POORNIMA

COLLEGE OF ENGINEERING

Name of faculty	**Dr. Meena Tekriwal**
Class	**B.Tech – I SEM**
Branch	**Computer Science and Engineering**
Course Code	**1FY2-03**
Course Name	**Engineering Chemistry**
Session	**2020-2021**

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Department of Computer Science and Engineering

Vision

Evolve as a centre of excellence with wider recognition and to adapt the rapid innovation in Computer Engineering.

Mission

- To provide a learning-centered environment that will enable students and faculty members to achieve their goals empowering them to compete globally for the most desirable careers in academia and industry.
- To contribute significantly to the research and the discovery of new arenas of knowledge and methods in the rapid developing field of Computer Engineering.
- To support society through participation and transfer of advanced technology from one sector to another.

PEO of the department

PEO 1

Graduates will work productively as skillful engineers playing the leading roles in team.

PEO 2

Graduates will identify the solutions for challenging issues inspiring the upcoming generations leading them towards innovative and creative technologies.

PEO 3

Graduates will implement their pioneering ideas practically to create products and the feasible solutions of research oriented problems.

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PSO of department

PSO-1

The ability to understand and apply knowledge of mathematics, system analysis & design, Data Modelling, Cloud Technology, and latest tools to develop computer based solutions in the areas of system software, Multimedia, Web Applications, Big data analytics, IOT, Business Intelligence and Networking systems.

PSO-2

The ability to understand the evolutionary changes in computing, apply standards and ethical practices in project development using latest tools & Technologies to solve societal problems and meet the challenges of the future.

PSO-3

The ability to employ modern computing tools and platforms to be an entrepreneur, lifelong learning and higher studies.

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Mapping of PEO with PSO

PEO -> **PSO**	**1** Skillful engineers Leading roles in multifaceted teams	**2** Innovative, creative, and sophisticated technologies Inspiring the upcoming generations	**3** Pioneering ideas Novel Products Solutions of research oriented problems
Ability to understand and apply knowledge	√	√	
Project development using latest tools & Technologies Solve societal problems and meet the challenges of the future	√	√	√
Modern computing tools Entrepreneurship Lifelong learning and higher studies	√	√	√

PEO with mission of institute

PEO **Mission**	**1** Skillful engineers Leading roles in multifaceted teams	**2** Innovative, creative, and sophisticated technologies Inspiring the upcoming generations	**3** Pioneering ideas Novel Products Solutions of research oriented problems
Effective Delivery of Knowledge	√	√	

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Commitment to Excellence	√	√	√
Proficient Communication		√	
Leadership Development	√	√	√

Mapping of PEO with PO

Program Educational Objectives (PEO)

The program educational objectives (PEO) of the Computer Engineering program are that its graduates could demonstrate the following essential components of a successful engineer and/or consultant within two to four years after the graduation.

1. Graduates will work productively as skillful engineers.
2. Graduates will identify the solutions for challenging societal issues using innovation and creativity
3. Graduates will implement their ideas practically to find the feasible solutions of research oriented problems.

Program Outcomes (PO) and their mapping with identified PEOs

	Program outcome (PO)	*PE O1*	*PE O2*	PE O3
1	*Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*	***X***		**X**
2	*Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*	**X**	**X**	**X**
3	*Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.*	**X**	**X**	**X**
4	*Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.*	**X**	**X**	**X**

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5	*Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.*	**X**		**X**
6	*Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.*		**X**	
7	*Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.*	**X**	**X**	
8	*Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.*	**X**	**X**	**X**
9	*Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*	**X**		**X**
10	*Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.*	**X**		**X**
11	*Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.*	**X**		**X**
12	*Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.*	**X**		**X**

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RTU Syllabus (2020-21)

1FY2-03/ 2FY2-03: Engineering Chemistry

ABC Analysis (RGB method) of units and topic

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics
1	Hardness, determination of hardness by complexometric (EDTA method), degree of hardness, Breakpoint chlorination, Formation of solids (Scale and Sludge formation), Lime-Sodaprocess, Zeolite (Permutit) process, Deionization (Demineralization) process. Numerical problems based on hardness, Lime-Soda and zeolite process.	Municipal water supply, requisite of drinking water, purification of water, sedimentation, filtration, sterilization, Methods of boiler water treatment(water softening) preliminary treatments, preheating,	Common natural impurities, Hardness of water and its causes, carryover (Foaming and Priming), boiler corrosion and caustic-embrittlement	Demonstration and ppt(Mission 10X lecture)
2	Ultimate analyses of coal, gross and net calorific value, determination of calorific value of coal by Bomb Calorimeter. and Hoffmann Oven (by-products oven) method cracking, synthetic petrol, knocking, octane number, anti-knockingagents. determination of calorific value of gaseous fuels by Junker's calorimeter, Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.	Solid fuels-, coal, classification of coal, significance of constituents, proximate Metallurgical coke, carbonization processes- Beehive coke oven, . Liquid fuels- Advantages of liquid fuels, petroleum and refining of petroleum, reforming, flue gas	Origin and classification of fuels. Gaseous fuels- advantages, manufacture, composition and uses of coal gas and oil gas,	Video, Demonstration of apparatus

		analysis by Orsat's apparatus.		
3	Portland CementManufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum. Lubricants: Properties; Viscosity andviscosity index, flash and fire point, cloud and pour point.	Manufacturing of glass by tank furnace, significance of annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass	Definition and composition of Cement , Glass, and Classification of lubricants,	PPT and Quiz
4	Mechanism of chemical (dry) and electrochemical (wet) corrosion, protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.	Galvanic corrosion, concentration type corrosion and pitting corrosion.Protection from corrosion	Corrosion Definition and its consequences.	PPT
5	SN1, SN2, Elecrophilicaromatic substitution in benzene, free radical halogenations ofalkanes, Elimination; elimination in alkyl halides Synthesis, properties and uses of Aspirin and Paracetamol	Addition: electrophilic and free radical addition in alkenes,nucleophilic addition in aldehyde and ketones, Rearrangement;Carbocation and free radical rearrangements	Types of organic reactions and its definitions, dehydration of alcohols, Drugs : Introduction	PPT and quiz

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RTU Syllabus (2020-21)
I & II Semester

Common to all branches of UG Engineering & Technology

1FY2-03/ 2FY2-03: Engineering Chemistry

SN	CONTENTS
1	**Water:** ~~Common impurities~~, hardness, determination of hardness by complexometric (EDTA method), Degree of hardness, ~~Units of hardness~~ ~~Municipal water supply: Requisite of drinking water, Purification of water;sedimentation, filtration, disinfection, breakpoint chlorination.~~ Boiler troubles: Scale and Sludge formation, ~~Internal treatment~~ methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process. Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.
2	**Organic Fuels:** Solid fuels: Coal, ~~Classification of Coal,~~Proximate and Ultimate analyses of coal and its significance, Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter. Metallurgical coke, Carbonization processes; Otto-Hoffmann by-product oven method. Liquid fuels: ~~Advantages of liquid fuels,Mining,~~ Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents,~~Cetane number~~ Gaseous fuels; ~~Advantages, manufacturing, composition and Calorific value ofcoal gas and oil gas,~~ Determination of calorific value of gaseous fuels by Junker‟s calorimeter Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.
3	**Corrosion and its control:** Definition ~~and significance of corrosion~~, Mechanism of chemical (dry) and electrochemical (wet) corrosion, ~~galvanic corrosion, concentration corrosionand pitting corrosion.~~ Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.

4	**Engineering Materials:** Portland Cement; Definition, Manufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum. Glass: Definition, Manufacturing by tank furnace, significance of annealing, Types and properties of soft glass, ~~hard glass,borosilicate glass, glass wool,safety glass~~ Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. ~~Emulsification and steam~~
5	~~**Organic reaction mechanism and**~~ **introduction of drugs:** ~~Organic reaction mechanism: Substitution; SN1, SN2, Elecrophilic aromaticsubstitution in benzene, free radical halogenations of alkanes, Elimination;elimination in alkyl halides, dehydration of alcohols, Addition: electrophilicand free radical addition in alkenes, nucleophilic addition in aldehyde andketones, Rearrangement; Carbocation and free radical rearrangements~~Drugs: Introduction, Synthesis, properties and uses of Aspirin, Paracetamol
	Total marks=100 **Credit=4**

[Red marked topic cut from syllabus for 2020-21 session]

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POORNIMA COLLEGE OF ENGINEERING

BLOWN UP SYLLABUS

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 20-10-2020**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

	WATER	
1.	**WATER** **Hardness of water, Units of hardness, Degree of hardness**	1.1 Definition of hardness of Water 1.1.1 Cause of Hardness of water 1.1.2 Differences between hard water and soft water 1.1.3 Advantages of hard water 1.1.4 Disadvantages of hard water 1.2 Types of hardness 1.2.1 Temporary or carbonate or alkaline hardness 1.2.2 Permanent or non-carbonate or non-alkaline hardness 1.3 Degree of hardness (Equivalents of $CaCO_3$) 1.4 Units of Hardness and their Inter-relationship

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2.	**Determination of Hardness of Water by EDTA method**	2.1 Introduction of EDTA method 2.2 Basic Principle of complexometric method 2.3 Preparation of standard solution 2.3.1 Preparation of standard hard water 2.3.2 Preparation of EDTA solution 2.3.3 Preparation of ammonia buffer solution 2.3.4 Preparation of Indicator solution 2.4 Experimental Procedure 2.5 Calculations 2.5.1 Standardization of EDTA solution 2.5.2 Calculations of Total hardness 2.5.3 Calculations of Permanent hardness 2.5.4 Calculations of Temporary hardness 2.6 Numerical based Problem's
3.	**Softening of water, Softening of water by Lime-soda method**	3.1 Definition of softening of water 3.2 Types of softening process of water 3.2.1 External treatment 3.2.2 Internal treatment 3.3 Lime & Soda Process

		3.3.1 Principle of Lime-Soda process 3.3.2 Types of Lime-Soda process 3.3.2.1 Cold Lime-Soda Process 3.3.2.2 Hot Lime-Soda Process 3.3.3 Chemistry of Lime -Soda process 3.3.4 Advantages 3.3.5 Disadvantages 3.3.6 Comparison of Hot and Cold Lime -Soda Process
4.	**Softening of water by Permutit (Zeolite) method and Softening of water by Deionization (Ion-exchange) method**	4.1 Introduction to Permutit (Zeolite) 4.1.2 Classification of Zeolites 4.1.3 Principles of zeolite process 4.1.4 Process 4.1.5 Regeneration of Zeolite 4.1.6 Advantages 4.1.7 Disadvantages 4.1.8 Limitations 4.1.9 Comparison of Zeolite and Lime -Soda Process 4.2.1 Introduction to Deionization process 4.2.2 Definition of ion-exchanger 4.2.2 Classification of ion-exchangers 4.2.2.1 Cation exchanger 4.2.2.2 Anion exchanger 4.2.3 Deionization Process 4.2.4 Regeneration of exchangers 4.2.5 Advantages

		4.2.6 Disadvantages 4.2.7 Mixed bed deioniser 4.2.8 Comparison of Lime-Soda Process, Zeolite Process and Ion-Exchange method
5.	**Boiler troubles – Formation of solids (Scale & sludge) and Internal Treatment of Boiler feed water**	5.1 Introduction to Boiler troubles 5.2 Scale and sludge 5.2.1 Definitions 5.2.2 Scale and sludge formation 5.2.3 Causes 5.2.4 Disadvantages 5.2.5 Elimination of Scale and sludge formation 5.2.6 Prevention Scale and sludge formation 5.2.7 Differences between Scale and sludge 5.3.1 Introduction to internal treatment of water 5.3.2 Conditioning methods 5.3.2.1 Colloidal conditioning 5.3.2.2 Carbonate conditioning 5.3.2.3 Phosphate conditioning 5.3.2.4 Treatment with Sodium aluminate 5.3.2.5 Calgon conditioning 5.3.2.6 Electrical conditioning 5.3.2.7 Radioactive conditioning 5.3.2.8 Complexometric method

6.	**Boiler corrosion and Caustic Embrittlement, Carry Over (Priming and foaming).**	6.1 Introduction to Carry over 6.2 Boiler Corrosion 6.3.1 Definition 6.2.2 Causes 6.2.2 Disadvantage 6.2.3 Prevention 6.3 Caustic Embrittlement 6.3.1 Causes 6.3.2 Disadvantage 6.3.3 Prevention 6.4.1 Priming and Foaming 6.4.2 Definitions 6.4.3 Causes 6.4.4 Disadvantages 6.4.5 Prevention of Priming and Foaming
	Corrosion	
7	**Corrosion and its control** **Definition and its significance. Mechanism of chemical (dry) corrosion**	7.1 Introduction of corrosion & Definition 7.2 Rusting of Iron 7.3 Cause of corrosion 7.4 Consequences of Corrosion 7.5 Significance of corrosion 7.6 Dry or Chemical corrosion 7.6.1 Corrosion by oxidation process 7.6.2 Corrosion by anhydrous liquid 7.6.3 Corrosion by other gases

