

## PAPER II

### PRACTICAL WORK – 15 Marks

Candidates are required to complete the following experiments:

#### 1. Titrations

Oxidation-reduction titrations: potassium manganate (VII) / ammonium iron (II) sulphate; potassium manganate (VII) / oxalic acid.

The candidate may be required to determine the percentage purity of a compound and the number of molecules of water of crystallization in hydrated salts. In such experiments sufficient working details including recognition of the end point will be given.

*Candidates will be required to calculate:*

- Molarity
- Concentration in grams  $L^{-1}$  / molecular mass
- Number of molecules of water of crystallisation/ percentage purity.

**NOTE: Molarity must be calculated upto 4 decimal places at least, in order to avoid error.**

**OBSERVATION TABLE**

S. No.	(A)	(B)	(B – A)
	Initial burette reading (ml)	Final burette reading (ml)	Difference (ml)
1			
2			
3			

- Concordant reading is to be used for titre value. Concordant reading is two consecutive values which are exactly the same. Average will not be accepted as titre value.
- The table is to be completed in ink only. Pencil is not to be used.
- Overwriting will not be accepted in the tabular column.

#### Observations:

- Pipette size (should be same for all the candidates at the centre).
- Titre value (concordant value).

#### 2. Study of the rate of reaction

The candidates will be required, having been given full instructions, to carry out an experiment on the rate of reaction, e.g. reaction between sodium thiosulphate and hydrochloric acid (using different concentrations for either), magnesium and dil. sulphuric acid/ dil. hydrochloric acid (using different concentrations).

- Graph of volume vs. time and its interpretation.
- Relationship between concentration and rate, volume and rate and time and rate.

#### 3. Identification of the following compounds and functional groups based on observations

- Alcoholic group - glycerol

- Aldehyde group- formaldehyde
- Ketonic group – acetone
- Carboxylic group – benzoic acid
- Amino group - aniline

**\*Please Note: Carbylamine and acrolein tests should not be performed.**

*The student should learn to differentiate between colours, solution, ring and precipitate.*

#### 4. Characteristic tests of carbohydrates and proteins

- Carbohydrates – glucose
- Proteins – powdered milk

*Identification should be of 'Carbohydrate' and 'Protein' not of individual substances.*

#### 5. Experiments related to pH change using pH paper or universal indicator.

- Determination of pH of some solutions obtained from fruit juice, solutions of known and varied concentrations of acids, bases and salts.
- Comparison of pH of the solutions of strong and weak acids of the same concentration.

*Use of universal indicator/pH paper must be taught to the students.*

#### 6. Electrochemistry

Setting up a simple voltaic cell.

Variation of cell potential in  $\text{Zn}/\text{Zn}^{2+}/\text{Cu}^{2+}/\text{Cu}$  with change in concentration of electrolyte ( $\text{CuSO}_4$ ,  $\text{ZnSO}_4$ ) at room temperature.

#### 7. Qualitative analysis

Qualitative analysis: identification of single salt containing one anion and one cation:

Anions:  $\text{CO}_3^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{PO}_4^{3-}$ .

Cations:  $\text{NH}_4^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ .

**NOTE:**

**Chromyl chloride test not to be performed.**

**For wet test of anions, sodium carbonate extract must be used (except for carbonate).**

**(Insoluble salts such as lead sulphate, barium sulphate, calcium sulphate, strontium sulphate will not be given).**

Anions: Dilute acid group –  $\text{CO}_3^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$

Concentrated Acid Group –  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{CH}_3\text{COO}^-$ .

Special Group -  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{C}_2\text{O}_4^{2-}$ .

Cations: Group Zero:  $\text{NH}_4^+$

Group I:  $\text{Pb}^{2+}$

Group II:  $\text{Cu}^{2+}$ ,  $\text{Pb}^{2+}$

Group III:  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$

Group IV:  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Co}^{2+}$

Group V:  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$

Group VI:  $\text{Mg}^{2+}$

**NOTE:**

- Formal analytical procedure is required for Qualitative Analysis.
- Specific solvent for O.S. to be used;
- Before adding Group III reagents to the filtrate of Group II,  $\text{H}_2\text{S}$  must be removed followed by boiling with conc. Nitric acid.
- The right order for buffer ( $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{OH}$ ) must be used.
- The flame test with the precipitate obtained in Group V for  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$  will also be accepted as a confirmatory test.

**For wet test of anions, sodium carbonate extract must be used (except for carbonate).**

## PATTERN OF CHEMISTRY PRACTICAL PAPER

Questions in the practical paper will be set as follows:

<b>Question 1</b>	<b>Volumetric Analysis</b>
<b>Question 2</b>	<b>Any one or a combination of the following experiments:</b>
	<ul style="list-style-type: none"> <li>• Study of the rate of reaction.</li> <li>• Identification of the organic compounds and functional groups based on observations.</li> <li>• Characteristic tests of carbohydrates and proteins.</li> <li>• Experiments related to pH determination using pH paper or universal indicator.</li> <li>• Electrochemistry.</li> </ul>
<b>Question 3</b>	<b>Qualitative Analysis (single salt).</b>

### PROJECT WORK AND PRACTICAL FILE - 15 Marks

#### Project Work – 10 Marks

The project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

The candidate is to creatively execute **one** project/assignment on an aspect of Chemistry. Teachers may assign or students may select a topic of their choice. Following is only a suggestive list of projects.

#### Suggested Evaluation criteria for Project Work:

• Introduction / purpose
• Contents
• Analysis/ material aid (graph, data, structure, pie charts, histograms, diagrams, etc.)
• Presentation
• Bibliography

**NOTE:** According to the recommendation of International Union of Pure and Applied Chemistry (IUPAC), the groups are numbered from 1 to 18 replacing the older notation of groups IA ..... VIIA, VIII, IB ..... VIIB and 0. However, for the examination both notations will be accepted.

Old notation	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	0
New notation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

#### Suggested Assignments:

1. Amino acids: Peptides, structure and classification, proteins structure and their role in the growth of living beings.
2. Nucleic Acid: DNA and RNA – their structure. Unique nature. Importance in evolution and their characteristic features.
3. Carbohydrates and their metabolism, Blood - haemoglobin and respiration.
4. Vitamins and hormones
5. Simple idea of chemical evolution.
6. Natural polymers (any **five**) - structure, characteristics, uses. Synthetic polymers (any **five**) - method of preparation, structure, characteristics and uses.
7. Types of Dyes - methods of preparation, characteristics and uses.
8. Chemicals in medicines: antiseptics, antibiotics, antacids, etc. and their uses.
9. Preparation of soap, nail polish, boot polish, varnish, nail polish remover, shampoo and perfumes.
10. Chemicals and chemical processes in forensic studies.
11. Insecticides, pesticides and chemical fertilisers.
12. Ancient Indian medicines and medicinal plants.
13. Organic Chemistry in Nutrition, Food Science and Biotechnology.
14. Effect of Green House Gases.
15. How Plastics have changed the world, both socially and economically.

#### Practical File – 5 Marks

The Visiting Examiner is required to assess students on the basis of the Chemistry Practical file maintained by them during the academic year.