CBSE Class 12 Chemistry Question Paper Solution 2011

QUESTION PAPER CODE 56/1

EXPECTED ANSWERS/VALUE POINTS

1 The sum of powers of the concentration terms of the reactants in the rate law expression is called the order of that chemical reaction. 1

Or

rate = $k[A]^P [B]^q$

Order of reaction = P+q

2 The catalytic reaction in which the pore structure of the catalyst and the size of the reactant and product molecules are comparable. 1

3 The naturally occurring chemical substances which occur in the earth's crust and are obtainable by mining are called minerals, while the mineral from which the element is extracted economically is called an ore. 1

4 The regular decrease in the atomic and ionic radii / (having the same charge) of Lathanoids with increasing atomic number is known as Lanthanoid contraction. 1

5 3-Bromoprop-I-ene / 3-Bromopropene 1

6 $CH_3 - CO - CH_2 - CH(Cl)-CH_3$ 1

7 $CH_3CH_2OH \xrightarrow[443K]{H_2SO_4} CH_2 = CH_2 + H_2O$ 1

8 $(C_6H_5)_2NH < C_6H_5NH_2 < C_6H_5N(CH_3)_2 < CH_3NH_2$ 1

9 We can determine the atomic mass of an unknown by using the formula.

$$M = \frac{d \times a^3 \times NA}{Z}$$ 1

By knowing d, a, NA & Z We can calculate the M

Where

d = density of the element

N_A = Avogadro number 1

a = cell edge or edge length

Z = no. of atoms present in one unit cell.

10 Packing efficiency

$$= \frac{Z \text{ x volume of one atom}}{\text{Volume of cubic unit cell}}$$ 1

$$= \frac{1 \text{ x } 4/3\ \pi r^3}{a^3}$$

For simple cubic lattice a= 2r

Therefore packing effieciency $= \frac{1 \text{ x } 4/3\ \pi r^3}{8r^3}$

= 0.524 or 52.4% 1

11 i) Raoult's law states that for a solution of volatile liquids, the partial vapour pressure of each component in the solution is directly proprtional to its mole fraction. 1

ii) Henry's law states that at a constant temperature, the solubility of a gas in a liquid is directly proportional to the pressure of the gas over the solution. 1

12 The representation of rate of reaction in terms of concentration of the reactants is known as rate law. ½x4 = 2

The rate constant is defined as the rate of reaction when the concentration of reactants is unity.

i) zero order

ii) second order

13 $t = \frac{2.303}{k} \times \log \frac{[A]_0}{[A]}$

$t = \frac{2.303}{2.4\times10^{-3}\ s^{-1}} \times \log \frac{[A]_0}{[A]_0/4}$ ½

$t = \frac{2.303}{2.4\times10^{-3}\ s^{-1}} \times \log 4$ ½

$t = \frac{2.303}{2.4\times10^{-3}\ s^{-1}} \times 0.60212$

t = 578s 1

14 (i) In this method the titanium metal is heated with I_2 to form a volatile compound TiI_4 which on further heating at higher temperature decomposes to give pure titanium metal. (or explanation by chemical equations) 1

(ii) This method is based upon the fact that the surface of the sulphide ores is preferentially wetted by oil while that of gangue is wetted by water. 1

15 (i) Cr^{2+} is reducing as its configuration changes from d^4 to d^3, the latter having half filled t_{2g} level whereas Mn^{3+} to Mn^{2+} results in half filled orbitals (d^5) 1

ii) In a transition metal series the oxidation state first increases and then decreases; At the middle it is maximum due to greater number of unpaired electron in (n-l)d and ns orbitals. 1

16 (i) $8MnO_4^-(aq) + 3S_2O_3^{2-}(aq) + H_2O\ (1) \rightarrow 8\ MnO_2\ (s) + 6\ SO_4^{2-}(aq) + 20H^-\ (aq)$ 1

ii) $Cr_2\ O_7^{2-}(aq) + 14\ H^+\ (aq) + 6\ Fe^{+2}(aq) \rightarrow 2\ Cr^3\ (aq) + 6\ Fe^{+3}\ (aq) + 7H_2O\ (1)$ 1

OR

i) Because Copper(I) ion is unstable in aqueous solution and undergoes dispro-portionation.

ii) Due to lanthanoid contraction the expected increase in size does not occur.