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8	**Electrochemical (wet)** **Corrosion, galvanic corrosion and Types of corrosion, concentration type corrosion, pitting corrosion.**	8.1 Wet or Electrochemical corrosion 8.1.1 Evolution of Hydrogen 8.1.2 Absorption of oxygen 8.2 Comparison between Dry and Wet corrosion 8.3 Electrochemical series 8.4.1 Galvanic corrosion 8.5 Types of corrosion(Introduction) 8.5.1 Concentration cell corrosion 8.5.2 Metal-metal ion concentration cell 8.5.3 Oxygen concentration cell 8.5.4 Pitting Corrosion 8.5.5 Stress Corrosion 8.5.6 Waterline corrosion 8.6 Factors affecting corrosion
9	**Protection from corrosion- protective coatings-galvanization and tinning,**	9.1 Introduction to Protection against Corrosion 9.2 Material Selection 9.3 Modifying the environment 9.3.1 Dearation 9.3.2 Dehumidification 9.3.3 Deactivation 9.3.4 Neutralization of acids 9.4 Corrosion inhibitors 9.4.1 Anodic inhibitors 9.4.2 Cathodic Inhibitors 9.5 Protective coating 9.5.1 Protective metallic coating

		9.5.1.1 Cathodic coating 9.5.1.2 Anodic coating difference between Tinning & Galvanization
10	**cathodic protection, sacrificial anode and modifications in design.**	10.5.2 Methods of metallic coating 10.5.2.1 Hot dipping 10.5.2.2 Cementation 10.5.2.4 Cladding 10.5.2.5 Spraying 10.5.2.6 Anodizing 10.5.2.7 Vacuum Metalling 10.5.2.8 Electroplating or Electrodeposition 10.5.3 Ceramic and non metallic Inorganic coating 10.5.4 Organic coating 10.6 Cathodic Protection method 10.6.1 Sacrificial anode method 10.6.2 Impressed current method 10.6.3.Protection by modification in Designs
	Inorganic Engineering Materials	
	Cement:	
11	**Manufacture of Portland cement. Rotary kiln technology**	11.1 Introduction 11.2 Types 11.3 Composition 11.4 Constituents 11.5 Significance

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		11.2 Manufacturing of Portland Cement 11.2.1 Raw Material 11.2.2 Process 11.2.2.1 Crushing 11.2.2.2 Mixing 11.2.2.3 Burning 11.2.2.4 Grinding 11.2.2.5 Packaging
12	**Chemistry of hardening** **and setting of cement. Role of gypsum.**	12.1 Introduction 12.2 Definition of Setting and Hardening 12.2.1 Initial Setting 12.2.2 Final Setting 12.2.3 Hardening 12.3 Role of gypsum
	Glass:	
13	**Manufacture of glass, annealing of glass .**	13.1 Introduction 13.2 Raw materials for manufacturing and their effects 13.3 Process 13.3.1 Melting 13.3.3 Shaping 13.3.4 Annealing & its importance 13.3.5 Finishing 13.4 Reactions of glass 13.5.1 Introduction 13.5.2 Principle 13.5.3 Construction and Working

		13.5.4 Properties 13.5.5 Application
	Lubricants:	
14	**Lubricants: Classification, types of lubrication, properties an d uses**	14.1 Introduction 14.2 Definition 14.3 Functions of Lubricant 14.4 Classification of Lubricants 14.4.1 Liquid lubricants or Lubricating oils 14.4.2 Semi-Solid lubricants 14.4.3 Solid lubricants 14.5 Types of Lubrication 14.5.1 Thick layer lubrication 14.5.2 Thin layer lubrication 14.5.3 Extreme pressure lubrication
15	**Viscosity and viscosity index,**	15.1 Introduction 15.2 Definition 15.3 Significance 15.4 Effect of temperature on viscosity 15.5 Significance of viscosity index 15.6 Determination of Viscosity by Redwood Viscometer 15.6.1 Construction of Redwood Viscometer 15.6.2 Difference between Redwood Viscometer No.1 &No.2 15.6.3 Working of Redwood Viscometer 15.6.4 Applications

16	**Flash and fire point, cloud and pour point. Emulsification and steam emulsion number.**	16.1 Introduction 16.2 Definition 16.3 Significance 16.4 Effect of temperature on viscosity 16.5 Significance of viscosity index 16.6 Determination of Viscosity by Redwood Viscometer 16.6.1 Construction of Redwood Viscometer 16.6.2 Difference between Redwood Viscometer No.1 &No.2 16.6.3 Working of Redwood Viscometer 16.6.4 Applications 16.7 Flash and Fire Point 16.7.1 Definition 16.7.2 Significance 16.7.3 Determination of Flash and Fire Point 16.7.4 Construction of Penskey Marten's apparatus 16.7.5 Working of Penskey Marten apparatus 16.7.6 Applications 16.8 Cloud and Pour point 16.8.1 Definition 16.8.2 Significance 16.8.3 Construction 16.8.4 Working 16.8.5 Applications

	Organic Fuels:	
17	**FUELS, Organic fuels: Origin, classification and general aspects of organic fuels** **Solid fuels: Coal, Proximate Analysis of Coal**	17.1.1 Introduction of organic fuels and its Definition 17.1.2 Origin and Classification of Fuel 17.1.3 Advantages of organic fuels 17.1.4 Characteristics of good fuel 17.1.5 Comparison of solid, liquid and gaseous fuel 17.1.6 Coal and its classification 17.2 Proximate analysis 17.2.1 Determination of moisture content 17.2.2 Determination of Volatile matter 17.2.3 Determination of Ash 17.2.4 Determination of Fixed carbon 17.2.5 Significance 17.2.6 Numerical based problem
18	**Ultimate analysis of Coal**	18.1 Introduction 18.2 Ultimate analysis 18.2.1Determination of carbon and hydrogen 18.2.2 Determination of nitrogen 18.2.3 Determination of sulphur 18.2.4 Determination of Fixed carbon

		18.2.5 Significance 18.2.6 Numerical based problem
19.	**Determination of Calorific Value of solid/Liquid Fuel by Bomb Calorimeter**	19.1 Introduction of bomb calorimeter 19.1.1 Principle 19.1.2 Construction of bomb calorimeter 19.1.3 Working 19.1.4 Observation and Calculations 19.1.5 Corrections 19.1.6 Numerical based problem
20.	**Carbonization of coal and Manufacturing of coke by Beehive oven method** **Manufacturing of coke by Otto-Hofmann's By product oven method**	20.6.1 selection of Coal 20.6.2 Caking and coking coal 20.6.3 Properties of coke 20.7 Carbonization 20.7.1 Types of Carbonization process 20.7.2 Low Carbonization process 20.7.3 High Carbonization process 20.7.4 Difference between low and high carbonization process 20.8.1 Introduction 20.8.2 Manufacture of metallurgical coke 20.8.3 Beehive's oven method 20.8.3.1 Construction 20.8.3.2 Working

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		20.8.3.3 Limitations 20.9 Otto Hoffmann's By product Oven Method 20.9.1 Principle 20.9.2 Construction 20.9.3Theory 20.9.4 Working 20.9.5 Recovery of By products 20.9.6 Significance of recovery of by product
21.	**Liquid fuels :Composition of Petroleum, Advantages and refining of petroleum, Cracking**	21.1 Refining of crude petroleum- 21.1.2 Removal of Water By Cottrell's Process 21.1.3 Removal of Sulphur Compounds 21.1.4 Fractional Distillation method 21.2 Introduction 21.2.1 Definition of Cracking 21.3 Types of Cracking 21.4.1 Thermal Cracking 21.4.1.1 Liquid phase Thermal Cracking 21.4.1.2 Vapour phase Thermal Cracking 21.4.2 Catalytic cracking 21.4.2.1 Fixed-bed catalytic cracking 21.4.2.2 Moving-bed catalytic cracking
22.	**Refining of gasoline and Reforming,**	22.1 Refining of gasoline

	Knocking and anti knocking agents, octane number	22.2 Reforming 22.2.1 Thermal reforming 22.2.2 Catalytic reforming 22.3 Reforming Reactions 22.3.1 Isomerization 22.3.2 Dehydrocyclization 22.3.3 Hydro-cracking 22.3.4 Dehydrogenation 22.5 Introduction 22.6 Knocking 22.6.1 Chemical structure and knocking 22.7 Anti-Knocking agents 22.8 Octane number
23.	**Synthetic Petrol (Coal to liquid, CTL Technology),Bergius Process Synthetic Petrol (Coal to liquid, CTL Technology) Fischer Tropsch Process,**	23.1 Introduction 23.2.1 Bergius process 23.2.2 Advantages & disadvantages of Bergius process 23.2.3 Limitations 23.1.1 Fischer Tropsch process 23.1.2 Advantages and limitations 23.2 Comparison of Bergius and Fischer Tropsch Process 23.3 Polymerization process

24.	**Determination of Calorific Value of gaseous Fuel by Junker's Calorimeter,** **Calculation of calorific value based on Dulong's formula** **And Combustion, requirement of oxygen in combustion process**	24.1 Introduction 24.1.1 Principle 24.1.2 Construction of Junker's calorimeter 24.1.3 Working 24.1.4 Calculations 24.2. Calculation of calorific value by Dulong's formula 24.3 Numerical based problem on Junker's Calorimeter and Dulong's Formula 24.4. Introduction of Combustion 24.4.1 Principles of combustion calculation 24.4.2 Calculation of the quantity of flue gases 24.4.3 Calculation of volume of oxygen required
	Organic Reaction Mechanism and Introduction of Drugs	
25.	Organic Reaction Mechanism, Types of organic reaction	25.1 Introduction of Organic Reaction 25.2 Types of Organic Reaction 25.3 Addition Reaction 25.4 Substitution Reaction 25.5 Elimination Reaction 25.6 Rearrangements
26	**Introduction of Drugs**	26.1 Introduction of drugs 26.2 Synthesis of aspirin 26.3 Properties of aspirin

		26.4 Uses of aspirin 26.5 Synthesis of Paracetamol 26.6 Properties of Paracetamol 26.7 Uses of Paracetamol

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POORNIMA
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SYLLABUS DEPLOYMENT

Campus: PCE **Course: B.Tech.** **Section: I year** **Date: 23-10-2020**

Name of Faculty: Dr. Meena Tekriwal

Name of Subject: Engineering Chemistry **Subject Code:1FY2-03**

S. NO.	TOPICS AS PER UP SYLLABUS	Lect. No.	Planned Date	Actual Del. Date	Reason for deviation	Ref. / text book with page no.	Special Academic activity
1.	**ZERO LECTURE**	**L-0**	23/11/2020	23/11/2020	-	**According to given format by PGC**	PPT
	WATER						
2.	**Common impurities in water, Hardness of water, Units of hardness, Degree of hardness** 1.1 Sources of water 1.2 Common impurities in water 1.2.1 Sources of impurities in water 1.2.2 Types of impurities	**L-1**	25/11/2020	25/11/2020	-	CBC publication by Dr. Rekha Nair (1-7 page)	PPT, PDF

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		1.2.2.1 Dissolved impurities 1.2.2.2 Suspended impurities 1.2.2.2.1 Inorganic impurities 1.2.2.2.2 Organic impurities 1.2.2.3 Colloidal impurities 1.2.2.4 Pathogenic Microscopic impurities 1.2.3 Effects of impurities in water 1.3 Definition of hardness of Water 1.3.1 Cause of Hardness of water 1.3.2 Differences between hard water and soft water 1.3.3 Advantages of hard water 1.3.4 Disadvantages of hard water 1.4 Types of hardness						

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		1.4.1 Temporary or carbonate or alkaline hardness 1.4.2 Permanent or non-carbonate or non-alkaline hardness 1.5 Degree of hardness (Equivalents of $CaCO_3$) 1.6 Units of Hardness and their Inter relationship						
	3.	**Determination of Hardness of Water by EDTA method** 2.1 Introduction of EDTA method 2.2 Basic Principle of Complexometric method 2.3 Preparation of standard solution 2.3.1 Preparation of standard hard water 2.3.2 Preparation of EDTA solution 2.3.3 Preparation of ammonia buffer solution 2.3.4 Preparation of Indicator solution	**L-2** Demonstra-tion	2/12/2020	26/11/2020, 28/12/2020	-	CBC publication by Dr. Rekha Nair (7-14 page)	PPT, PDF, demonstration in lab

