

### Applied Chemistry

Paper Code: ETCH – 113  
Paper : Applied Chemistry

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INSTRUCTIONS	TO	PAPER	SETTER:
<b>MAXIMUM MARKS: 75</b>			
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.			
2. Each unit should have two questions. However, student may be asked to attempt only 1 question from each unit.			

*Objective: The objective of the paper is to facilitate the student with the basics of Applied Chemistry aspects that are required for his understanding of basic chemistry*

#### **UNIT I: FUELS**

Definition, Classification & Calorific value of fuels (gross and net), Dulong's formula (**Numericals**), Determination of calorific value of fuels using bomb's calorimeter (**Numericals**), Determination of calorific value of fuels using Boy's Gas Calorimeter (**Numericals**), Cracking – Thermal & catalytic cracking, Octane & Cetane numbers with their significance. High & Low temperature carbonization, Manufacture of coke (Otto – Hoffmann oven) Proximate and ultimate analysis of Coal (**Numericals**) Combustion of fuels (**Numericals**).

[T1,T2][No. of hrs. 08]

#### **UNIT II: THE PHASE RULE & CATALYSIS**

Definition of various terms, Gibb's Phase rule & its derivation, Application of phase rule to One component system- The water system, Application of phase rule to Two component system- The Lead-Silver system (Pattinson's process).

Catalyst and its characteristics, Types of catalysts, Concept of promoters, inhibitors and poisons. Theories of catalysis: Intermediate compound formation theory, adsorption or contact theory. Application of catalysts for industrially important processes Enzyme catalysis: Characteristics, Kinetics & Mechanism of enzyme catalysed reaction ( Michaelis-Menten equation), Acid-Base catalysis: Types, Kinetics & Mechanism, Catalysis by metals salts (Wilkinson's Catalyst), Auto-catalysis, Heterogeneous catalysis (Langmuir-Hinshelwood mechanism).

[T1,T2][No. of hrs. 08]

#### **UNIT III: WATER**

Introduction and specifications of water , Hardness and its determination by EDTA method (**Numericals**), Alkalinity and its determination (**Numericals**), Reverse Osmosis, Electrodialysis, Disinfection by break-point chlorination. Boiler feed water, boiler problems– scale, sludge, priming & foaming: causes & prevention, Boiler problems– caustic embrittlement & corrosion: causes & prevention, Water Softening by Internal Treatment: carbonate & phosphate conditioning, colloidal conditioning & calgon treatment Water Softening by External Treatment: Lime-Soda Process (**Numericals**) Zeolite & Ion-Exchange Process.

[T1,T2][No. of hrs. 08]

#### **UNIT IV: CORROSION & ITS CONTROL**

Causes, effects & consequences; Chemical or Dry corrosion & its mechanism (Pilling-Bedworth Rule) Electrochemical or Wet Corrosion & Its mechanism, Rusting of Iron Passivity, Galvanic series, Galvanic Corrosion, Soil Corrosion Pitting Corrosion, Concentration Cell or Differential Aeration Corrosion, Stress Corrosion. Factors Influencing Corrosion: Nature of metal and nature of corroding environment; Protective measures: Galvanization, Tinning Cathodic Protection, Sacrificial Anodic protection, Electroplating, Electroless plating, Prevention of Corrosion by Material selection & Design.

[T1,T2][No. of hrs. 08]

#### **Text Books:**

- [T1] P. C. Jain & Monika Jain, *Engineering Chemistry*, Latest edition, Dhanpat Rai Publishing Co., 2002.  
[T2] P. Mathew, *Advance Chemistry*, 1 & 2 Combined Editions, Cambridge University Press, 2003.

#### **Reference Books:**

- [R1] P. W. Atkins and J. De Paula, *Atkins' Physical Chemistry*, Oxford, 2010.  
[R2] T. Engel and P. Reid, *Physical Chemistry*, Pearson Education, 2013.

- [R3] K. Qanungo, *Engineering Chemistry*, PHI Learning Private Limited, New Delhi, 2009.
- [R4] O. G. Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Private Limited, 2012.
- [R5] D. A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall, 2<sup>nd</sup> Edition, 1996.
- [R6] H. K. Chopra and A. Parmar, *Engineering Chemistry- A Text Book*, Narosa Publishing House, 2012.
- [R7] S. Chawla, *Engineering Chemistry-All India Edition*, Dhanpat Rai & Co., 2003.
- [R8] R. Gadi, S. Rattan and S. Mohapatra, *Environmental Studies*, S.K. Kataria & Sons, 2<sup>nd</sup> Edition 2009.