



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. $MgCl_2 \cdot 6H_2O$ (277.85 g/mol) in sufficient water to give 2.00L calculate

- The molar concentration of Mg^{+2} .
- The (w/v) of $KCl.MgCl_2 \cdot 6H_2O$.
- Ppm k^+
- Pcl for this solution

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

- 500mmol of MgO
- 22.5 mol of NH_4NO_3
- A 250 ml of 5% (w/w) H_2SO_4 with s.p(1.1)
- 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



- 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 أسئلة الدور الأول لعام 2015

Q1 عرف define

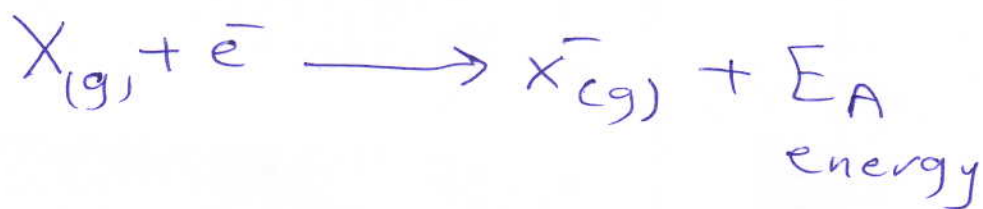
1. Molarity: It's one of the method to describe concentration of solution, which is number of moles per liter and can be calculated as:

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

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



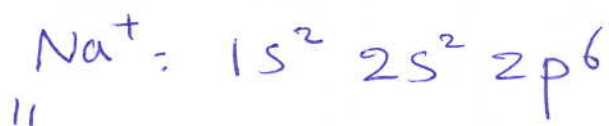
4. ionic compound: The ionic compound is two elements one have positive charge and the other have negative charge like $(\text{Na}^+, \text{Cl}^-)$ to become a neutral compound like NaCl and it's a powerful bond.

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

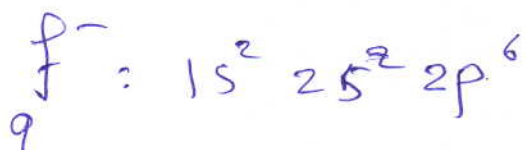
$$\frac{\text{mg}}{\text{kg}} \quad \text{or} \quad \frac{\text{mg}}{\text{L}}$$

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



11



9

$$Z^* = Z - S$$

$$S = 2 \times 0.85 + 8 \times 0.85 \\ = 1.7 + 6.8 = 8.5$$

$$Z_{\text{Na}}^* = 11 - 8.5 = 2.5$$

$$Z_{\text{F}}^* = 9 - 8.5 = 0.5$$

$$Z_{\text{Na}}^* + Z_{\text{F}}^* = 2.5 + 0.5 = 3$$

$$r^+ = \frac{0.5}{3} \times 231 = 38.5 \text{ pm for Na}^+$$

$$r^- = \frac{2.5}{3} \times 231 = 192.5 \text{ pm for F}^-$$

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Q3

المحلول يحتوي على عدة أيونات



حيث يجب إيجاد p_{Cl} , p_{H} , p_{Na}

∴ عدد مولات HCl + عدد مولات NaCl

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

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

$$p_{\text{Cl}} = -\log (1.36 \times 10^{-3}) = 2.87$$

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

$$p_{\text{Na}} = -\log (9 \times 10^{-4}) = 3.05$$

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

$$p_{\text{H}} = -\log (4.59 \times 10^{-4}) = 3.34$$

-5-

Q4

$$a. \frac{5.76 \text{ g KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}}{2.00 \text{ L}} \times \frac{\text{mol KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}}{277.85 \text{ g}}$$

$$= 0.01037 \text{ M KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$$

$$b. \frac{5.76 \text{ g KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}}{2.00 \text{ L}} \times \frac{\text{L}}{1000 \text{ ml}} \times 100\%$$

$$= 0.288 \% \text{ (w/v)}$$

$$c. 0.01037 \text{ M KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O} \times \frac{1 \text{ mol K}^+}{1 \text{ mol KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}} \\ \times \frac{39.10 \text{ g K}^+}{\text{mol K}^+} \times \frac{1000 \text{ mg}}{\text{g}}$$

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

$$d. \text{pCl} = -\log(3.12 \times 10^{-2} \text{ M}) \\ = 1.507$$

Q5

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

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

$$b. 22.5 \text{ mol NH}_4\text{NO}_3 \times \frac{80.04 \text{ g NH}_4\text{NO}_3}{\text{mol NH}_4\text{NO}_3} \times$$

$$\frac{1000 \text{ mg}}{\text{g}} = 1.80 \times 10^6 \text{ mg NH}_4\text{NO}_3$$

$$c. \frac{5 \text{ g} / 98 \text{ g/mol}}{100 \text{ g} \times 10^{-3} \frac{\text{kg}}{\text{g}} / 1.4 \text{ kg/L}} = \text{M}$$

$$250 \text{ ml} \times \frac{\text{mol}}{\text{L}} = \text{mmol}$$

$$\text{mmol} \times 98 \frac{\text{g}}{\text{mol}} = \text{mg of H}_2\text{SO}_4$$

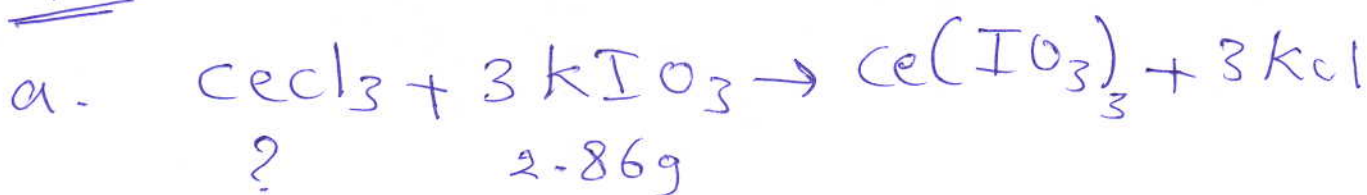
$$d. \frac{70 \text{ mg} / 35 + 40 \text{ g/mol}}{\text{L}} = \text{M}$$

$$\times 300 = \text{mmol}$$

$$\text{mmol} \times 35 + 40 \text{ g/mol} = \text{mg of NaCl}$$

Q6

~~16~~
7



$$\frac{\text{g}}{\text{m.wt}} \frac{2.86\text{g}}{39 + 127 + 48} = \frac{2.86\text{g}}{214 \text{ g/mol}} = 0.0134 \text{ mol}$$

$$\frac{0.0134}{3} = 0.0045 \text{ mol of CeCl}_3$$

$$0.0045 * 245 = 0.98 \text{ g CeCl}_3$$

↓
m.wt CeCl₃

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