		2.4 Experimental Procedure 2.5 Calculations 2.5.1 Standardization of EDTA solution 2.5.2 Calculations of Total hardness 2.5.3 Calculations of Permanent hardness 2.5.4 Calculations of Temporary hardness 2.6 Numerical based Problem's						
	4.	**Boiler troubles – Formation of solids (Scale & sludge) and Internal Treatment of Boiler feed water** 3.1 Introduction to Boiler troubles 3.2 Scale and sludge 3.2.1 Definitions 3.2.2 Scale and sludge formation 3.2.3 Causes 3.2.4 Disadvantages	**L-3**	1/12/2020	30/11/2020, 1/12/2020	-	CBC publication by Dr. Rekha Nair (24-31 page)	PPT, PDF

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		3.2.5 Elimination of Scale and sludge formation 3.2.6 Prevention Scale and sludge formation 3.2.7 Differences between Scale and sludge **Boiler corrosion and Caustic Embrittlement, Carry Over (Priming and foaming).** 3.3 Introduction to Carry over 3.4 Boiler Corrosion 3.4.1 Definition 3.4.2 Causes 3.4.3 Disadvantage 3.4.4 Prevention 3.5 Caustic Embrittlement 3.5.1 Causes 3.5.2 Disadvantage 3.5.3 Prevention 3.6 Priming and Foaming 3.6.1 Definitions 3.6.2 Causes						

		3.6.3 Disadvantages 3.6.4 Prevention of Priming and Foaming						
	5.	**Softening of water, Softening of water by Lime-soda method** 4.1 Definition of softening of water 4.2 Types of softening process of water 4.2.1 External treatment 4.2.2 Internal treatment 4.3 Lime & Soda Process 4.3.1 Principle of Lime-Soda process 4.3.2 Types of Lime-Soda process 4.3.2.1 Cold Lime-Soda Process 4.3.2.2 Hot Lime-Soda Process	**L-4**	5/12/2020	5/12/2020	-	CBC publication by Dr. Rekha Nair (31-52 page)	PPT, PDF, hand written notes

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		4.3.3 Chemistry of Lime -Soda process 4.3.4 Advantages 4.3.5 Disadvantages 4.3.6 Comparison of Hot and Cold Lime -Soda Process						
	6.	**Softening of water by Permutit (Zeolite) method** 5.1 Introduction to Permutit (Zeolite) 5.1.2 Classification of Zeolites 5.1.3 Principles of zeolite process 5.1.4 Process 5.1.5 Regeneration of Zeolite 5.1.6 Advantages 5.1.7 Disadvantages 5.1.8 Limitations 5.1.9 Comparison of Zeolite and Lime -Soda Process	**L-5**	7/12/2020	7/12/2020	-	CBC publication by Dr. Rekha Nair (52-54page)	PPT, PDF, hand written notes

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	7.	**Softening of water by Deionization (Ion-exchange) method** 6.2.1 Introduction to Deionization process 6.2.2 Definition of ion-exchanger 6.2.2 Classification of ion-exchangers 6.2.2.1 Cation exchanger 6.2.2.2 Anion exchanger 6.2.3 Deionization Process 6.2.4 Regeneration of exchangers 6.2.5 Advantages 6.2.6 Disadvantages 6.2.7 Mixed bed deionizer 6.2.8 Comparison of Lime-Soda Process, Zeolite Process and Ion-Exchange method	**L-6**	8/12/2020	8/12/2020, 8/12/2020	Taken 2 lectures to complete as student want to revise	CBC publication by Dr. Rekha Nair (54-57page)	PPT, PDF, hand written notes

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	8.	**Class test of topic I, Water**	**L-7**	12/12/2020	12/12/2020	-	-	Microsoft form (20 marks)
		Inorganic Engineering Materials						
	9	**Manufacture of Portland cement. Rotary kiln technology** 8.1 Introduction 8.2 Types 8.3 Composition 8.4 Constituents 8.5 Significance 8.3 Manufacturing of Portland Cement 8.3.1 Raw Material 8.3.2 Process 8.3.3 Crushing 8.3.4 Mixing 8.3.5 Burning 8.3.6 Grinding 8.3.7 Packaging	**L-8**	14/12/2020	14/12/2020, 15/12/2020	Due to network problem cover in 2 lectures	Dhanpatrai Publications- by Dr. Sashi Chawla (Page-133-138)	PPT, PDF, hand written notes
	10	**Chemistry of hardening and setting of cement. Role of gypsum.**	**L-9**	15/12/2020	15/12/2020	-	Dhanpatrai Publications- by Dr. Sashi Chawla	PPT, PDF, notes

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		9.1 Introduction 9.2 Definition of Setting and Hardening 9.2.1 Initial Setting 9.2.2 Final Setting 9.2.3 Hardening 9.3 Role of gypsum					(Page-138-144)	
		GLASS:						
	11	**Definition, type and properties of glasses, Manufacture of glass, annealing of glass and Optical fibre grade glass.** 10.1 Introduction 10.2 Definition 10.3 Properties 10.4 Types of silicate glasses 10.5 Commercial Uses **Manufacturing of glass** **Raw materials for manufacturing and their effects** 10.5 Process	**L-10, OBT**	19/12/2020	17/12	Arrangement	Dhanpatrai Publications- by Dr. Sashi Chawla (Page-150-155)	PPT, PDF, notes

		10.5.1 Melting 10.5.3 Shaping 10.5.4 Annealing & its importance 10.5.5 Finishing						
	12	**Lubricants: Classification, types of lubrication, properties and uses** **Viscosity and viscosity index** 11.1 Introduction 11.2 Definition 11.3 Functions of Lubricant 11.4 Classification of Lubricants 11.4.1 Liquid lubricants or Lubricating oils 11.4.2 Semi-Solid lubricants 11.4.3 Solid lubricants 11.5 Types of Lubrication 11.5.1 Thick layer lubrication 11.5.2 Thin layer lubrication	**L-11**	21/12/2020	21/12/2020	-	Dhanpatrai Publications- by Dr. Sashi Chawla (Page-160-165)	PPT, PDF, notes

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		11.5.3 Extreme pressure lubrication **Determination of Viscosity by Redwood Viscometer**						
	13	**Flash and fire point, cloud and pour point. Emulsification and steam emulsion number.** 12.1 Introduction 12.2 Flash and Fire Point 12.2.1 Definition 12.2.2 Significance 12.2.3 Determination of Flash and Fire Point 12.2.4 Construction of Penskey Marten's apparatus 12.2.5 Working of Penskey Marten apparatus	**L-12, Demonstration**	22/12/2020				

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		12.2.6 Applications 12.3 Cloud and Pour point 12.3.1 Definition 12.3.2 Significance 12.3.3 Construction 12.3.4 Working 12.3.5 Applications						
	14	**Class test-1**	**L-13**	26/12/2020	28/12/2020	-	-	-
	15	**Revision class**	**L-14**	28/12/2020	2/1/2021	leave		
		Organic fuels						
	16.	**FUELS (Organic fuels: Origin, classification and general aspects of organic fuels)** **Proximate Analysis of Coal** 15.1.1 Introduction of organic fuels and its Definition 15.1.2 Origin and	**L-15**	17/1/2021	17/1/2021			

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		Classification of Fuel 15.1.3 Advantages of organic fuels 15.1.4 Characteristics of good fuel 15.1.5 Comparison of solid, liquid and gaseous fuel 15.1.6 Coal and its classification 15.1 Proximate analysis of coal 15.2 Need of Proximate Analysis 15.2.1 Determination of moisture content 15.2.2 Determination of Volatile matter 15.2.3 Determination of Ash 15.2.4 Determination of Fixed carbon 15.2.5 Significance						

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		15.2.6 Numerical based problem						
	17.	**Ultimate analysis of Coal** 16.1 Introduction 16.2 Need of Ultimate analysis 16.2.1 Determination of carbon and hydrogen 16.2.2 Determination of nitrogen 16.2.3 Determination of sulphur 16.2.4 Determination of Fixed carbon 16.2.5 Significance 16.2.6 Numerical based problem	**L-16**	18/1/21	18/1/21			
	18.	**Determination of Calorific Value of solid/Liquid Fuel by Bomb Calorimeter** 17.1 Introduction of	**L-17**	18/1/2021	18/1/2021			

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		bomb calorimeter 17.1.1 Principle 17.1.2 Construction of bomb calorimeter 17.1.3 Working 17.1.4 Observation and Calculations 17.1.5 Corrections 17.1.6 Numerical based problem **Determination of Calorific Value of gaseous Fuel by Junker's Calorimeter Calculation of calorific value based on Dulong's formula** 17.2.1 Introduction 17.2.2 Principle 17.2.3 Construction of Junker's calorimeter 17.2.4 Working						

		17.2.5 Calculations 17.2.6 Calculation of calorific value by Dulong's formula 17.2.7 Numerical based problem on						
	19	**Solid fuels: Coal, Carbonization of coal and Manufacturing of coke by Beehive oven method** 18.1.1 Selection of Coal for carbonization 18.1.2 Caking and coking coal 18.1.3 Properties of coke 18.2 Carbonization 18.2.1 Types of Carbonization process 18.2.2 Low Carbonization process 18.2.3 High Carbonization process	**L-18**	19/1/2021				

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		18.2.4 Difference between low and high carbonization process 18.3 Manufacture of metallurgical coke 18.4 Beehive's oven method 18.4.1 Construction 18.4.2 Working 18.4.3 Limitations **Manufacturing of coke by Otto-Hofmann's By product oven method** 18.5 Otto Hoffmann's By product Oven Method 18.5.1 Principle 18.5.2 Construction 18.5.3Theory 18.5.4 Working 18.5.5 Recovery of By products						

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		18.5.6 Significance of recovery of by product						
	20.	**Liuid fuels :** Refining of crude petroleum- 19.1 Removal of Water By Cottrell's Process 19.1.2Removal of Sulphur Compounds 19.1.3 Fractional Distillation method **Cracking** 19.2 Introduction 19.2.1 Definition of Cracking 19.2.2 Types of Cracking 19.2.3 Thermal Cracking 19.2.3.1 Liquid phase Thermal Cracking	**L-19**	23/1/2021	23/1/2021			

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		19.2.3.2 Vapour phase Thermal Cracking 19.2. 4 Catalytic cracking 19.2.4.1 Fixed-bed catalytic cracking 19.2.4.2 Moving-bed catalytic cracking						
	21.	**Refining of gasoline and Reforming,** 20.1 Refining of gasoline 20.2 Reforming 20.2.1 Thermal reforming 20.2.2 Catalytic reforming 20.3 Reforming Reactions 20.3.1 Isomerization 20.3.2 Dehydrocyclization 20.3.3 Hydro-cracking 20.3.4 Dehydrogenation	**L-20**					

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		Knocking and anti knocking agents, octane number 20.4 Introduction 20.4.1 Knocking 20.4.2 Chemical structure and knocking 20.4.3 Anti-Knocking agents 20.4.4 Octane number						
	22	**Synthetic Petrol (Coal to liquid, CTL Technology),Bergius Process** 21.1 Introduction 21.2.1 Bergius process 21.2.2 Advantages & disadvantages of Bergius process 21.2.3 Limitations **Synthetic Petrol (Coal to liquid, CTL Technology)**	**L-21**	24/1/2021	24/1/2021			

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		Fischer Tropsch Process 21.3.1 Fischer Tropsch process 21.3.2 Advantages and limitations 21.3.2 Comparison of Bergius and Fischer Tropsch Process 21.3.3 Polymerization process						
	23	**Revision of Organic fuels**	**L-22**	25/1/2021	25/1/2021			
		CORROSION						
	24	**Corrosion and its control** **Definition and its significance. Mechanism of chemical (dry) corrosion** Introduction of corrosion 23.1 Definition of corrosion 23.2 Rusting of Iron 23.3 Cause of corrosion	**L-23**	28/1/2021	28/1/2021			

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		23.4 Consequences of Corrosion 23.5 Significance of corrosion 23.2 Dry or Chemical corrosion 23.2.1 Corrosion by oxidation process 23.2.2 Corrosion by anhydrous liquid 23.2.3 Corrosion by other gases						
	25	**Electrochemical (wet)** **Corrosion, galvanic corrosion and** 24.1 Wet or Electrochemical corrosion 24.1.1 Evolution of Hydrogen 24.1.2 Absorption of oxygen 24.2 Comparison between Dry and Wet corrosion 24.3 Electrochemical series	**L-24**					
	26	**Protection from corrosion-protective**	**L-25**					

		coatings-galvnization and tinning 25.1 Introduction to Protection against Corrosion 25.2 Material Selection 25.3 Modifying the environment 25.3.1 Dearation 25.3.2 Dehumidification 25.3.3 Deactivation 25.3.4 Neutralization of acids 25.4 Corrosion inhibitors 25.4.1 Anodic inhibitors 25.4.2 Cathodic Inhibitors 25.5 Protective coating 25.5.1 Protective metallic coating 25.5.1.1 Cathodic coating 25.5.1.2 Anodic coating difference between Tinning & Galvanization						