17 (i) **Peptide linkage:** A link between two amino acids with loss of water / – CO - NH – 1

(ii) The six membered cyclic structure of glucose is called pyranose structure in analogy with pyran heterocyclic compound / or structure. 1

18 In DNA, sugar is Deoxyribose while in RNA, it is ribose./ DNA is as double stranded while RNA is single stranded.(any one) 1

The common bases present in both are adenine, cytosine & guanine. 1

19 $\pi = CRT$ 1

$$M_2 = \frac{w_2 R T}{\pi V}$$

$$M_2 = \frac{8.95\text{x}10^{-3}\text{g x } 0.0821\text{L atm mol}^{-1}\text{ K}^{-1}\text{ x } 298\text{ K x } 760\text{ x } 1000}{0.335\text{ atm x } 35\text{ L}}$$ 1

$\mathbf{M_2 = 14193.3\ g\ mol^{-1}\ or\ 1.42x10^4 g\ mol^{-1}}$ 1

20 They are of two types

i) Hydrophilic ii) hydrophobic ½+½

The hydrophile sol is more stable and reversible while hydrophobic sol is less stable and is irreversible. 1

Hydrophilic sol e.g. $\rightarrow$ Starch, gum, gelatin etc. (anyone)

Hydrobhobic sol e.g $\rightarrow$ metal sulphide, metal hydroxide (anyone) 1

OR

i) Electrophoresis takes place when sol **particles move towards opposite electrodes due to attraction.**

ii) Tyndall effect will be observed due to **scattering of light by colloidal particles.**

iii) Coagulation takes place (due to neutralisation of charges.) 1x3= 3

21 i) Because bond dissociation enthalpy of H-S bond is lower that of H-O bond. / oxygen is more electronegative than S.

ii) In the resonance structure of these two species, in NO_2^-, 2 bonds are sharing a double bond while in NO_3^-, 3 bonds are sharing a double bond which means that bond in NO_2^- will be shorter than in NO_3^-.

Or

iii) In NO_2^- , bond order is 1.5 while in NO_3^-, bond order is 1.33 Because of the tendency of oxygen to form multiple bonds with metal. 1x3 = 3

22 i) Ambident ligand: a unidentate ligand which can co-ordinate to the central metal atom through more than one co-ordinating bond.e.g. NO_2^-, SCN^- 1

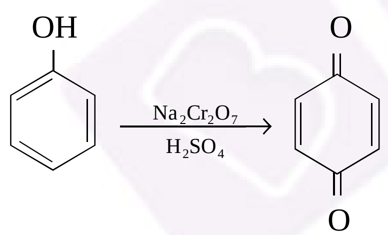
ii) The number of donor atoms in ligating groups is known as denticity of that ligand. e.g. in $C_2O_4^{2-}$ denticity is 2 (or any other example) 1

iii) Crystal field splitting in an Octahedral field: The splitting of d-orbitals under the influence of approaching ligand is known as crystal field splitting for example for d^4, configuration is $t_{2g}^{\,3}e_g^{\,1}$ / **or diagrammatic representation.** 1

23 i) 1-Bromopentane > 2-Bromopentane > 2-Bromo -2-methyle butane.

ii) 1- Bromo-2 - methyl butane> 3-Bromo- 2-methyl butane> 2-Bromo-2-methyl butane 1

iii) 1- Bromobutane > 1-Bromo- 2-methyl butane> 1-Bromo-2, 2-dimethyl propane 1

24 (i) 

(ii) $CH_3MgBr \xrightarrow[\text{(ii) } H_2O]{\text{(i) } CH_3COCH_3} CH_3-C(OH)(CH_3)-CH_3$

(iii) $CH_3-CH=CH_2 \xrightarrow{\text{(i) } H_2O/H^+} CH_3-CH(OH)-CH_3$

(or by any other suitable method.) 1x3 = 3

25 (i) Due to resonance in aniline, N acquires + charge which increases its pK_b whereas due to electron donating methyl group electron density increases on N which decreases its pK_b.

