



**DBZ-003-1102004**

Seat No. \_\_\_\_\_

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

**July - 2022**

**C204 : Chemistry**

**(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) How will you analyze acidity of water sample?
  - (b) What are particulates? Give their classification and sources.
  - (c) Give the names of the radioactive pollutants in the context of air pollution.
  - (d) Give the names of major sources of soil pollution.
  - (e) Define : Relative error, Precision, Deviation and F-test.
  - (f) The standard deviation in method for the analysis of CO in automotive exhaust gases has been found on the basis of extensive past experience to be 0.80 ppm. How many measurements would be needed for the confidence limit for the set to be 0.50 ppm? (For 90% confidence  $z=1.64$ )
  - (g) Calculate the average deviation and the relative average deviation of the following set of analytical results : 15.67, 15.69 and 16.03 g.
  - (h) Analysis of a group of sample yielded the following data 29.03, 29.08, 28.97 and 29.24. Apply the Q-test to see if the outlying result should be retained or rejected at the 90% level. [ $Q_{\text{tab}} = 0.76$ ]

- (i) Define green chemistry. Why do we need green chemistry?  
 (j) What is phase transfer catalyst? Give their example.

**2** Answer the following. (any two) **14**

- (a) Discuss the photochemical smog in detail.  
 (b) What is Chemical Oxygen Demand? How will you determine it in water sample? Discuss the principle and procedure for its determination.  
 (c) How will you determine total sulphur in soil sample?

**3** Answer the following. **14**

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

<i>Conc. of MVK, mmol / lit., <math>X_i</math></i>	0.500	1.50	2.50	3.50	4.50	5.50
<i>Current, <math>\mu A, Y_i</math></i>	3.76	9.16	15.03	20.42	25.33	31.9

Calculate

- (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.  
 (b) Following data from a continuing study of calcium ion in the blood plasma of several individuals are obtained.

subset	Mean Ca content mg/100 ml	No. of obsns.	Deviation of individual result from the mean value
1	3.16	5	0.14, 0.09, 0.06, 0.00, 0.11
2	4.08	4	0.07, 0.12, 0.10, 0.01
3	3.75	5	0.13, 0.05, 0.08, 0.14, 0.07
4	3.49	3	0.10, 0.13, 0.07
5	3.32	6	0.07, 0.10, 0.11, 0.03, 0.14, 0.05

- (i) Calculate  $s$  for each set of values.  
 (ii) Pool the data and calculate  $s$  for analysis.

**OR**

3 Answer the following.

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- (a) Sulphate in natural water can be determined by measuring the turbidity that results when an excess of the  $\text{BaCl}_2$  is introduced into a measured quantity of the sample. The instrument was calibrated with a series of standard  $\text{Na}_2\text{SO}_4$  solutions. The following data were obtained.

$\text{SO}_4^{2-}$ , mg/lit, $X_i$	0.00	5.00	10.00	15.00	20.00
Turbidimeter reading, $Y_i$	0.06	1.48	2.28	3.98	4.61

Assuming a linear relationship between the instrument reading and concentration.

- (i) Fit the best straight line.
- (ii) Calculate the concentration of sulphate in a sample yielding a turbidimeter reading of 3.67.
- (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  $Q_{\text{tab}} = 0.94$ ]

A	B	C	D	E	F
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

4 Answer the following.

14

- (a) Discuss photochemical reaction in detail.
- (b) Give the twelve principles of green chemistry and discuss any three of them in detail.

5 Answer the following. (any two)

14

- (a) Discuss green reactions of benzoin condensation in detail.
- (b) How will you analyze fluoride ( $\text{F}^-$ ) ion in water sample?

- (c) 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	125
129	

- (d) A new method for the analysis of mercury was tested against an are 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 the bound of (a) the 95% confidence interval and (b) the 80% confidence interval?  
[For 95% level  $t=2.78$  and 80% level  $t=1.53$ ]
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