		Cathodic protection, sacrificial anode and modifications in design. 25.6 Methods of metallic coating 25.6.1 Organic coating 25.6.2 Cathodic Protection method 25.6.3 Sacrificial anode method 25.6.4 Impressed current method 25.6.5 Protection by modification in Designs						
	27	**Revision of topic Corrosion**	**L-26**	29/1/2021	29/1/2021			
		Introduction of Drugs						
	28	**Organic Reaction Mechanism, Types of organic reaction** Introduction of Organic Reaction 27.2 Types of Organic Reaction	L-27	1/2/2021	2/2/2021			

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		27.3 Addition Reaction 27.4 Substitution Reaction 27.5 Elimination Reaction 27.6 Rearrangements **Drugs** **27.7.1 Introduction of drugs** 27.7.2 Synthesis of aspirin 27.7.3 Properties of aspirin 27.7.4 Uses of aspirin 27.7.5 Synthesis of Paracetamol 27.7.6 Properties of Paracetamol 27.7.7 Uses of Paracetamol						
	29	**REVISION**	L-28	2/2/2021	2/2/2021			
	30.	**Class test-2**	L-29	3/2/2021	3/2/2021			

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POORNIMA
COLLEGE OF ENGINEERING

Name of faculty	**Dr. Meena Tekriwal**
Class- I Year	**B.Tech –I SEM**
Branch	**Computer Science and Engineering**
Course Code	**1FY2-03**
Course Name	**Engineering Chemistry**
Session	**(2019-2020)**

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COURSE OUTCOMES

After completion of course

1FY2-03.1	**Describe** characteristics of water, fuel and Engineering materials
1FY2-03.2	**Determine** of hardness of water and calorific value of fuels for Industrial as well as domestic purposes
1FY2-03.3	**Compare** different techniques of water treatment, fuel analysis, Manufacturing of engineering materials and corrosion protection methods
1FY2-03.4	**Prepare** the generic drugs or medicines by understanding the applications of organic reaction mechanism and **manufacturing** of engineering materials

CO-PO/PSO MAPPING AND TARGETS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	**Target CO for PO**
CO1	**1**	-	-	-	-	-	-	-	-	-	-	-	**1.00**
CO2	**2**	-	-	-	-	-	-	-	-	-	-	-	**2.00**
CO3	**3**	-	-	-	-	-	-	-	-	-	-	-	**3.00**
CO4	-	**2**	-	-	-	-	-	-	-	-	-	-	**2.00**
Target PO/PSO through CO	2.00	2.00											**2.00**

Level of course

Course Category	Level 3	Level 2	Level 1
A	60% of students getting >60% marks	50-60% of students getting >60% marks	40-50% of students getting >60% marks

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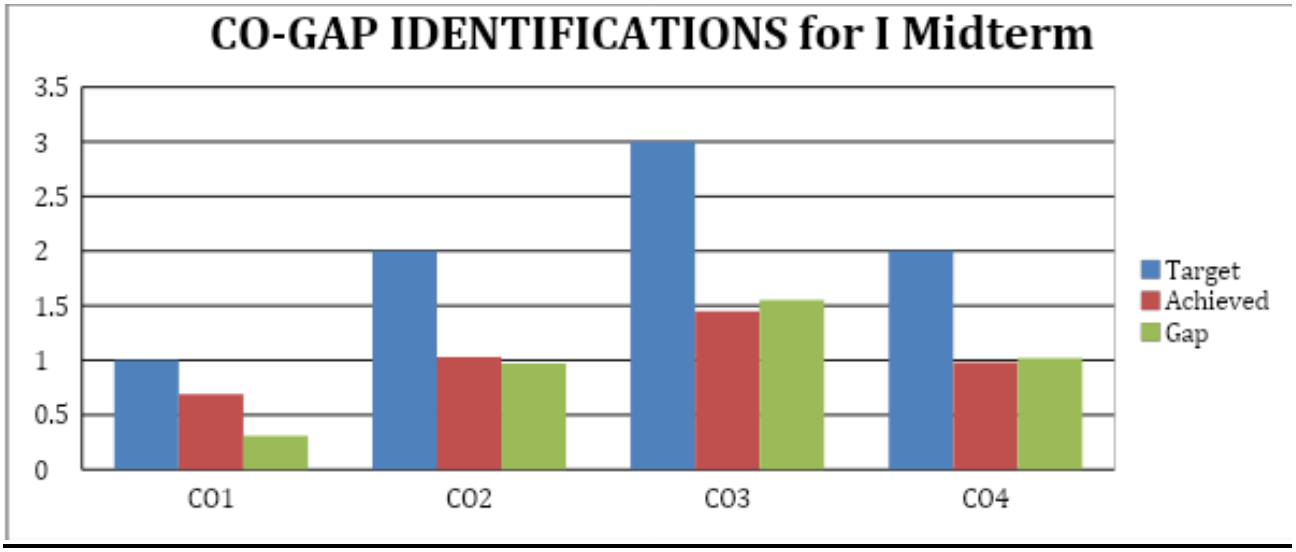
ACTIVITY WISE ASSESSMENT TOOLS

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1	Class test	Direct	Marks	20	For CO1-CO4
2	OBT	Direct	Marks	10	ForCO1-CO4
3	Assignment	Direct	Marks	70	For CO1-CO4
4	MidTerm1	Direct	Marks	80	For CO1-CO4
5	MidTerm2	Direct	Marks	80	For CO1-CO4

CO-GAP IDENTIFICATIONS for I Midterm				
COs	CO1	CO2	CO3	CO4
Target	1.00	2.00	3.00	2.00
Achieved	0.69	1.03	1.45	0.98
Gap	0.31	0.97	1.55	1.02



CO-GAP IDENTIFICATIONS for II Midterm				
Overall CO Attainments for PO	CO1	CO2	CO3	CO4
Targets	1.00	2.00	3.00	2.00

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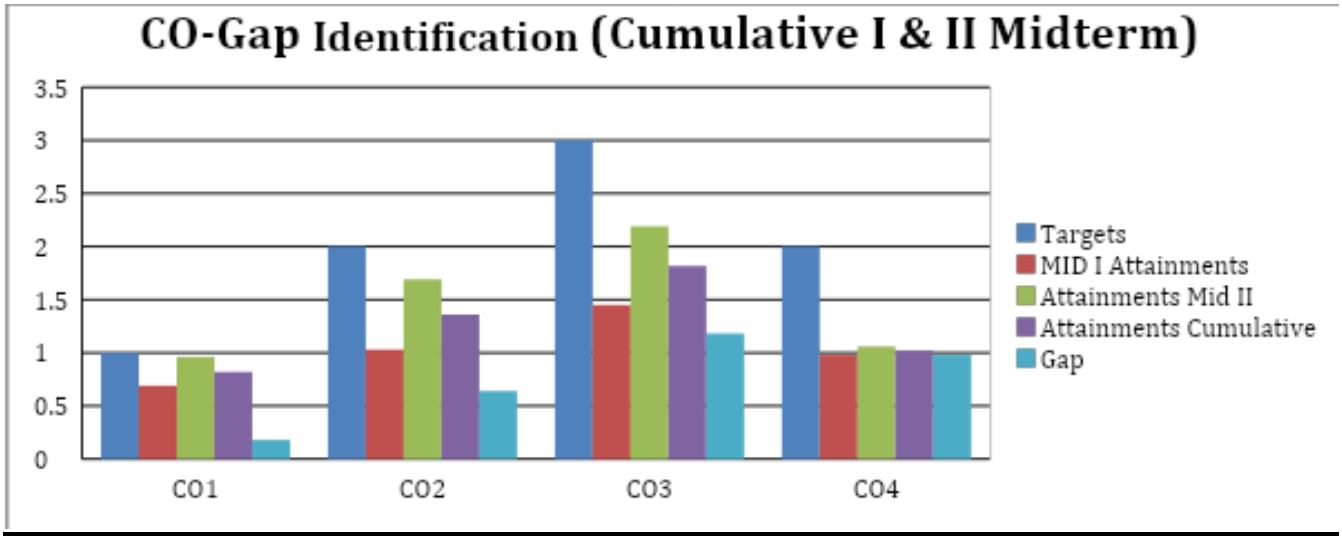
MID I Attainments	**0.69**	**1.03**	**1.45**	**0.98**
Attainments Mid II	**0.96**	**1.69**	**2.19**	**1.06**
Attainments Cumulative	**0.82**	**1.36**	**1.82**	**1.02**
Gap	**0.18**	**0.64**	**1.18**	**0.98**



CO-GAP IDENTIFICATIONS for Activities conducted				
COs	**CO1**	**CO2**	**CO3**	**CO4**
Target	**1**	**2**	**3**	**2**
Achieved	**0.98**	**1.98**	**2.96**	**1.92**
Gap	**0.02**	**0.02**	**0.04**	**0.08**

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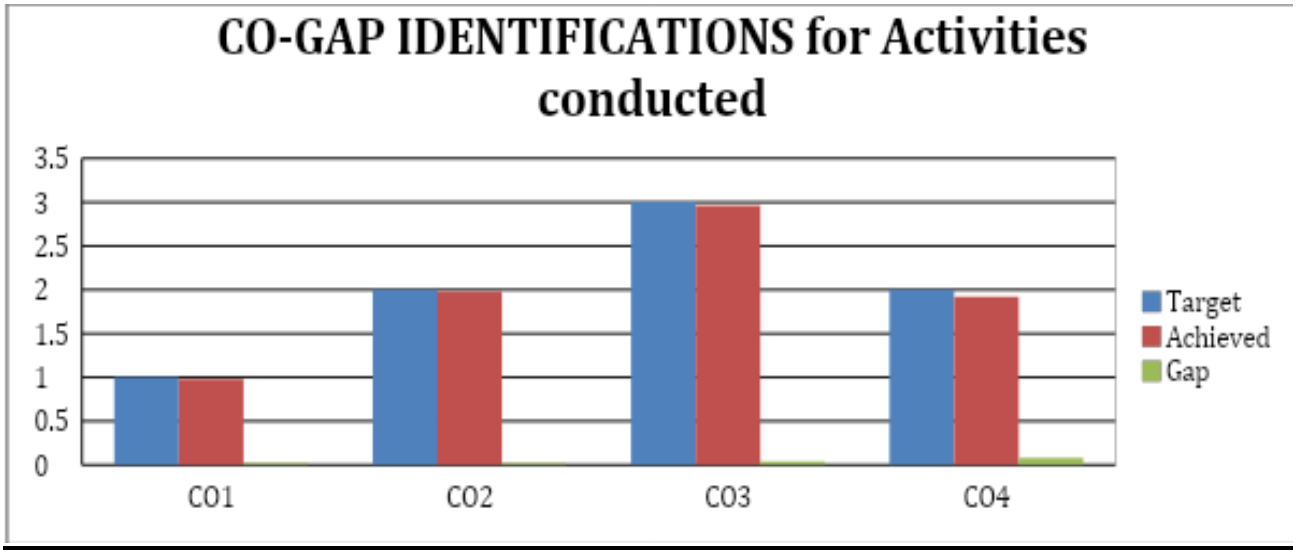
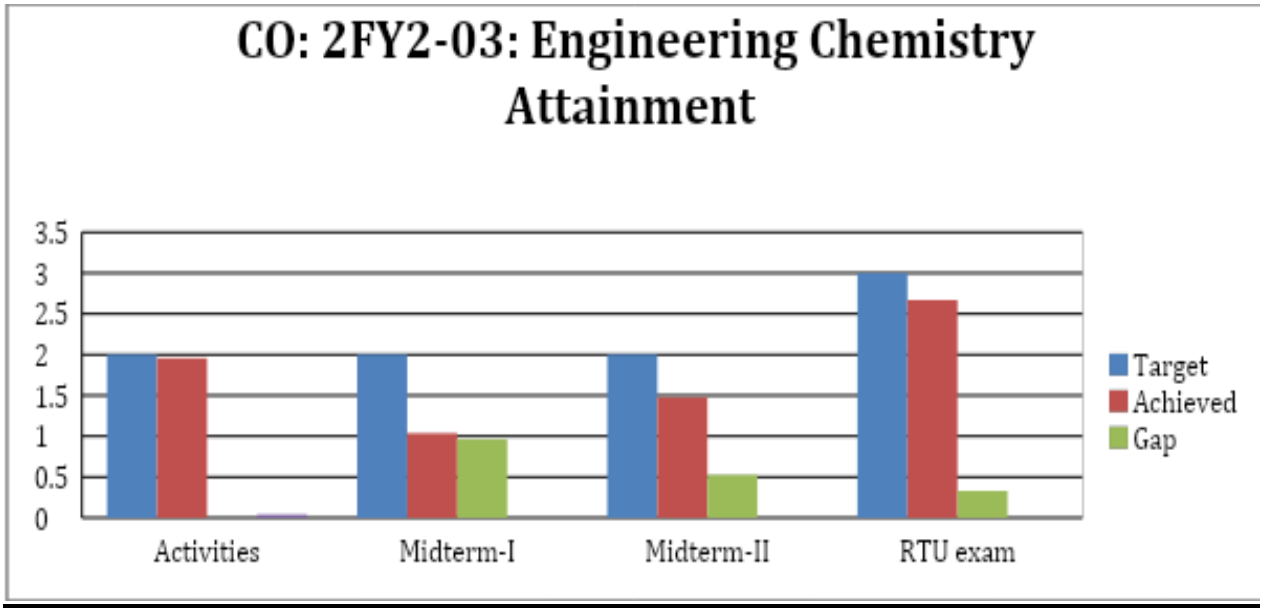


