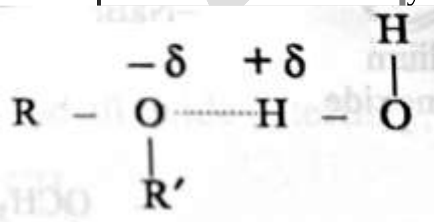
Q.19. 1. Band angle in ether is110°.So, net dipole moment is 1.18 D for diethyl ether.

2. Boiling points of alkanes, alcohols and ethers: If Ethers, alkanes and alcohols of similar molecular masses are compared, boiling point of ethers is slightly more than alkanes due to weak dipole-dipole interaction but less alcohols due to absence of hydrogen bonding.

Compound	n-Heptane	Methyl n-plenty ether	n-Hexyl alcohol
Boiling pinot/K	371	373	430

3. Miscibility with water :

Ethers are water miscible as they from hydrogen bonds with water.



Q.20. Low density polythene (LDPE)

It is manufacture by heating ethylene to 350-570K under a pressure of 1000-2000 atm. And in presence of a trace of O^2 or peroxide (as initiator). It is a branched polymer. The branching occurs due to h abstraction from the middle of the chain and thus, the branch grows.

The polymer is produced by free-radical poly mediation :

These polymers have low meting point and are transparent, chemically inert.

They are used as insulation for cables, as packaging bags, making toys, flexible pipes, etc.

Q.21. (i) Degree of dissociation : If is defined as the fraction of the total number of moles an electrolyte that dissociated into its ions when equilibrium is attained.

$$\alpha - \frac{number\ of\ moles\ is\ dissociated}{Total\ number\ of\ moles}$$

Percent dissociation = $\alpha \times 100$

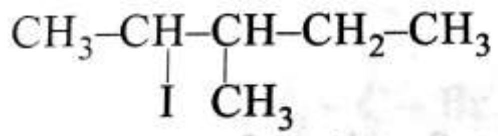
OR

Percent ionization = $\alpha \times 100$

Q.22.

Q.23.

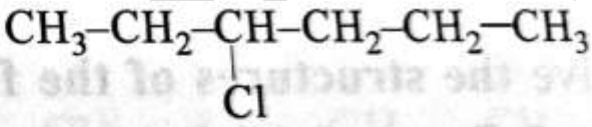
1.



2–Iodo–3–methyl pentane

1.

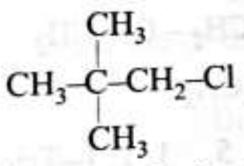
2.



3–Chlorohexane

2.

3.



1–Chloro 2,–2–dimethyl propane

Q.24 (I) in this defect, the foreign atoms are found at the latterent sites in place of host atoms.

(ii) The regular atoms are displaced from their lattice sites by impurity atoms.

For example:

Soild solutions of metals (alloys) :Brass is an alloy of Cu and Zn.

In brass, host Cu atoms are replaced by impurity of Zn atoms.

The Zn atoms occupy regular sites of Cu atoms as shown in

Dr

Q.25 Date n = $\frac{4.4\times10^{-2}(kg)}{44\times10^{-3}(kgmol^{-1})} = 1mol,$

T =293K, W=+1.245kJ = +1245J, $P_1 = 150kPa,$

P_2 =?

W = 2.303n RT $log_{10}\frac{p_1}{P_2}$

Substitution of the given quantities into the equation give

1245(J) = - 2.303 ×1(mol) ×8.314 $(JK^{-1}mol^{-1})\times\frac{150(kPa)}{P_2}$ × 293

Hence,

$\therefore\ log_{10}\left[\frac{150(kPa)}{P_2}\right] = \frac{-1245}{2.303\times8.314\times293} = -0.2219.$

If follows that

$\frac{150(kPa)}{P_2} = antilag\ (-0.229)$

= antilog (-0.229 +1 – 1)

= 0.6

$\therefore\ P_2 = \frac{150(kPa)}{P_2}$ = 250kPa

∴ The Final pressure is 250kPa.

Q.26 1. In glucose, the aldehydic group at C_1 forms a cyclic hemiacetal with –OH distempers called as anomers.

2. The anomers differ in their configuration of –OH group at C_1.

3. If –OH group at C_1 is trans to the –OH group at the lowest chirality center, the anomer is α-anomers.

4. If –OH group at C_1 is cis to the –OH group at the lowest chirality center, the anomer is α-anomers.

α, β anomers are not mirror imges. So they are not enantiomers.