(ii) Due to formation of hydrogen bond with water ethyl amine is soluble in water whereas due to bulky phenyl group aniline does not form H-bond and thus is insoluble.

(iii) Due to hydrogen bonding in primary amines, they have higher boiling points whereas there is no hydrogen bonding in tertiary amines. 1x3=3

26 i) $CH_2 = CH_2$ 1

ii) $CH_2 = CHCl$ 1

iii) $CF_2 = CF_2$ 1

27 (i) Food preservatives: are the compounds which prevent spoilage of food due to microbial growth. eg: sodium benzoate, vinegar (or anyone example) ½+½

(ii) Synthetic detergents are sodium salts of long chain alkyl sulphonates or benzene sulphonates. eg: Sodium Lauryl sulphate. ½+½

(iii) Antacids: are the drugs used to prevent the overproduction of acid in the stomach. e,g, Sodium hydrogencarbonate. ½+½

28 a) It is secondary cell ½

Anode Reaction: - $Pb + SO_4^{2-} \rightarrow PbSO_4(s) + 2e^-$ ½

Cathode. Reaction: - $PbO_2 + 4H^+ + SO_4^{2-} + 2e^- \rightarrow PbSO_4 + 2H_2O$ ½

Net reaction:- $Pb + PbO_2 + 2SO_4^{2-} + 4H^+ \rightarrow 2PbSO_4 + 2H_2O$ ½

b) $$E_{cell} = E^o_{cell} - \frac{0.0591}{n} \log \frac{[Cr^{3+}]^2}{[Cr_2O_7^{2-}][H^+]^{14}}$$ 1

$$E_{cell} = 1.33\text{ V} - \frac{0.0591}{6} \log \frac{(0.20)^2}{(0.10)(10^{-4})^{14}}$$ 1½

$= 1.33V - 0.55V$

$= 0.78V$

OR

a) $m = Zlt$

$$m = \frac{M \times I \times t}{nF}$$

$$m = \frac{M}{2 \times 96500\ Cmol^{-1}} \times 2A \times 3 \times 60 \times 60\ s$$

$m = 0.112\ mol \times M$

$$\text{no. of moles of mercury} = \frac{0.112mol \times M}{M}$$

$= 0.112\ mol$

b) $2Al + 3Ni^{2+} \rightarrow 2Al^{3+} + 3Ni$

$E^o_{cell} = E^o_{Cathode} - E^o_{anode} = [-0.25\ V - (-1.66\ V)] = 1.41\ V$

$E^o_{cell} = 1.41\ V$ ½

Nernst equation: $2Al + 3Ni^{2+} \rightarrow 2Al^{3+} + 3Ni$ 1

n=6 electrons

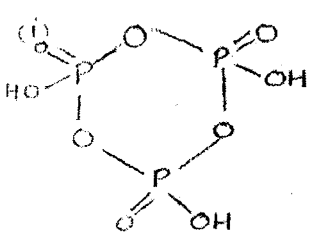
$$E_{cell} = E^o_{cell} - \frac{0.059}{n} \log \frac{[Al^{3+}]^2}{[Ni^{2+}]^3}$$ 1

$$E_{cell} = 1.41\ V - \frac{0.059}{6} \log \frac{(0.001\ M)^2}{(0.50\ M)^3}$$

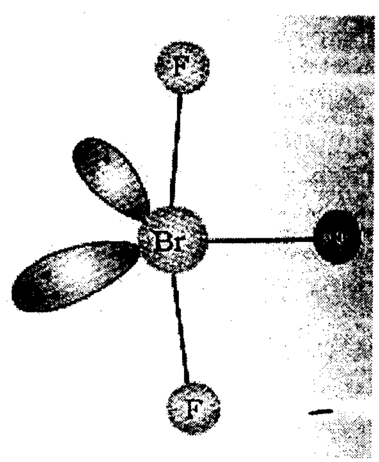
$$= 1.41\ V - \frac{0.059}{6}[-5.097] \log (10^4)$$ ½

