University of Technology

Building and Construction Engineering Department

Final Exam-1st trial 2014-2015

Subject Chemistry
Class : 1st
Examiner:

year: First
Time: 3 hrs
Date :

Answer (Five questions only)

Q1/ Define the following (choose five) ?

1. Molarity 2. Z^* 3. EA 4. Ionic compound 5. ppm 6. Sub –shell

Q2/ Calculate r^- and r^+ for NaF compound if i.d = 231pm

Q3/ calculate the p. value for each one in solution that results from mixing 2.25×10^{-3} of Nacl with 200ml and 300ml of 7.65×10^{-4} Hcl.

Q4/ A solution was prepared by dissolving 5.7g of Kcl. Mgcl2 .$6H_2O$ (277.85 g/mol) in sufficient water to give 2.00L calculate

a. The molar concentration of Mg^{+2} .
b. The (w/v) of Kcl.$Mgcl_2$. $6H_2O$.
c. Ppm k^+
d. Pcl for this solution

Q5/ what is the mass in milligrams for (Leave one)

a. 500mmol of MgO
b. 22.5 mol of NH_4NO_3
c. A 250 ml of 5% (w/w) H_2SO_4 with s.p(1.1)
d. A 300ml of 70ppm Nacl.

Q6/ Describe the preparation of the following:

a. What weight of $Cecl_3$ will be needed to react completely with 2.86g KIO_3

$cecl_3 + KIO_3 \longrightarrow Ce\ (IO_3)_3 + Kcl$

b. What volume of 0.0518 $cecl_3$ that will react completely with 40ml of 0.084 KIO_3

Elemnt.	Atomic no.	Atomic weight
Ce	58	140
Na	11	22.9
F	9	18.99
K	19	39
Cl	17	35.9
Mg	12	24.3
O	8	15.9
H	1	1
N	7	14
S	16	32

WITH GOOD LUCK

حلول اسئلة الدور الاول لعام 2015

Q1 عرف define

1. Molarity: It's one of the method to describe concentration of solution, which is number of moles per liter and can be calculated as:

$$M = \frac{\text{no. of moles}}{\text{liters}}$$

2. Z^*: It's the effective atomic number (EAN) which can be calculated from:

$$Z^* = Z - S$$

3. E_A: It's the electron Affinity as it the energy released as in

$$X_{(g)} + e^- \longrightarrow X^-_{(g)} + E_A$$

energy

4. ionic compound: The ionic compound is two elements one have positive charge and the other have negtive charge like (Na^+, Cl^-) to become a netrual compound like Nacl and it's a powerfull bond.

5. ppm: It's one of the method for determine concentration in very little amount which is part per millione as:

$$\frac{mg}{Kg} \quad \text{or} \quad \frac{mg}{L}$$

6. sub-shell: It's part of the energy level (n) as in level like (2) the sub-shell becomes (2s, 2p) which contain e^- inside

Q2

Na^+ : $1s^2\ 2s^2\ 2p^6$

F^- : $1s^2\ 2s^2\ 2p^6$

$Z^* = Z - S$

$S = 2 * 0.85 + 8 * 0.85$

$= 1.7 + 2.8 = 4.5$

$Z^*_{Na} = 11 - 4.5 = 6.5$

$Z^*_{F} = 9 - 4.5 = 4.5$

$Z^*_{Na} + Z^*_{F^-} = 6.5 + 4.5 = 11$

$r^+ = \frac{4.5}{11} * 231 = 94.5$ pm for Na^+

$r^- = \frac{6.5}{11} * 231 = 136.5$ pm for F^-

Q3

المحلول يحتوي على عدة ايونات

Cl^-, H^+, Na^+

حيث يجب ايجاد pcl , pH , pNa

عدد مولات Hcl + عدد مولات Nacl :-

$$\therefore [Cl^-] = \frac{(200\,ml * 2.25 * 10^{-3}\,\frac{mol}{L}) + (300 * 7.65 * 10^{-4}\,\frac{mol}{L})}{(200+300)\,ml}$$

$$= 1.36 * 10^{-3}\ mol/L$$

$$pcl = -\log (1.36 * 10^{-3}) = 2.87$$

$$[Na] = \frac{300ml * 2.25 * 10^{-3}\,\frac{mol}{L}}{200+300\ ml} = 9 * 10^{-4}\ M$$

$$PNa = -\log (9 * 10^{-4}) = 3.05$$

$$[H^+] = \frac{300 * 7.65 * 10^{-4}}{500} = 4.59 * 10^{-4}\ M$$

$$pH = -\log [4.59 * 10^{-4}) = 3.34$$

Q4

a. $\frac{5.76\ g\ KCl.MgCl_2.6H_2O}{2.00\ L} \times \frac{mol\ KCl.MgCl_2.6H_2O}{277.85\ g}$

$= 0.01037\ M\ KCl.MgCl_2.6H_2O$

b. $\frac{5.76\ g\ KCl.MgCl_2.6H_2O}{2.00\ L} * \frac{L}{1000\ ml} * 100\%$

$= 0.288\ \%\ (w/v)$

c. $0.01837\ M\ KCl.MgCl_2.6H_2O \times \frac{1\ mol\ K^+}{1\ mol\ KCl.MgCl_2.6H_2O}$

$\times \frac{39.10\ g\ K^+}{mol\ K^+} \times \frac{1000\ mg}{g}$

$= \frac{405\ mg}{L} = 405\ ppm\ K^+$

d. $pCl = -\log(3.12 * 10^{-2}\ M)$

$= 1.507$

Q5

a. $500\ mmol\ MgO \times \frac{mol}{1000\ mmol} \times \frac{40.30\ g\ MgO}{mol\ MgO} \times$

$\frac{1000\ mg}{g} = 2.015 \times 10^4\ mg\ MgO$

b. $22.5\ mol\ NH_4NO_3 \times \frac{80.04\ g\ NH_4NO_3}{mol\ NH_4NO_3} \times$

$\frac{1000\ mg}{g} = 1.80 \times 10^6\ mg\ NH_4NO_3$

c. $\frac{5\ g\ /\ 98\ g/mol}{100\ g * 10^{-3}\ \frac{kg}{g} / 1.\ kg/L} =$ M

$250\ ml *$ $\frac{mol}{L}$ = mmol

$mmol * 98\ \frac{g}{mol}$ = mg of H_2SO_4

d. $\frac{70\ mg\ /\ 35+40\ g/mol}{L} =$ M

$* 300 =$ mmol

$mmol * 35+40\ g/mol =$ mg of NaCl

Q6

a. $CeCl_3 + 3KIO_3 \rightarrow Ce(IO_3)_3 + 3KCl$

? 2.86g

$\frac{g}{M.wt\ KIO_3} \quad \frac{2.86g}{39+127+48} = \frac{2.86\ g}{214\ g/mol} = 0.0134\ mol$

$\frac{0.0134}{3} = 0.0045\ mol\ of\ CeCl_3$

$0.0045 * 245 = 0.98\ g\ CeCl_3$

$\Downarrow$

$M.wt\ CeCl_3$

b. $\frac{40ml * 0.084\ M}{3 * 0.0518} = 21.6\ ml$