These six-membered cyclic structures of glucose are called pyranose structures. (pyran means one oxygen atom with 5 carbon atoms in a ring)

SECTIION D

Attempt Any Three: 12

Q.27 i. (a) $\underset{Ethanoic\ acid}{CH_3COOH} \xrightarrow{LiA1H_4} CH_3CH_2\ OH \xrightarrow{p/I_2} CH_3CH_2I \xrightarrow{KCN} CH_3CH_2CN\ \underset{propanoic\ acid}{CH_3CH_2COOH}$

b) $\underset{propanoic\ acid}{CH_3CH_2COOH} \xrightarrow{NH_3} CH_3 - CH_2 - COONH_4 \xrightarrow{\Delta} CH_3CH_2COOH_2$

$\xrightarrow{Br_2/KOH} CH_3CH_2\ NH_2 \xrightarrow{NaNO_{2/HCI}} CH_3CH_2OH \xrightarrow{K_2Cr_2O_7/O^+} CH_3CHO \xrightarrow{[O]} \underset{Ethanoic\ acid}{CH_3COOH}$

ii (a) $\underset{propanoic\ acid}{CH_3CH_2COOH} \xrightarrow{NH_3} CH_3 - CH_2 - COONH_4 \xrightarrow{\Delta} CH_3CH_2COOH_2$

$\xrightarrow{KOH/Br_2} \underset{Ethanamine}{CH_2CH_2NH_2}$

(b) $\underset{Ethanamine}{CH_3CH_2NH_2} \xrightarrow{HNO_2} CH_3CH_2OH \xrightarrow{PCI_5} CH_3CH_2CI \xrightarrow{KCN} CH_3CH_2CN$

$\xrightarrow{H_2O/H^+} \underset{propanoic\ acid}{CH_3CH_2COOH}$

Q.28. i. Dissilution od solid I_2 in water :

$I_2(s) + aq\ \rightarrow I_2(g)(aq)$ $(\Delta S\ is\ positive)$

Ordered state disordered state

When solid iodine dissolves in water I_2 molecules move randomly. Thus disorder and hence, entropy of the system increase or ΔS is positive for the dissolution process.

(ii) Dissociation H_2 gas is converted into two H atoms.

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

One mole of H_2 gas is converted into two H atoms.Larger disoeder is associated with separated H atoms than with H_2 molecular. Thus, disorder and hence entropy increases or ΔS is positive.

ii Given : $[I^-]$ = 0.03M

$E^0_{electron}$ = 0.5355 V

To find : electron potential (E_{cell}) = ?

Formula: $E^0_{electron} - \left(\frac{0.0592}{n}\right) \times log \frac{[Product]}{[Reactant]}$

Calculation:

The reduction reaction at the electrode is represented as $\frac{1}{2} I_2 + e^- \rightarrow I^-$

According to Nernst equation

$E^0_{Cell} = E^0_{Ecell} - \left(\frac{0.0592}{n}\right) \times log \frac{[I^-]}{[I_2]^{\frac{1}{2}}}$

$= 0.5355 \left(\frac{0.0592}{n}\right) \times log \left[\frac{0.03}{1}\right]$

=0.5355 -0.0592)×log (0.03)

= 0.5355-(0.0592 × - 1.5228)

= 0.5355 – 0.09014

= + 0.6256V

Q.29. i. $[Ni(NH_3)_6]^{3\oplus}$

(i) Ni→ $Ni(28) \rightarrow 3d^8 4s^2$

(ii) Oxidation state of Ni^{3+}

(iii) Valence shell electronic configuration of Ni^{+3}

(iv) Six NH_3 ligands so vacant hybrid orbitals required for ligand bonding with central metal atom is 6

(NH_3 is S.F.Ligand, spin paining doesn't help)

Ni uses sp^3d^2 hybrid orbitals

Six sp^3d^2 hybrid orbitals of Ni^{+3} overlap with the six orbitals of NH_3 ligand so configuration will be.

Geometry is octahedral

Since there are 3 unpaired electrons hence it will be paramagnetic

ii

Double salt	Co-ordination compounds
i)They contain two simple salts in equimolar ratio. ii) They exist only in solid state and dissociate completely in aqueous solution to give present. iii) Only ionic bonds are present. They contain cations and anions. iv) The metal ions show normal valency only in the salt.	1.The simple salts may or may not be in equimolar ratio. 2.They exist in solid state and do not dissociate completely into ions when dissolved in water. 3. Co-ordinate bands are present, ionic bonds may be present.

	4. They contain counter ions (cation/ anions) and complex ion (cationic/ anionic) or may be neutral. The metal ions show both primary and secondary valency.

Q.30. i. 1. Molecular formula of glucose was to be $C_6H_{12}O_6$ from experimental analysis.
2. It is optically active and contains four chiral carbon atoms.
3. Chemical reactions show that glucose has five hydroxyl and one aldehyde functional group.
4. Fischer gave the exact spatial arrangement of different –OH groups in glucose, confirming, its structure.

ii The standard enthalpy of formation of compound is the enthalpy change that accompanies a reaction in which one mole of pure compound its standard state is formed from its elements in their standard states.
Consider

$$H_2(g) + \frac{1}{2} O_{2(g)} \rightarrow H_2O, \Delta_r H^0 = -286kJ$$

For the reaction where one mole of liquid water in standard state is formed from $H_2$and O_2 gases in their standard states, the enthalpy changes for the reaction would be the standard enthalpy of formation of water. $\Delta_f H^0$ of water is -286kJmol^{-1}.

Q.31. $XeOF_4 = +6$
XeO_3= +6
XeF_6= +6
$XeF_4 = +4$
XeF_2 = +2

Anomalous behavior of fluorine is due to
i) Small atomic size
ii) High electro-negativity
iii) Absence of d orbital
iv) Low F-F bond dissociation enthalpy.