CO: 2FY2-03: Engineering Chemistry				
	Activities	**Midterm-I**	**Midterm-II**	**RTU exam**
Target	**2**	**2**	**2**	**3**
Achieved	**1.96**	**1.037**	**1.475**	**2.67**
Gap	**0.04**	**0.963**	**0.525**	**0.33**



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POs GAP IDENTIFICATION

Attainment of PO through CO (Class Test, OBT and Assignment) Component

1FY2-03	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Targets	2.0	2.0	-	-	-	-	-	-	-	-	-	-
Achieved	1.38	1.25	-	-	-	-	-	-	-	-	-	-
Gap	1.38	1.25	-	-	-	-	-	-	-	-	-	-

Attainment of PO through CO (I Midterm) Component

1FY2-03	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Targets	2.0	2.0	-	-	-	-	-	-	-	-	-	-
Achieved	0.73	0.75	-	-	-	-	-	-	-	-	-	-
Gap	1.27	1.25	-	-	-	-	-	-	-	-	-	-

Attainment of PO through CO (II Midterm) Component

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1FY2-03	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Targets	**2.0**	**2.0**	-	-	-	-	-	-	-	-	-	-
Achieved	**1.07**	**0.78**	-	-	-	-	-	-	-	-	-	-
Gap	**0.93**	**1.22**	-	-	-	-	-	-	-	-	-	-

Attainment of PO through CO (cumulative) Component

1FY2-03	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Targets	**2.0**	**2.0**	-	-	-	-	-	-	-	-	-	-
Achieved	**1.16**	**1.12**	-	-	-	-	-	-	-	-	-	-
Gap	**0.84**	**0.88**	-	-	-	-	-	-	-	-	-	-

Attainment of PO through CO (RTU)

CO Attainments	Overall CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Target	**3.00**	**2.00**	**2.00**										
RTU Component Attainments	**2.67**	**1.25**	**1.25**										
Gap	**0.33**	**0.75**	**0.75**										

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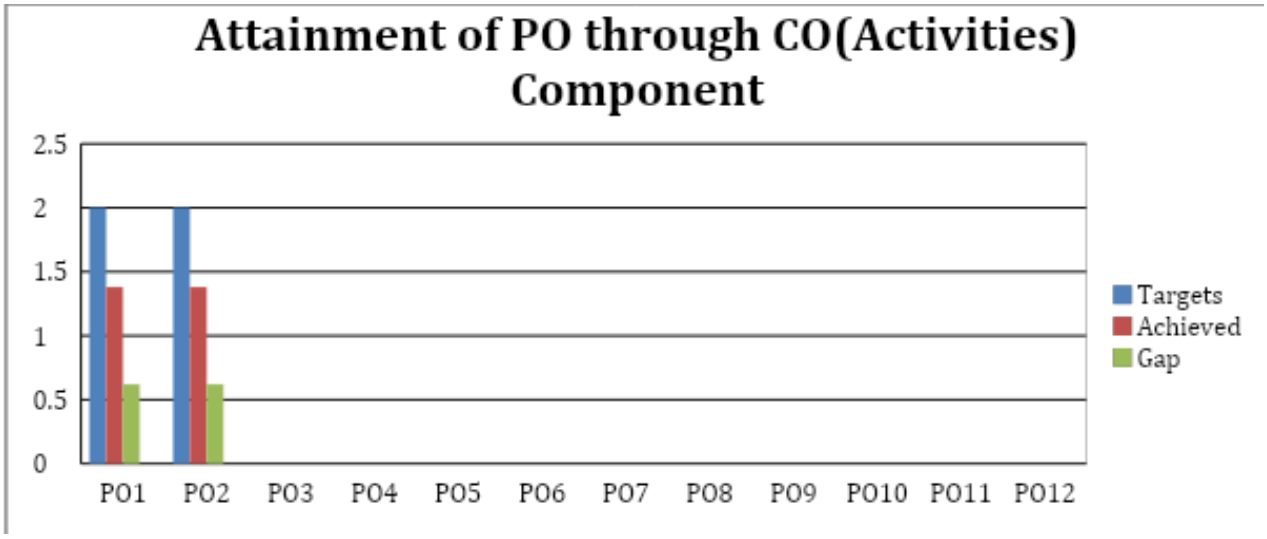

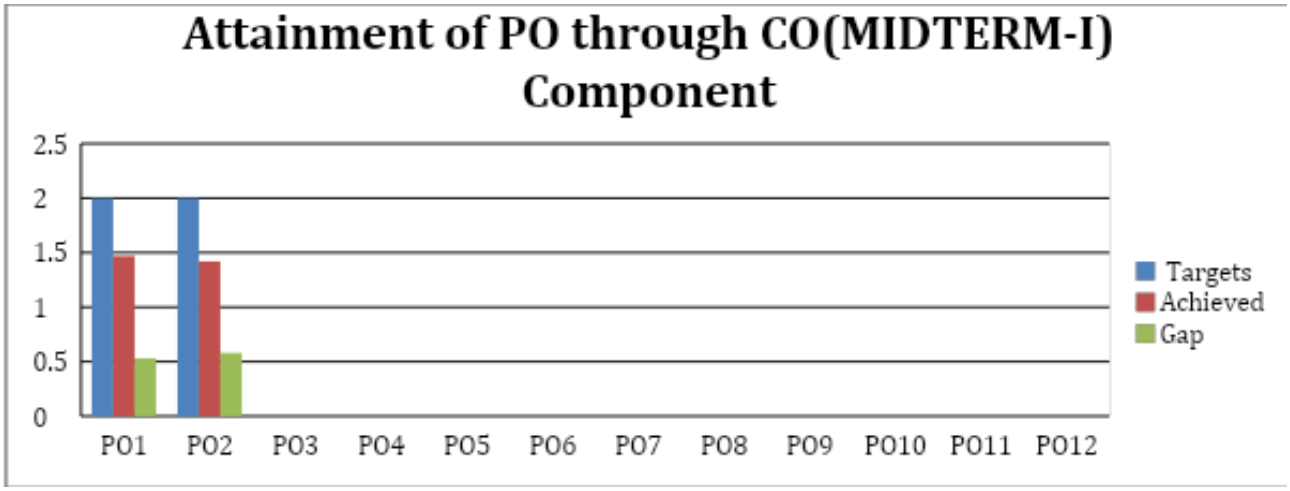

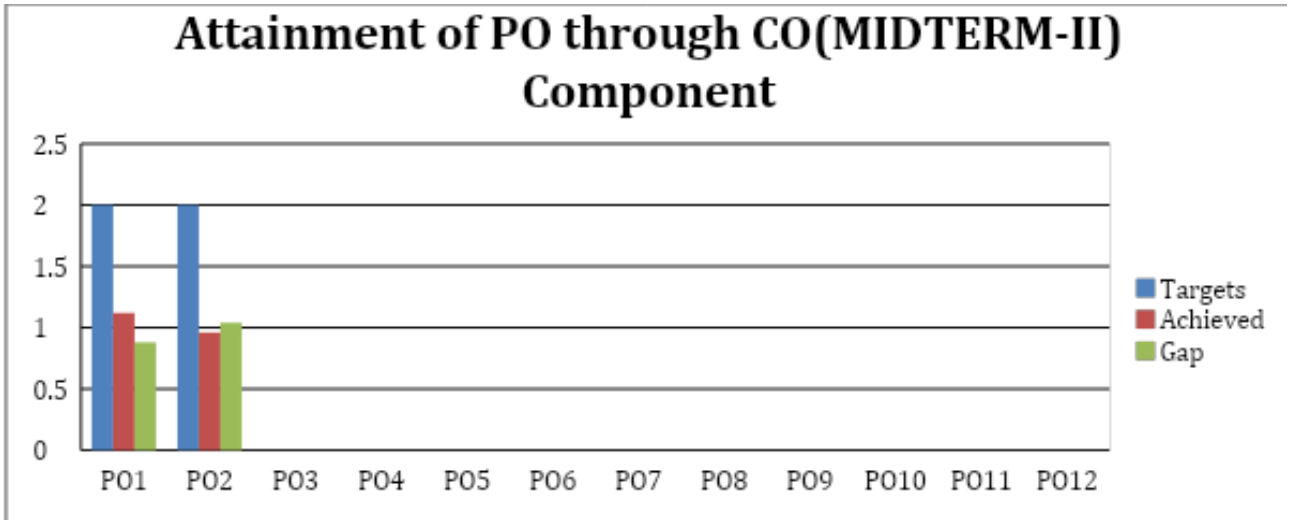

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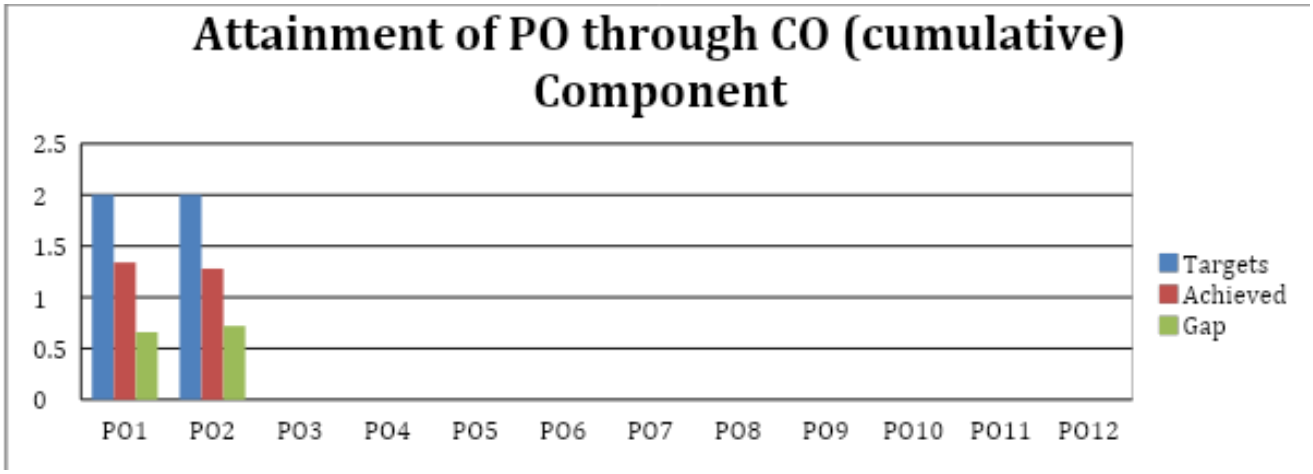

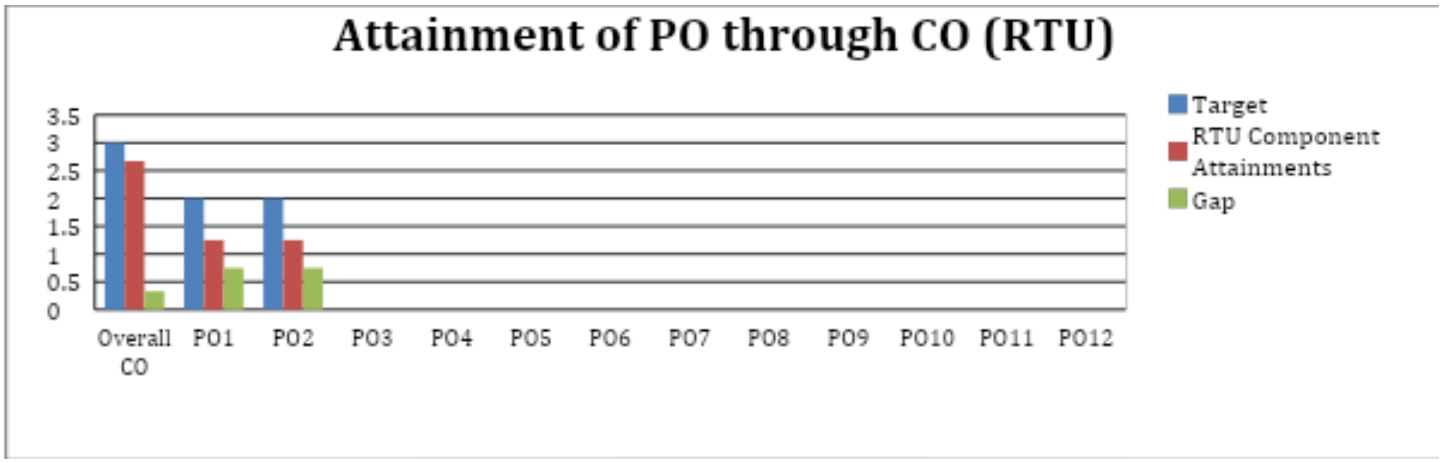

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POORNIMA COLLEGE OF ENGINEERING

Session: 2020-21

Campus: PCE **Course: B. Tech.** **Class/Section: 1st year**

1). Name of Subject:Engineering Chemistry [Code: 1FY2-03]

2). Self-Introduction:

(a) Name of Faculty: Dr. MeenaTekriwal

(b). Qualification:

B.Sc.(Chemistry Hons.), Maharani College
M.SC. (Physical Chemistry), Rajasthan university campus
PhD (Topic-Synthesis and Physico-Analytical Characterization of Anticancer Drugs using Transition Metals)

(c). Designation: Assistant Professor
(d). E-mail Id: meenatekriwal@poornima.org

Other details: I have taught engineering chemistry-I & II, Environmental Studies, Biology. My research paper has been published in different National and International Journals and presented papers in many national and international conferences. I have **13 years experience** of teaching.

