



**PAT-003-1102004** Seat No. \_\_\_\_\_

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

**August/September – 2020**

**C-204 : Analytical Chemistry**

*(New Course)*

**Faculty Code : 003**

**Subject Code : 1102004**

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

[Total Marks : 70

**Instructions :**

- (1) All questions are compulsory.
- (2) All questions carry equal marks.

**1** Answer the following : (any seven)

- (a) Which are the major parameters to be studied for analyzing pollutants in water ?
- (b) What is green chemistry ? How it differ from environmental chemistry ?
- (c) What are particulates ? Give their classification and sources.
- (d) Give the conventional and alternative green reaction for the preparation of p-bromo acetanilide with green context.
- (e) Name some of the radioactive pollutants in context of air pollution.
- (f) Define : Standard deviation, t-test, confidence limit and deviation.
- (g) The analysis of calcite sample yielded CaO % of 55.95, 56.00, 56.04, 56.08 and 56.23. The last value appears anomalous, should it be retain or rejected ? ( $Q_{tab} = 0.64$ )
- (h) Give the name of major sources of soil pollution.
- (i) The percentages of a constituent A in a compound AB found to be 48.32, 48.36, 48.23, 48.11 and 48.38%. Calculate the mean deviation and the relative mean deviation.

- (j) An established method of a analytical technique for chlorinated hydrocarbon in air sample has standard deviation of 0.030 ppm (i) Calculate the 95% confidence limit for a group of four measurement obtained by this method (ii) how many measurements should be made if the 95% confidence limit is to be  $\pm 0.17\%$  ? ( $t = 3.18$ ).

2 Answer the following : (any two)

- (a) Discuss in detail the major types of air pollution.  
 (b) How will you determine total hardness in water sample ? Give the procedure and chemical reactions for its determination.  
 (c) Calibration data for a chromatographic method for the determination of isooctane in a hydrocarbon mixture are as under :

Isooctane, $X_i$	0.352	0.803	1.08	1.38	1.75
Peak area, $Y_i$	1.0	1.78	2.60	3.03	4.01

Calculate the fit the best straight line.

3 Answer the following :

- (a) Write a detail note on sources of water pollution.  
 (b) A new method for the analysis of mercury was tested against an ore sample that was known to assay 12.63% Hg.

Trial	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 bound of (I) the 95% confidence interval and (II) the 80% confidence interval ?  
 [For 95% level  $t = 2.78$  and 80% level  $t = 1.53$ ]

**OR**

- (a) A new gravimetric method is developed for Fe (III), in which the iron is precipitated in crystalline form with an organo boron cage compound. The accuracy of the method is checked by analyzing the iron in an ore sample and comparing with the results using the standard precipitation with  $\text{NH}_3$  and weighing as  $\text{Fe}_2\text{O}_3$ . The results reported as % Fe for each analysis.

Test method %	Ref. method %
20.10	18.89
20.50	19.20
18.65	19.00
19.25	19.70
19.40	19.40
19.99	

Is there a significant difference between the two methods ?  
( $t = 2.26$  and  $F_{\text{tab}} = 6.26$ )

- (b) The following are polarographic diffusion current for standard solutions of methyl vinyl ketone (MVK).

Conc. of MVK m mol/lit, $X_i$	0.500	1.50	2.50	3.50	4.50	5.50
Current $\mu_A, Y_i$	3.76	9.16	15.03	20.42	25.33	31.9

- (i) Fit the best straight line.  
(ii) Two samples containing MVK yielded currents of 6.3 and  $27.5 \mu_A$ . Calculate the concentration of MVK in each solution.

4 Answer the following :

- (a) What is PTC ? Discuss any two synthesis by using PTC with reaction mechanism.  
(b) Give the twelve principles of green chemistry and discuss any four in detail.

5 Answer the following : (any two)

- (a) An automatic absorption method for the determination of Fe is used engine oil was found from pooling 30 triplicate analysis to have a standard deviation  $S \rightarrow \sigma = 2.4 \mu\text{g/ml}$ . Calculate the 80 and 95% confidence interval for the results  $18.5 \mu\text{g Fe/ml}$ , if it was based upon
- (i) a mean of two analysis
  - (ii) single analysis
  - (iii) the mean of four analysis [80% confidence limit  $Z = 1.29$  and 95% confidence limit  $Z = 1.96$ ]
- (b) What is chemical oxygen demand ? How will you determine it in water sample ? Discuss the principle and procedure for its determination.
- (c) Discuss the photochemical smog in detail with reactions.
- (d) A method for determining the particulate lead content of air sample is based upon drawing a measured quantity of air through a filter and performing the analysis on circles cut from the filter. Calculate the individual values for S as well as a pooled value for the accompanying data.

Sample	$\mu_{\text{g}}, \text{Pb/m}^3 \text{ Air}$
1	1.5, 1.2, 1.3
2	2.0, 2.3, 2.3, 2.2
3	1.8, 1.7, 1.4, 1.6
4	1.6, 1.3, 1.2, 1.5, 1.6