No. of Printed Pages : 4

MCH-001

00268

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY

Term-End Examination

June, 2010

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 hours *Maximum Marks : 75*

Note : *Answer **any five** questions. All questions carry **equal** marks.*

1. (a) Give any five factors affecting stability of Metal-Ligand complexes. **5**

   (b) List the proper number of significant figures in the following numbers : **4**

   (i) 0.123

   (ii) 20.04

   (iii) 0.0340

   (iv) 400.0

   (c) What do you understand by levelling effect of solvents ? Explain with the help of an example. **3**

   (d) Explain the behaviour of salts of polyprotic acids in aqueous solution. **3**

2. (a) Name (any six) nuclear methods of analysis which are used in analytical chemistry and describe any one of these in brief. **6**

(b) Calculate the pH at 0, 25 and 50 ml titrant in the titration of 50 ml of 1 M acetic acid with 1 M NaOH. **4**

(c) What is meant by masking and demasking in a complexometric titration ? Explain with the help of an example. **5**

3. (a) What are the three types of samples pertaining to water sampling and describe any one of them. **3+2=5**

(b) Discuss any two instrumental methods of analysis based on comparing the coloured products. **5**

(c) Consider the following set of replicate measurements of an analyte : **5**

0.892, 0.894, 0.913 and 1.000 g.

The true value is 0.930 g.

Calculate :

(i) Mean (rounded upto three decimals).

(ii) Absolute error of the mean.

(iii) Relative error of the mean in parts per thousand.

Consider no observation is rejected.

4. (a) Derive an expression for the cell potential of the following cell : 5

$$Zn + Cu^{2+} \rightleftharpoons Zn^{2+} + Cu$$

(b) What are the advantages of the 'Initial rate method' for kinetic measurements ? 5

(c) What should be the criteria of a nonaqueous solvent for it to be suitable in redox titrations ? 5

5. Write short notes on the following : 3x5=15

(a) Ostwald's Theory of Indicators.

(b) Hammet's acidity functions.

(c) Separation of tracer quantities by coprecipitation.

6. (a) What kind of training is required for the personnel working in a chemistry laboratory ? 5

(b) What do you mean by pseudo first order reaction ? Give an example. 4

(c) Describe the methods of collection of gaseous pollutants with concentration. 6

7. (a) List any five precautions to be taken while handling glassware in the chemistry laboratory. 5

(b) What do you mean by the χ^2 (chi-square) Test ? Explain with a suitable example. 5

(c) Give any five requirements that should be satisfied by a primary standard in titrimetry. 5

8. (a) Explain the precipitation titration curve for titration of a mixture of chloride and iodide ions with silver ions. 6

(b) Identify the conjugate acid-base pairs in the following equations : 4

(i) $NH_3 + CH_3OH \rightleftharpoons NH_4^+ + CH_3O^-$

(ii) $NO_2^- + H_2O \rightleftharpoons HNO_2 + OH^-$

(c) What is the significance of non-aqueous titrations ? Explain with the help of an example. 5