S. No.	Authors name	Paper Title	journal name	DOI	page nos.	year of publication	Indexing
1	Harshittiwari, MeenaTekriwal, Rekha Nair	Air quality Status in jaipurand nearby areas of Rajasthan	Springer https://link.springer.com/book/10.1007/978-981-15-1059-5			2019	Springer

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2	Dr. rupalishrivastava , MeenaMour	Method Development for Spectrophotometric Determination of Drug Mesna using Co(II)	Advanced Science, Engineering and Medicine	DOI.10.1166/	pp. 74-76	2019	ASEM
3	Meena T , Deepika S, Arachana S.	Production of Bio-Fuel from Neem Oil by Pyrolysis Method	Int. Arch. App. Sci. Technol	DOI.10.15515/iaast.0976-4828.6.1.2630	Vol 6 [1] 26-30.	2015	IAAST
4	RupaliShrivastava, MeenaMour	Innovative method for Spectrophotometric determination of Anticancer drug Mesna using Vanadium	Khoj- An Interdisciplinary Journal of Research	ISSN:2349-8749	Vol. 5, No.2	2019(pp .48-54)	Khoj
5	RupaliShrivastava, MeenaMour	Spectrophotometric Determination of Anticancer Drug Using Vanadium as an Analytical Reagent	International Conference FCASI held in Rajasthan University				FCASI
6	RupaliShrivastava, MeenaMour	Spectrophotometric Method Determination of Stability Constant of Anticancer Drug Mesna by using Cobalt (II) As analytical Reagents	December 6-8, 2018 held in S.S. JAIN subodh P.G.(autonomous) college				
7	RupaliShrivastava, MeenaMour	Study of viscosity and density of Mesna with transition metal complexation in aqueous solution	Modern approaches of chemical science and nanomaterials-2019 held in VGU				

3).Introduction of Students:

a).*Students will be asked to introduce them covering the following points:*

1.) 95% students of section A (CS) are from English medium

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2). 70% students got

b). Achievement of students in previous years

Sr. No.	Section	Year	Result %
1	C(CS)	2019-20	78%
	E(IT)		80%
	G (EE)		72%

c). Targets and Attainments

Academic Year	2019-20
Target	2
Attainment	1.9

d). Methods of Evaluation

(i) I & II Mid-Term Examination.
(ii) Assignment / Tutorials / Lab Records.
(iii) Quiz (Objective) / Viva-Voce
(iv) OBT
(v) OET
(vi) Google Classroom

Introduction to subject: Chemistry is the branch of science that deals with the study of composition and properties of matter. So chemistry is relevant to every walk of life. Chemistry is needed everywhere in life. Without a chemical reaction there is no single moment in life. Chemistry plays an important role in engineering. Mathematics, Physics and Chemistry are the basic sciences learnt by a student in school and Intermediate courses. Engineering students must have basic understanding of these subjects.

a) Relevance to branch:

The pillars of Mechanical engineering were made by the basic sciences and we can see the role of chemistry everywhere in mechanical engineering. A mechanical engineer must know material science that comprises of physic and chemistry, properties of metal and alloys, composition of alloys, its stability, reactivity etc that are related to chemistry. Without a fuel no machine or vehicle runs, the efficiency, quality and other properties of a fuel can be studied only by chemistry. In research of finding a new, suitable and efficient fuel, chemistry needs a lot. Even after production of exhausts or residues from the operation of an engine, chemistry is necessary to treat that and making it harmless to the environment. If a mechanical engineer chooses a fuel which is suitable for an engine, he/she has to think of its exhausts also, there their knowledge of chemistry helps a lot. Lubricants are necessary to reduce the friction between two metal surfaces when they are in contact with each other. A mechanical engineer must know the suitable lubricant for that purpose at their environment. To know the nature and properties of a lubricant knowledge of chemistry is necessary. Like that many of t[illegible]

chemistry must be known by the mechanical engineer, which will be helpful to him/she at their student life, professional life and even in research.

b). Relevance to Society:

- Engineering requires applied science, and chemistry is the center of all science. The more chemistry an engineer understands, the more beneficial it is.
- Knowledge of chemistry can be applied for designing the industrial processes that provide materials, petroleum products and plastics that make our lives easier and more productive.
- Use chemistry and engineering to turn raw materials into usable products, such as medicine, petrochemicals and plastics etc.
- By the knowledge of chemistry engineers can make processes more cost effective or more environmentally friendly or more efficient. .
- In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution.

c). Relevance to self:

- The advancement in the fields of science & technology requires various materials of specific characteristics, where chemistry plays a significant role.
- Knowledge of chemistry is essential for developing advanced materials used in the communications, space industries, food and beverage industries, and modern electronics.

d). Relation with laboratory:

- Give a better understanding of the subject area.
- Develop interest in the subject
- Enhance practical knowledge
- Able to analyze the data and help him to develop new ideas, hence develop
- Scientific temper
- Increased students' problem-solving ability

- To develop skills necessary for more advanced study or research.

e). Connection with previous year and next year:

- Chemistry is one of the major subjects in science stream. As it deals with nature and natural phenomenon, fundamental principles and concepts, which form a base for all branches of science and engineering.
- Till now the students had gained the basic knowledge of water, polymers, cement, glass, refractories, lubricant etc but now in engineering field, they will study regarding their analysis and their applications.

(B) Relevance of concepts in real time ongoing and futuristic application

Engineer must have the technical knowledge about the cause of environmental problems and its effects on our environmental, plant, animal materials and human being. This basic knowledge is provide help them to develop environmentally sound economical viable and social acceptable technology to improve environment. Adequate knowledge of Engineering Chemistry will enhance scientific and technical mastery.

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COURSE NAME: ENGINEERING CHEMISTRY

COURSE CODE: 1F Y2-03, 2F Y2-03

Course Outcomes

After completion of this course, students will be able to –

CO-1	**1FY2-03.1**	Describe characteristics of water, fuel and Engineering materials
CO-2	**1FY2-03.2**	Determine of hardness of water and calorific value of fuels for Industrial as well as domestic purposes
CO-3	**1FY2-03.3**	Compare different techniques of water treatment, fuel analysis, Manufacturing of engineering materials and corrosion protection methods
CO-4	**1FY2-03.4**	Prepare the generic drugs or medicines by understanding the applications of organic reaction mechanism and manufacturing of engineering materials

6). Syllabus

Sr. No.	Name of Unit	Keywords
1.	**Water**	**Water analysis**
2.	**Organic Fuels**	**Solid, liquid and gaseous fuel**
3	**Engineering Materials**	**Cement, Lubricants, Glass**
4.	**Corrosion and its control**	**Protection from corrosion**
5.	**Organic reaction mechanism and introduction of drugs**	**Organic reaction mechanism and its applications**

b). ABC Analysis (RGB method) of units and topic

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics

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1	Hardness, determination of hardness by complexometric (EDTA method), degree of hardness, Breakpoint chlorination, Formation of solids (Scale and Sludge formation), Lime-Soda process, Zeolite (Permutit) process, Deionization (Demineralization) process. Numerical problems based on hardness, Lime-Soda and zeolite process.	Municipal water supply, requisite of drinking water, purification of water, sedimentation, filtration, sterilization, Methods of boiler water treatment(water softening) preliminary treatments, preheating,	Common natural impurities, Hardness of water and its causes, carryover (Foaming and Priming), boiler corrosion and caustic-embrittlement	Demonstration and ppt(Mission 10X lecture)
2	Ultimate analyses of coal, gross and net calorific value, determination of calorific value of coal by Bomb Calorimeter. and Hoffmann Oven (by-products oven) method cracking, synthetic petrol, knocking, octane number, anti-knockingagents. determination of calorific value of gaseous fuels by Junker's calorimeter, Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.	Solid fuels-, coal, classification of coal, significance of constituents, proximate Metallurgical coke, carbonization processes- Beehive coke oven, . Liquid fuels- Advantages of liquid fuels, petroleum and refining of petroleum, reforming, flue gas analysis by Orsat's apparatus.	Origin and classification of fuels. Gaseous fuels- advantages, manufacture, composition and uses of coal gas and oil gas,	Video, Demonstration of apparatus
3	Portland CementManufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum. Lubricants: Properties; Viscosity andviscosity index, flash and fire point, cloud and pour point.	Manufacturing of glass by tank furnace, significance of annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass	Definition and composition of Cement , Glass, and Classification of lubricants,	PPT and Quiz

4	Mechanism of chemical (dry) and electrochemical (wet) corrosion, protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.	Galvanic corrosion, concentration type corrosion and pitting orrosion.Protection from corrosion	Corrosion Definition and its consequences.	PPT
5	SN1, SN2, Elecrophilicaromatic substitution in benzene, free radical halogenations ofalkanes, Elimination; elimination in alkyl halides Synthesis, properties and uses of Aspirin and Paracetamol	Addition: electrophilic and free radical addition in alkenes,nucleophilic addition in aldehyde and ketones, Rearrangement;Carbocation and free radical rearrangements	Types of organic reactions and its definitions, dehydration of alcohols, Drugs : Introduction	PPT and quiz

7. BOOKS/ WEBSITE/JOURNALS & HANDBOOKS/ ASSOCIATION & INSTITUTION:

(a) Recommended Text & Reference Books and Websites:

S. No.	Title of Book	Authors	Publisher	Cost (Rs.)	No. of books in Library
Text Books					
T1	A text book of engineering chemistry	Shashichawla	Dhp-dhanpatrai& co. (p) ltd.		*20*
T2	Engineering Chemistry	Dr.Rekha Nair	CBC publication		*150*
T3	Engineering Chemistry	Dr. Bina Rani	Ashirvad Pub.		*80*
Reference books					
R1	Chemistry of water treatment	Samuel fuest&osman m aly	Crcprss		*4*

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R2	Engineering Chemistry	Monica Jain and P C Jain,	DhanpatRai Publishing Company (P) Ltd, New Delhi.		*Old books are available new requirement given*
R3	Engineering Chemistry	Wiley	India.		1
R4	The Chemistry and Technology of Coal,	J.G Speigh,	CRC Press.		*1*
R5	The Chemistry and Technology of Petroleum	J.G Speigh,	CRC Press.		*1*
R6	Polymer Chemistry: An Introduction,	Malcolm P. Stevens,	Oxford University Press.		*2*
R7	Lubricants and Lubrications, VCH.	Theo Mang, Wilfeied	Wiley		2
R8	Chemistry of water treatment	Samuel Faust & Osman M Aly,	CRC Press.		*2*
R9	Boilers water treatment. Principles and Practice	Colin Frayne	CRC Press.		*4*
R10	Corrosion Understanding the Basic	Joseph R Davis	ASM International.		*2*
R11	Engineering Chemistry	O.G. Palanna,	McGraw Hill Education, India.		*2*
Websites related to subject					
1	www.chemistry.about.com				
2	www.hyperphysics.com				

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3	www.khanacademy.org
4	www.chemistrylecturenotes.com

(b) Journals & Handbooks: - To give information about different Journals & Handbooks available in library related to the subject and branch.

