



NCF-003-010204

Seat No. _____

M. Sc. (Chemistry) (Sem. II) (CBCS) Examination

April / May – 2017

C-204 : Chemistry

(Analytical Chemistry)

[Old Course]

Faculty Code : 003

Subject Code : 010204

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (i) All questions are **compulsory**.
(ii) All questions carry equal marks.

- 1** Answer the following : (any **seven**) **14**
- (a) Define air and water pollution. Enlist air and water pollutants.
 - (b) Why hardness is measured ? Write the chemical reaction involved in measurement.
 - (c) Write the chemical reactions for nitrite and nitrate nitrogen determination in water sample.
 - (d) How will you determine sulphate and chloride in water sample ? Write chemical reaction for both.
 - (e) Define percentage economy and atom utilization.
 - (f) What is supercritical fluid ? Give its name and its importance in green chemistry.
 - (g) Define : Accuracy, precision, t-test and F-test.
 - (h) A particular method for the analysis of copper yields results that is low by 0.5 mg. What will be the percentage error due to this source and if the weight of copper in a sample is (i) 25 mg (ii) 100 mg (iii) 250 mg (iv) 500 mg.

- (i) A soda ash sample is analyzed in analytical chemistry laboratory by titration with standard HCl. The analysis is performed in triplicate with the following results : 93.50, 93.58 and 93.43% Na_2CO_3 . Within what range are you 95% confident that the true value lies ? [$t=4.303$]
- (j) The analysis of calcite sample yielded CaO% of 55.95, 56.00, 56.04, 56.08 and 56.23 respectively. The last value appears anomalous; should it be retained or rejected ? [$Q_{tab} = 0.64$].

2 Answer the following : (any **three**) **14**

- (a) What is alkalinity and acidity of water sample ? Explain its determination techniques and importance of measurement.
- (b) Why fluoride ion concentration is essential to maintain in water ? Give the principle of ion selective electrode.
- (c) How will you analyze oxidants and ozone in air sample ?
- (d) Draw and explain the flow sheet diagram of energy balance of earth atmospheric system.

3 Answer the following : **14**

- (a) Riboflavin (Vitamin B_2) is determined in a cereal sample by measuring its fluorescence intensity in 5% acetic acid solution. A calibration curve was prepared by measuring the fluorescence intensities of a standard of increasing concentrations. The following data were obtained. Use the method of least squares to obtain the best straight line for the calibration curve and to calculate the concentration of riboflavin in the sample solution. The sample fluorescence intensity was 15.4.

<i>Riboflavin</i> $\mu\text{g/ml} (X_i)$:	0.000	0.100	0.200	0.400	0.800
<i>Fluorescence Intensity</i> (Y_i):	0.0	5.8	12.2	22.3	43.3

- (b) Describe the chemistry of photochemical smog with relevant equation.

OR

- 3 (a) Calibration data for a chromatographic method for the determination of isooctanes in a hydrocarbon mixture are 14
Mole %

Isooctane, X_i :	0.352	0.803	1.08	1.38	1.75
Peak area, Y_i :	1.09	1.78	2.60	3.03	4.01

Fit the best straight line.

- (b) Define DO and COD. Write the chemical reactions involved in its determination procedure. Discuss the practical procedure for DO determination.
- 4 Answer the following : (any two) 14
- (a) A new method for the analysis of mercury was tested against an ore sample that was known to assay 12.63% Hg.

<i>Trial</i> :	1	2	3	4	5
%Hg :	12.76	12.57	12.72	12.79	12.76

- (i) Calculate the standard deviation s for these data.
- (ii) Calculate the 95% confidence interval for the analysis.
- (iii) Is the assay mean within the bounds of (I) the 95% confidence interval and (II) the 80% confidence interval ?
[For 95% level $t=2.78$ and 80% level $t=1.53$]
- (b) What is error ? Discuss types of errors in detail and draw a normal error curve.
- (c) The following values were obtained for the atomic weight of Cd : 112.25, 112.36, 112.32, 112.21, 112.30 and 112.36.
Calculate mean, mean deviation, relative mean deviation, C.V. and standard deviation.

5 Answer the following : (any two)

14

- (a) Write note on particulates matter.
- (b) Define the term green chemistry. Enlist the twelve principles of it. Discuss any three in detail.
- (c) Discuss the following :
- (i) Microwave assisted organic synthesis.
- (ii) Define ionic liquid. Give its name and synthesis of any one ionic liquid.
- (d) Each of the following sets of data has what appears to be an outlying result. Apply the Q test (90% confidence) to determine whether this value should be retained or rejected. [For 3 measurement $Q_{tab} = 0.94$ and 4 measurements $Q_{tab} = 0.76$]

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>
75.97	14.64	31.42	31.42	9.22	9.22
76.36	14.41	31.40	31.40	9.06	9.06
76.04	14.46	31.04	31.04	9.20	9.20
76.13	14.44		31.44		9.24