P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

December, 2013

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 hours   *Maximum Marks : 75*

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

1. (a)   The result of three quantities a, b, and c is   5
          to be calculated as $y=(a \times b)/c$. The
          individual standard deviation of each
          quantity are given in parenthesis :
          $a=54.36(\pm 0.04)$, $b=32.87(\pm 0.03)$ and
          $c=0.1169(\pm 0.0001)$. Calculate the standard
          deviation of the operation and express the
          calculated result with absolute uncertainty.

    (b)   Explain the difference between inhalation   5
          and ingestion of chemicals ? Which is most
          dangerous ? How can ingestion accidents
          be minimised ?

    (c)   Briefly explain the general procedure to   5
          determine the $[H_3O^+]$ of a diprotic acid.

2. (a)   Compute the potential at which the   5
          indicator "Ferroin" would acquire the
          colour of the oxidised form of the indicator.
          The indicator half reaction is as below :

          $[Fe(Phen)_3]^{3+} + e \rightleftharpoons [Fe(Phen)_3]^{2+}$ $E^0=1.06V$

(b) Give the procedure for washing a precipitate when it is a salt of a weak acid or a weak base. Furuish suitable examples. 5

(c) Explain indeterminate errors ? What is their other name ? How can these be prevented. 5

3. (a) Write a procedure for the general preservation of nutrient group during preservation of samples. 5

(b) 75.0 ml of a 0.15 M solution of weak acid, HB, $Ka=1.0 \times 10^{-6}$ is mixed with 75.0 ml of 0.15 M NaOH. Calculate the pH of the resulting solution. 5

(c) In complexometric titration when is replacement titration carried out ? Explain the method with a suitable example. 5

4. (a) Mention the two main drawbacks of organic reagents for inorganic gravimetric analysis. 5

(b) Draw the nature of 'normal error curve' ? Explain with the help of suitable figures. 5

(c) What are the specific criteria for selecting the location of air sampling site. 5

5. Write short notes (on **any three**) :

(a) Buffer capacity 5

(b) Chelates 5

(c) Sampling of food materials 5

(d) The t-test 5

6. (a) Write down the conditions in gravimetric analysis for improving the quality of precipitate. In what way can the particles size of the precipitates like $BaSO_4$ and CaC_2O_4 be increased ?   5

(b) What is the difference between the methods based on NMR and ESR ?   5

(c) Explain with the help of suitable figures the Metal-EDTA titration curves.   5

7. (a) Explain the modern quinoid theory with reference to acid-base indicators.   5

(b) What symbol is used for the radioactive materials in a laboratory ? Explain the colour code used ?   5

(c) What is the role of coprecipitation for the separation of tracer quantities ?   5

8. (a) What is meant by variance with reference to statistics. What is the ratio of two variances known as and what is it used for ?   5

(b) Briefly describe the methods of collection of gaseous pollutants with concentration.   5

(c) Define **any two** of following terms :   5

    (i) Order of a reaction

    (ii) Differential method

    (iii) half life