- Indian Journal of Chemical Society
- Journal of Scientific and Industrial Research
- Journal of Science Education
- Green Energy
- Reader digest
- Science competition vision
- International Journal of Chemistry and Environment
- Current Affairs

(c) Associations and Institutions: -

- Department of Science and technology (DST)
- BARC
- DRDO
- MNIT & NIT
- Indian Association of Chemistry Teachers.
- CDRI, Lucknow

8. Syllabus Deployment: -

a). Total weeks available for academics (excluding holidays) as per Poornima Foundation calendar-

Semester	II
No. of Working days available(Approx.)	65
No. of Weeks (Approx.)	11

Total weeks available for special activities (as mentioned below)- 02 to 03 weeks (Approx.)

c). Lecture schedule per week

i). University scheme (L+T+P) =4+1+1

Sr. No.	Name of Unit	No. of lectures	Broad Area	Degree of difficulty (High/Medium/Low)	Text/ Reference books

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1.	Water	6+1	Hardness of water and Softening of hard water	Hard	R1, R2, R3
2.	Inorganic Engineering Materials	5 +2	Cement, Glass and Lubricants	Medium/Hard	Old T1,T2, T3
	Revision	1			
After I mid term					
4.	Organic fuel	8+ 1	Types of Fuel, its analysis and determination of calorific value	Hard	*R2, R3, R4, R5*
3.	Corrosion	2+1	Theories, protection against corrosion	Medium/Hard	Old T1,T2, T3
5.	Organic reaction mechanism andintroduction of drugs	1	Substitution, Elimination, Addition, Rearrangement	Hard	New T1
	Revision	1			

c). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

d). *Time Distribution in lecture class:* - Time allotted: 60 min.

- First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days and taking attendance by calling the names of the students and also sharing any new/relevant information.
- Actual lecture delivery should be of 50 min. and after 20/15 minutes, feed back questions should be asked to the students
- Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
- After completion of any Unit/Chapter a short quiz should be organized
- During lecture student should be encouraged to ask the question.

9). Special Activities:-

a). Academics :

- Open Book Test- Topic: Knocking & Octane Number
- Quiz: Topic Glass

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- Revision class-Before 2nd Mid term
- Video Lectures, Topic: Fractional Distillation
- Virtual Labs: Bomb Calorimeter, Redox titration.
- Google Classroom: Lubricant, Organic fuel
- Class Tests- After Competition of each Topic.
- Application based questions: By Google Class room of topic Water and Fuel.
- Students' involvement- Recap before each Lecture and Conclusion after each lecture and in tutorial.

10). Tutorial: - An essential component of Teaching- Learning process in Professional Education.

Objective: -To enhance the recall mechanism.

To promote logical reasoning and thinking of the students.

11) Mapping of POs and PSOs with Course Outcome

CO	PO-1 (Engineering Knowledge)	PO-2 (Problem Analysis)	PO-3 (Design/Development of Solutions)	PO-4 (Conduct Investigations of Complex Problems)	PO-5 (Modern Tool)	PO-6 (Engineer and Society)	PO-7 (Environment and Sustainability)	PO-8 (Ethics)	PO-9 (Individual and Team Work)	PO-10 (Communication)	PO-11 (Project Management and Finance)	PO-12 (Life-Long Learning)
CO-1	**1**	-	-	-	-	-	-	-	-	-	-	-
CO-2	**2**	-	-	-	-	-	-	-	-	-	-	-
CO-3	**3**	-	-	-	-	-	-	-	-	-	-	-
CO-4	-	**2**	-	-	-	-	-	-	-	-	-	-

12). Examination Systems:

Sr. No.	Name of the Exam	Max. Marks	% of passing marks	Nature of paper Theory + Numerical	Syllabus coverage (in %)	Conducted by
1.	I st Mid Term Exam	50	20%	T+N	50%	PCE
2.	II nd Mid Term Exam	50	20%	T+N	50%	PCE
3.	Assignments	100	10%	T+N	100%	PCE
4.	University (End) Term Exam	70	40%	T+N	100%	RTU

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Place & Date:
Jaipur,

Name of Faculty with Designation
Dr. Meena Tekriwal
Assistant Professor

Dr. Mahesh Bundele
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1E2403

Roll No. _____ Total No of Pages: 3

1E2403

B. Tech. I - Sem. (Main/Back) Exam., Dec. 2019

1FY2-03 Engineering Chemistry

Time: 3 Hours **Maximum Marks: 160**

Min. Passing Marks: 56

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 Define Caustic Embrittlement. [3]

Q.2 What is break point chlorination? [3]

Q.3 Give 2-2 examples of secondary solid fuel, secondary liquid fuel and secondary gaseous fuel. [3]

Q.4 What is Cetane number? [3]

Q.5 State Pilling-Bedworth rule. [3]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×20=80]**

Attempt any four questions

Q.1 Calculate the quantity of hydrated lime and sodium carbonate required to soften 20,000 litres of water containing following salts – [20]

$CaCO_3$ = 10.0 mg/litre, $MgCO_3$ = 8.4 mg/litre, $CaC\ell_2$ = 11.1 mg/litre, $MgSO_4$ = 6.0 mg/litre assuming the purity of lime as 90% and that of sodium carbonate 95%.

Q.2 (a) 0.26 gm coal sample gave on combustion 0.039 gm of water and 0.245 gm of CO_2. Calculate the percentage of carbon and hydrogen in it. [10]

(b) Calculate the volume of air required for complete combustion of $1m^3$ of gaseous fuel having the composition: CO = 48%, CH_4 = 8%, H_2 = 40%, C_2H_2 = 2%, N_2 = 1% and remaining being ash. [10]

Q.3 Write short notes –

(a) Pitting corrosion [10]

(b) Dry theory of corrosion [10]

Q.4 Write short notes –

(a) Borosilicate glass [5]

(b) Significance of annealing [5]

(c) Extreme pressure lubrication [5]

(d) Setting and Hardening of Portland cement [5]

Q.5 (a) Explain free radical halogenation of alkane. [10]

(b) Describe the synthesis, properties and uses of Aspirin. [6+2+2=10]

Q.6 Why does corrosion occur in steel pipe connected to copper plumbing? [3]

Q.7 Why Gypsum is added in the cement? [3]

Q.8 What do you understand by steam emulsion number? [3]

Q.9 How Aspirin is useful in prevention of heart attacks? [3]

Q.10 State Markovnikov's rule. [3]

PART – B

(Analytical/Problem solving questions) **[5×10=50]**

Attempt any five questions

Q.1 Explain zeolite method of water softening. [10]

Q.2 Discuss the flue gas analysis by Orsat's apparatus. [10]

Q.3 What do you understand by calorific value? Distinguish between gross and net calorific value. [10]

Q.4 Explain sacrificial anodic protection method to minimize corrosion. [10]

Q.5 Define flash and fire point and its determination using PENSKY MARTIN apparatus. [10]

Q.6 Explain Fischer Tropsch process with neat and labelled diagram. [10]

Q.7 Explain electrophilic substitution reactions of benzene with the help of suitable example. [10]

1E2205

Roll No. rtuonline.com

Total No of Pages: 2

1E2205

B. Tech. I Sem. (Main) Exam., Dec. - 2017

CY-101 Engineering Chemistry

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 28

rtuonline.com

Instructions to Candidates:

*Attempt any **five questions,** including Question **No.1 which is Compulsory.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

Q.1 Compulsory. Answer for each sub-question be given in about 25 words- [8×2=16]

(a) Essential parameter of potable water.

(b) What are Net Calorific Value (NCV) and a Gross Calorific Value (GCV) of fuel?

(c) Calgon conditioning of boiler.

(d) Properties of conducting polymers.

(e) Industrial significance of viscosity measurement.

(f) Water line corrosion.

(g) Role of gypsum in cement.

(h) Importance of annealing of glass.

Q.2 (a) Describe zeolite method of water softening with its limitations. [10]

(b) Discuss preventive measures to minimize the problem of scale formation in boilers. [6]

Q.3 (a) What is carbonization of coal? Explain Beehive coke oven method of coal carbonization. rtuonline.com [12]

(b) Explain the composition and uses of coal gas. [4]

Q.4 (a) What do you mean by synthetic rubbers? Explain the manufacture properties and uses of Buna –S and Buna – N rubbers. [8]

(b) Thick layer lubricating mechanism and application in machines. [8]

Q.5 (a) Explain theory of wet electrochemical corrosion of metals. [8]

(b) Discuss various methods for the prevention of corrosion. [8]

Q.6 (a) What is cement? Explain manufacturing of cement by Rotatory kiln technology with diagram and reactions involved in the process. [10]

(b) Calculate the requirement of Lime & Soda for softening 10^5 litres of water. Analysis of water is as follows:- [6]

HCO_3^- = 396.5 mg/Lit ; Mg^{+2} = 42 mg/Lit

Ca^{++} = 90 mg/Lit ; H^+ = 1.5 mg/Lit

$FeSO_4.7H_2O$ = 14 mg/Lit

The purity of Lime is 91% and that of Soda is 97.2%

Q.7 (a) What do you mean by refractory material? Explain important properties of refractories. [8]

(b) Describe manufacturing, properties and uses of Silica glass. [4]

(c) Calculate the gross and net calorific values of a coal sample having the following composition: [4]

C = 80% ; H = 07% ; O = 03% ; S = 3.5% ; N = 2.1% and ash = 4.4%

18103

Roll No. Total No of Pages: [2]

18103

B. Tech. I - Sem. UD (Main) Exam., Jan. - 2020

IFY2 – 03 Engineering Chemistry

Time: 3 Hours **Maximum Marks: 100**

Min. Passing Marks: 33

Instructions to Candidates:

PART - A : *Short answer questions (up to 25 words) 10 × 2 marks* ***20 marks.***

*All **ten** questions are compulsory.*

PART - B : *Analytical/Problem Solving questions (up to 100 words) 6×5 marks* ***30 marks.***

*Candidates have to answer **six** questions out of **eight.***

PART - C : *Descriptive/Analytical/Problem Solving questions 5×10 marks* ***50 marks.***

*Candidates have to answer **five** questions out of **seven.***

1. NIL 2. NIL

PART – A

Q.1 How are exhausted ion – exchange resins regenerated?

Q.2 What happens when temporary hard water is boiled? Give equations.

Q.3 What is power alcohol?

Q.4 What is sweetening of petrol?

Q.5 What is chemical formula of rust?

Q.6 The rate of metallic corrosion increases with increase in temperature. Give reason.

Q.7 Write the formula and uses of Paracetamol.

Q.8 Write the formula with percentage of borosilicate glass.

Q.9 Define Emulsification.

Q.10 Write the components with percentage of Portland cement.

PART – B

Q.1 How calorific value of a gaseous fuel is determined by Junker's calorimeter.

Q.2 What are the requirements of boiler feed water?

Q.3 Define cloud and pour points and how it is determined in laboratory?

Q.4 Explain the mechanism of free radical substitution reaction with suitable example.

Q.5 Explain role of gypsum in cement manufacturing.

Q.6 Differentiate between chemical corrosion and electrochemical corrosion.

Q.7 Write short notes on –

(a) Galvanic corrosion

(b) Breakpoint chlorination

Q.8 What is the significance of octane number and cetane number and for which these are used. How these can be improved?

PART – C

Q.1 0.72gm of a fuel containing 80% carbon, when burnt in a Bomb calorimeter, increased the temperature of water from 27.3° C to 29.1° C. If the calorimeter contains 250 gms of water and its water equivalent is 150 gms, calculate the HVC of fuel. Answer is calculated in kJ/kg.

Q.2 A water sample on analysis give following data –

Ca^{+2} = 30mg/L; Mg^{+2} = 24mg/L; CO_2 = 24mg/L; HCl = 50mg/L; K^+ = 10mg/L;

Calculate the quantity of lime (90% pure) and soda (94% pure) required to soften one million liters of water sample.

Q.3 Define cement and explain its manufacturing by R.K. method with chemical reaction and neat diagram.

Q.4 Explain scale formation and slug formation in boilers. How are they removed?

Q.5 Write short notes on any two –

(a) Refining of gasoline

(b) Characteristics of a good fuel

(c) Metallurgical coke

Q.6 (a) How is corrosion prevented by cathodic protection? Explain.

(b) Explain Pitting corrosion

Q.7 (a) Explain thick and thin layer mechanism of lubrication.

(b) Explain general chemistry of different types of glass.

1E2205

Roll No.

Total No of Pages: 2

1E2205

B. Tech. II-Sem. (Back) (Back) Exam., Oct.-Nov. - 2020

CY – 101 Engineering Chemistry

Time: 2 Hours

Maximum Marks: 48

Min. Passing Marks: 16

Instructions to Candidates:

*Attempt any **two questions** including Question No. 1, which is compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

Q.1 **Compulsory**, Answers for each sub-question be given in about 25 words - [8×2=16]

(a) Define anti-knocking agents with example.

