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**AG—84—2018**

**FACULTY OF SCIENCE**

**M.Sc. (Second Year) (Third Semester) EXAMINATION**

**OCTOBER/NOVEMBER, 2018**

**(CBCS Pattern)**

**ANALYTICAL CHEMISTRY**

**Paper CH-532/4**

**(Fundamentals of Analytical Chemistry)**

**(Wednesday, 28-11-2018)**

**Time : 2.00 p.m. to 5.00 p.m.**

*Time—Three Hours*

*Maximum Marks—75*

*N.B. :— (i) All questions carry equal marks.*

*(ii) Use of logarithmic table/calculator is allowed.*

*(iii) Figures on the right shows marks.*

1. Answer any *three* : 15

(a) Discuss use of fluxes in dissolution and decomposition of ores.

(b) What are determinate errors ? Discuss effect of determinate errors on final result.

(c) Limestone sample analysed for its calcium content and the following results were obtained :

Ca : 59.31%, 58.96%, 59.57%, 59.42%, 59.53%

Can any value be rejected on the basis of Q test. ( $Q_{crit} = 0.64$ )

(d) Calculate number of moles and millimoles of ozone present in 96 kg of pure ozone gas.

(e) Define activity and activity coefficient of an ion and ionic strength of a solution.

P.T.O.

2. Answer any *three* :

15

- (a) Define key terms used in sampling of solids, liquids and gases.
- (b) Draw normal curve error curve and explain its usage for tackling indeterminate errors.
- (c) Write equilibrium constant expressions for associating species known to you.
- (d) Calculate molarity of 35% (W/W) of hydrochloric acid. Provided density of the sample is 1.18 g/ml.
- (e) You have received three shipments of polonium ore of equal weight. Analysis of the three ores indicated contents of :

$3.978 \pm 0.004\%$ ,  $2.536 \pm 0.003\%$  and  $3.680 \pm 0.003\%$  respectively.

What is the average polonium content of the ores and what are the absolute and relative uncertainties ?

3. (a) Discuss in detail safety measures for academic chemical laboratories. 8

Or

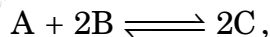
How can we minimize determinate errors using blanks and variation in sample size ?

- (b) Explain the terms 'mole' and 'millimole' with suitable examples. 7

Or

State and explain law of equilibrium constant.

Calculate equilibrium constant for the hypothetical reaction :



if 1.0 moles of A, 2.0 moles of B and 3.0 moles of C are placed in a 1 L vessel and allowed to come to equilibrium. The final concentration of C is 1.4 mol/L.

4. (a) Explain the terms weight fraction and volume fraction with suitable examples. 8

Or

Discuss effect of pressure and temperature on equilibrium constants.

- (b) Define equivalent weight of an oxidizing agent. Calculate equivalent weight of  $\text{KMnO}_4$  in acidic and basic medium. 7

Or

Define stepwise formation constant and overall formation constant of the complex. Write correct expressions for stepwise formation constants and overall formation constant for the complex formation reaction between Ni(II) and neutral ligand water.

5. (A) Select the *correct* alternative : 5

- (i) Which acid is preferred for dissolution of stainless steel ?

(a)  $\text{HClO}_4$

(b)  $\text{HNO}_3$

(c)  $\text{H}_2\text{SO}_4$

(d)  $\text{H}_3\text{PO}_4$

- (ii) Minimum deviation from central value shows ..... precision of the measurement.

(a) low

(b) medium

(c) high

(d) none of the above

P.T.O.

- (iii) How many gold atoms should be present in 24 g 24 carat gold ?  
(A.W. of Au : 196.97)
- (a)  $7.33 \times 10^{22}$
  - (b)  $7.33 \times 10^{23}$
  - (c)  $7.33 \times 10^{24}$
  - (d)  $7.33 \times 10^{25}$
- (iv) ..... of the complex is also known as formation constant of the complex.
- (a) stability constant
  - (b) instability constant
  - (c) dissociation constant
  - (d) none of the above
- (v) How many equivalents of sulphuric acid should react with one mole of AR grade soda ash ?
- (a) one-equivalent
  - (b) two-equivalent
  - (c) three-equivalent
  - (d) four-equivalent

(B) Write short notes on any *two* :

10

- (i) Laboratory note-book
- (ii) Significant figures
- (iii) Weighing methods.