$= 1.41\ V + 0.050\ V = 1.46\ V$

(a)



ii)



b)

i) $3HgCl_2 + 2PH_3 \rightarrow Hg_3P_2 + 6HCl$

ii) $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

iii) $6\ XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

OR

a)

i) $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$

ii) $2Fe^{3+} + SO_2 + 2H_2O \rightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$

b) i) Two, due to presence of two P-OH bonds.

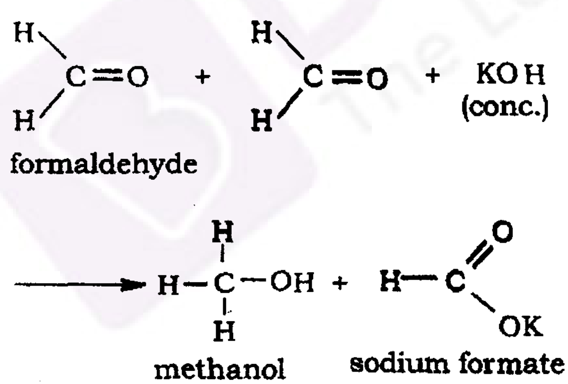
ii) Due to high electronegativity of fluorine.

iii) There are no interatomic forces except weak dispersion forces.

30 a)

i) **Cannizzaro reaction:** Aldehydes which do not have an

α-hydrogen atom, uhdergo self oxidation and reduction reaction on treament with concentrated alkali



(or any other correct equation)

ii) **Clemmensen reduction:** The carbonyl group of aldehydes and ketones is reduced to CH_2 group on treatment with zinc amalgam and concentrated HCI 1+1

$$>C=O \xrightarrow[HCl]{Zn\text{-}Hg} >CH_2 + H_2O \qquad \text{(Clemmensen reduction)}$$

b)

i) $2CH_3\text{-}CHO \xrightarrow{\text{dil. NaOH}} CH_3\text{-}CH(OH)\text{-}CH_2\text{-}CHO \xrightarrow[-H_2O]{\Delta} CH_3\text{-}CH{=}CH\text{-}CHO$

ii) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OH \xrightarrow{CrO_3,\ H_2SO_4} CH_3\text{-}CH_2\text{-}CH_2\text{-}COOH$

iii) $C_6H_5\text{-}CH_2\text{-}CH_3 \xrightarrow[\text{ii) } H^+]{\text{i) } KMnO_4,\ KOH} C_6H_5\text{-}COOH$ 1x3 = 3

(Or by any other suitable method)

OR

(i) Benzoic acid and ethyl benzoate

Sodium bicarbonate test. Warm each compound with $NaHCO_3$,

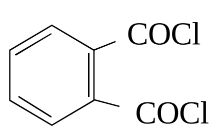
Bezoic acid gives brisk effervesence of CO_2 gas whereas ethyl benzoate does not respond to this test

(Other relevant test can be accepted)

(ii) Benzaldehyde and Actophenone

Iodoform test: Warm each organic compound with I_2 and NaOH solution. with Acetophenone ($C_6H_5COCH_3$) Yellow precipitates of iodoform is formed white Benzaldehyde does not respond to this test. 1+1

(Other relevent test can be accepted)

b) (i) 

(ii) $C_6H_5CH = NNHCONH_2$

iii) a) B_2H_6. H_2O_2 /OH^- b) PCC