PAT-003-010204    Seat No. _____

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

## August/September – 2020

## Chemistry

### C-204 : Analytical Chemistry (Old Course)

Time : $2\frac{1}{2}$ Hours]                                    [Total Marks : 70

**Instructions :**

(1) All questions carry equal marks.

(2) All questions are compulsory.

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

(a) Define :

   (i) Mean error            (ii) Deviation

   (iii) Variance            (iv) Standard Deviation

(b) What are organic particulates ? How soot particles look ?

(c) What is the role of PTC in chemical reactions ? Give its three names.

(d) What is demand oxygen ? Why it is determined in water sample ?

(e) Define Air pollution and give their name and sources of originate.

(f) The analysis of calcite sample yielded CaO% of 55.95, 56.00, 5,6-04, 56.08 and 56.23. The last value appears anomolous, should it be retained or rejected ? [$Q_{Tab}$ = 0.64].

(g) Define green chemistry. Give its importance and name of techniques for syntheses in green chemistry.

(h) The percentage 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 deviation and the relative mean deviation.

(i) How will you determine chloride in water sample ? Give the name of method, chemical used and chemical reaction for the method.

(j) Define : Confidence level, t-test, F-test and accuracy.

**2** Answer the following : (any **two**)

(a) Following values were recorded for the potential E of an electrode measured against the saturated calomel electrode as a function of concentration C (mole/lit)

Fit the best straight line to these data.

| $-\log C \, Xi$ | 1.0 | 1.10 | 1.20 | 1.50 | 1.70 | 1.90 | 2.10 | 2.20 | 2.40 | 2.70 | 2.90 | 3.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $E, mV, Yi$ | 106 | 115 | 121 | 139 | 153 | 158 | 174 | 182 | 187 | 211 | 220 | 226 |

(b) How will you determine dissolved oxygen ? Give the procedure with chemical reactions.

(c) How will you determine hardness of water ? Give the principle, procedure and chemical reactions.

**3** Answer the following :

(a) A method for determining the particulate nitrate content of air sample is based upon drawing a measured quantity of air through a filter and performing the analysis of circles out from the filter. Calculate the individual values for S as well as a pooled value for the accompanying data.

| Sample | $\mu g$, $NO_2/m^3$ air |
|---|---|
| 1 | 1.6, 1.2, 1.3 |
| 2 | 2.0, 2.2, 2.3, 2.2 |
| 3 | 1.8, 1.7, 1.4, 1.6 |
| 4 | 1.6, 1.3, 1.2, 1.5, 1.6 |

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

**OR**

(a) A new method for the analysis of Hg 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 deviations S for these data.

(ii) Calculate the 95% confidence interval for the analysis [For 95% level t = 2.78]

(iii) Is the assay mean within the bounds of

(a) the 95% confidence interval

(b) the 80% confidence interval ?

[as 80% level t = 1.53]

(b) Write twelve principles of green chemistry and explain any three in detail.

4    Answer the following :

(a) How will you determine nitrogen, acidity and alkalinity in water sample ?

(b) What is error ? Discuss types of errors and normal error curve.

5    Answer the following : (any **two**)

(a) How will you determine total organic carbon ? Give the principle and procedure for its determination.

(b) What is microwave radiation reaction ? Discuss its role in organic synthesis with suitable example.

(c) The following data were obtained in calibrating a colorimetry for the determination of trace amount of iron in aqueous solution.

| $Fe\ ppm\ Xi$ | 0.510 | 1.020 | 1.530 | 2.040 | 2.556 | 3.060 | 3.570 | 4.080 | 4.590 | 5.100 |
|---|---|---|---|---|---|---|---|---|---|---|
| Colorimetry Reading Yi | 8.2 | 15.1 | 18.0 | 23.7 | 32.1 | 36.4 | 45.0 | 49.6 | 56.1 | 61.2 |

(i) Fit the best straight line.

(ii) Calculate the concentration of solution that yielded reading of 9.9 and 43.7.

(d) Discuss earth atmospheric system energy balance with diagram.

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