



Seat No. _____

HQ-003-1102004
M. Sc. (Chemistry) (Sem. II) (CBCS)
Examination
April - 2023
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) 14
- (a) Define water pollution and classify water pollutants.
 - (b) How will you analyze ammonia in air sample ?
 - (c) Draw and explain flow sheet diagram of energy balance of earth atmosphere system.
 - (d) What is BOD ? Give the principle behind BOD measurement.
 - (e) Define : Confidence limit, coefficient of variance, precision and t-test.
 - (f) What do you mean by green chemistry ?
 - (g) Give the name of techniques used in organic synthesis.
 - (h) The percentages of a constituent A in a compound AB were found to be 48.32, 48.36, 48.23, 48.11 and 48.38% Calculate the mean and average deviation.
 - (i) 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 ? [$Q_{tab}=0.64$].
 - (j) Calculate the 50% and 95% confidence limits for the mean value 1.67 ppm Hg in a fish sample [$s \cong \sigma = 0.10$, $n=3$, 50% confidence limit $Z=0.67$ and 95% confidence limit $z=1.96$].

- 2 Answer the following : (any two) 14
- (a) How will you analyze nitrate and nitrite in water sample?
- (b) Discuss the chemistry of photochemical smog.
- (c) Explain mechanical analysis of soil.

- 3 Answer the following : 14
- (a) The following are polarographic diffusion currents for standard solutions of methyl vinyl ketone. (MVK).

<i>Con.ofMVK m mol / lit.x_i</i>	0.500	1.50	2.50	3.50	4.50	5.50
<i>Current $\mu A, Y_i$</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 μA . Calculate the concentration of MVK in each solution.
- (b) Given the following set of weights 29.8, 30.2, 28.6 and 29.7 mg. Calculate the average deviation and standard deviation of the individual values and the average deviation and the standard deviation of the mean. Express these as absolute and relative values.

OR

- (a) The following data were obtained in calibrating a calcium ion electrode for the determination of P^{Ca} . A linear relationship between the potential E and p^{Ca} is known to exist.

<i>P^{Ca}, X_i</i>	5.00	4.00	3.00	2.00	1.00
<i>E, mV, Y_i</i>	-53.8	-27.7	2.7	31.9	65.1

- (i) Fit the best straight line.
- (ii) Calculate the P^{Ca} of a serum solution in which the electrode potential was to be 20.3 mV.

- (b) 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	$\mu\text{g, Pb/m}^3$, 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

4 Answer the following : 14

- (a) Enlist the twelve principles of green chemistry. Discuss any three in detail.
- (b) 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 4 measurement $Q_{\text{tab}}=0.76$ and 3 measurement $Q_{\text{tab}}=0.94$].

<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

5 Answer the following : (any two) 14

- (a) Write a note on particulate matter.
- (b) Give the preparation of acetanilide by conventional and green procedure. Mention the non-green components. Give the green context.

- (c) An established method of analysis for chlorinated hydrocarbon in air sample has standard deviation of 0.030 ppm.
- (i) Calculate the 95% confidence limit for a group of four measurements obtained by this method.
 - (ii) How many measurements should be made if the 95% confidence limit is to be $\pm 0.017\%$? [For 95% confidence level $t=3.18$]
- (d) You are developing a new colorimetric procedure for determining the glucose content of blood serum. You have chosen the Folin–Wu procedure with which to compare your results. From the following two sets of replicate analysis on the same sample, determine whether the variance of your method differs significantly from that of the standard method. [$F_{\text{tab}}=4.95$]

Your method mg/dl	Folin–Wu method mg/dl
127	130
125	128
123	131
130	129
131	127
126	<u>125</u>
<u>129</u>	