(b) What is breakpoint chlorination?

(c) Explain caustic embrittlement.

(d) What is elastomers?

(e) Define viscosity index.

(f) What is galvanization? Write applications also.

(g) What do you mean by vulcanization?

(h) What is annealing of glass?

Q.2 (a) What is the degree of hardness? Discuss the EDTA method for determination of hardness of water. [8]

(b) Write short notes on the following – [8]

(i) Sterilization

(ii) Sedimentation

Q.3 (a) What is calorific value of fuel? Describe the working of Bomb calorimeter. [10]

(b) The ultimate analysis of a coal sample is given in the following data – C=84.5%, N=0.5%, H=6%, O=8.4% and S=1%. Calculate the high and low calorific value by Dulong's formula. [3]

(c) Signification of constituents of Coal. [3]

Q.4 (a) Discuss the polymerization mechanism of free radical polymerization. [8]

(b) Write short notes on any two of the following – [4+4=8]

(i) Natural rubber & Vulcanization

(ii) Synthetic rubber

(iii) Fullerenes and its applications

(iv) Manufacturing and uses of nylon

Q.5 (a) Explain thick layer lubricants. [8]

(b) Write short notes on – [8]

(i) Classification of lubricants

(ii) Emulsification

Q.6 (a) Discuss about the chemical corrosion. [8]

(b) Describe various methods for the prevention of corrosion. [8]

Q.7 (a) Explain the Portland cement manufacturing. [8]

(b) Calculate the requirement of lime and soda for softening 105 liters of water. Analysis of water is an follows– [8]

HCO_3^- = 396.5 mg/lit. ; Mg = 42mg/lit.

Ca^{++} = 90mg/lit. ; H^+ = 1.5mg/lit.

$FeSO_4.7H_2O$= 14mg/lit.

The purity of lime is 91X and that of soda is 97.2X.

1E2403

Roll No. _ [Total No. of Pages : 2]

1E2403

B.Tech. I - Semester (Main) Examination, Dec. - 2018

BSC

1FY2-03 Engineering Chemistry

(Common for all Branches)

Time : 3 Hours Maximum Marks : 100

Instructions to Candidates:

*Attempt all **ten** questions from **Part A**, any **five** questions out of seven questions from **Part B** and any **four** questions out of five from **Part C**. (Schematic diagrams must be shown wherever necessary). Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly*

Part - A

(Answer should be given up to 25 words only). All questions are compulsory. (10×3=30)

1. What is Calgon conditioning?
2. What is Octane number?
3. Define corrosion.
4. What is lime saturation factor in cement?
5. Structure and uses of Aspirin.
6. What is annealing of glass?
7. Cloud and pour point.
8. Composition and uses of coal gas.
9. Advantages of gaseous fuels.
10. Hardness of water.

Part - B

(Analytical/Problem solving questions). Attempt any **five** questions. (5×10=50)

1. Explain the problems of priming and its preventions in boilers.
2. What is carbonization of coal? Describe Otto - Hoffmann by product oven method of carbonization.

3. What is municipal water? Explain the sterilization process to get drinking grade water.
4. Describe process of dry corrosion and the importance of pilling Bedsworth's rule.
5. Explain composition, preparation, properties and uses of borosilicate glass.
6. Explain electrophilic substitution in benzene
7. What is viscosity of oil? Describe viscosity measurement of oil by Red wood's viscometer number -1.

Part - C

(Descriptive/Analytical/Problem Solving/Design question). Attempt any **four** questions. **(4×20=80)**

1. What is water softening? Describe water softening by De-mineralization process with diagram. **(5+10+5=20)**
2. What is calorific value? Explain the determination of calorific value of coal, with diagram, by a Bomb - Calorimeter. **(5+10+5=20)**
3. a) Explain the phenomena of galvanic corrosion by taking suitable example. **(10)**
   b) Describe any two methods of protection from corrosion. **(5+5=10)**
4. What is cement? Describe cement manufacturing by a rotatory kiln technology with diagram and reactions involved in the process. **(5+5+5+5=20)**
5. a) Explain thick layer mechanism of lubrication. **(10)**
   b) Describe the synthesis, properties and uses of paracetamol. **(6+2+2=10)**

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1E2403

Roll No.

Total No of Pages: 3

1E2403

B. Tech. II - Sem. (Main) Exam., May - 2019

BSC

2FY2 – 03 Engineering Chemistry

(Common for all branches

Time: 3 Hours **Maximum Marks: 160**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. Calculator (Non Programmable) 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 What are the advantages of break point chlorination? [3]

Q.2 State harmful effects of Scale and Sludge formation in boilers. [3]

Q.3 What are the characteristics of good metallurgical Coke? [3]

Q.4 Name the catalysts used for the synthesis of gasoline by Fischer-Tropsch Method. [3]

Q.5 Define Octane No. of Gasoline. [3]

Q.6 How galvanizing protects iron from corrosion? [3]

Q.7 Why is gypsum added to cement? [3]

Q.8 What is Annealing of glass? Give its importance. [3]

Q.9 Name the additives mixed with lubricant used for Extreme pressure lubrication. [3]

Q.10 What is Nucleophile? [3]

PART – B

(Analytical/Problem solving questions) **[5×10=50]**

Attempt any five questions

Q.1 A water sample contains following impurities: Ca $(HCO_3)_2$ = 16.2 ppm, Mg $(HCO_3)_2$ = 14.6 ppm, $CaCl_2$ = 11.1 ppm, $MgSO_4$ = 12.0 ppm, and HCl = 7.3 ppm. Calculate quantity of lime (90% pure) and soda (85% pure) required for softening of 100,000 litres of hard water using 8.2 ppm of $NaAlO_2$ as a coagulant. [10]

Q.2 What are Zeolites? Explain softening of hard water by Zeolite method with neat and well labeled diagram and reactions. How zeolite bed is regenerated? [10]

Q.3 Ultimate analysis of a fuel gave following results. C = 80%, H = 5%, O = 3%, S = 5%, N = 5%, Ash = 2%. Calculate amount of air required for complete combustion of 1 kg of fuel if 50% excess air is supplied. [10]

Q.4 What is Oil Gas? Give its synthesis, composition, calorific value and uses. [10]

Q.5 What is Flash and Fire point of a lubricating oil? How is it determined by Pensky Martins apparatus? Also give its significance. [10]

Q.6 What is glass? How is glass manufactured by Tank furnace? Explain with neat and well labeled diagram. [10]

Q.7 Write preparation, properties and uses of Paracetamol Drug. [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×20=80]**

Attempt any four questions

Q.1 What is hardness of water? Explain determination of hardness of water by complexometric method using EDTA. [20]

Q.2 Define calorific value of fuels. How calorific value of solid fuels is determined by Bomb calorimeter? Describe with neat and well labeled diagram. [20]

Q.3 What is Corrosion? Explain theory of Electrochemical Corrosion. What are the factors affecting corrosion of metals? [20]

Q.4 What are the various raw materials used for manufacturing of cement? Explain manufacturing of Portland cement with neat and well labeled diagram of Rotary Kiln. Also give chemical reactions taking place during the process. [20]

Q.5 What are the different types of organic reactions? Explain reaction mechanism of addition reactions with suitable examples. [20]

2E1026

Roll No. _____ Total No of Pages: 3

2E1026

B. Tech. II Sem. (Old Back) Exam., May - 2017
Common for All Branch
206 Engineering Chemistry - II

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) How metallurgical coke is manufactured by Otto-Hoffmann's by product coke oven process? [10]

(b) What are the advantages of gaseous fuel over solid and liquid fuel? Give one example of gaseous fuel with its calorific value. [6]

OR

Q.1 (a) Describe Fischer Tropsch's process for the manufacture of synthetic petrol. [10]

(b) What is knocking and Octane number? Give names of two antiknocking substances. [6]

UNIT – II

Q.2 (a) Derive complete formula for determining calorific value of a solid fuel by bomb calorimeter. [10]

(b) Calculate the mass of air required for complete combustion of 5 kg of coal containing 80% carbon, 15% hydrogen and rest is oxygen, if 40% excess air is supplied. [6]

OR

Q.2 (a) Write short notes on any two of the following: [5+5]

(i) Significance of proximate analysis

(ii) Delong's formula for calorific value of a fuel.

(iii) Combustion: Write balanced equation for the combustion of methane, acetylene and Hydrogen gases.

(iv) Importance of ultimate analysis.

(b) The ultimate analysis of a coal sample gives :

C = 84%

O = 8.4%

H = 5.5 %

S = 1.5%

N = 0.6%

Calculate the higher (Gross) and lower (Net) calorific values of the sample. [6]

UNIT – III

Q.3 State and explain phase rule of one component system with diagram, taking water system as an example [16]

OR

Q.3 Describe the application of phase rule to Ag – Pb system with the help of diagram. What is Eutectic point? [16]

UNIT – IV

Q.4 (a) What are type – I and type – II super – conductors? Write important applications of superconductors. [10]

(b) Discuss the structure of C_{60} fullerenes. [6]

OR

Q.4 (a) What are organic electronic material? How conjugated Π – electrons are used for conductivity in poly-aniline, poly-pyrrole, and poly-acetylene. [10]

(b) Discuss the principle and working of optical fibres. [6]

UNIT – V

Q.5 (a) What is corrosion? Describe in detail the electrochemical (wet) corrosion of metals. [10]

(b) Explain cathodic protection to prevent corrosion. [6]

OR

Q.5 (a) What is corrosion? Describe in detail the chemical (dry) corrosion of metals. [10]

(b) Explain anodic sacrificial protection to minimize corrosion. [6]

Total No. of Pages : 2

Roll No.

1E2004

1E2004

B. Tech. I Semester (Back) Examination, Dec. 2018
104 Engineering Chemistry

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary). Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) What is coke? Explain the manufacturing of coke by Beehive oven method. **(8)**

   b) What is synthetic petrol? Explain it by Fischer Tropsch process. **(8)**

OR

2. a) Write short notes on any two-
   i. Octane number
   ii. Oil gas
   iii. Coal gas **(2×4=8)**

   b) Explain Refining of petroleum crude. **(8)**

Unit - II

3. a) Explain High and low calorific value of fuel. How will you determine calorific value of gaseous fuel by Junker's calorimeter. **(8)**

   b) Write short notes on any two
   i. Flue gas Analysis
   ii. Ultimate Analysis
   iii. Proximate Analysis. **(2×4=8)**

OR

4. a) Describe the Bomb calorimeter for the determination of calorific value of solid fuel and explain corrections also. **(8)**

b) A coal sample found to have following composition.

C = 76%, H = 8.0%, O = 5.2%, N = 3.0%

Ash = Rest. Calculate minimum amount of oxygen and air required (by weight) for complete combustion of 1 Kg of coal. Calculate amount of Air required if 60% excess air is supplied. **(8)**

Unit - III

5. Write short notes on following.
   i. Neoprene rubber and its valcanization
   ii. Buna - S
   iii. Buna - N
   iv. Butyl Rubber **(4×4=16)**

OR

6. a) Discuss the free radical polymerization mechanism. **(8)**

   b) Explain the manufacturing properties and uses of fullerenes. **(8)**

Unit - IV

7. What is portland cement? Describe the manufacturing of cement by Rotary Kiln Technology. **(16)**

OR

8. Write the short notes on following
   i. Optical fiber grade glass
   ii. Annealing in glass
   iii. Role of gypsum
   iv. Basic constitutions and composition of cement. **(4×4=16)**

Unit - V

9. a. What is refractory? Describe properties of refractories. **(10)**
   b. Explain silica refractory. **(6)**

OR

10. Explain following-
    i. Classification of lubricant
    ii. Viscosity and its measurement
    iii. Cloud and pour point
    iv. Flash and fire point. **(4×4=16)**

1E 2004

Roll No. _____ [Total No. of Pages : 3

1E 2004

B.Tech. I Semester (Main/Back) Examination -2015

104 Engineering chemistry

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks(Old Back) : 24
Min. Passing Marks(Main/Back) : 26

Instructions to Candidates:

*Attempt any **five** questions. Selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. What is carbonization. Describe the manufacturing of metallurgical coke by Von Hoffmann's oven method. Discuss also the recovery of by products **(16)**

OR

1. Write notes on any four of the following
   - i) classification of coal **(4)**
   - ii) metallurgical coke **(4)**
   - iii) Refining of petroleum crude **(4)**
   - iv) cracking **(4)**
   - v) synthetic petrol **(4)**
   - vi) oil gas **(4)**

Unit - II

2. a) What is calorific value of a fuel. Discuss the determination of calorific value of coal by bomb calorimeter. **(10)**

   b) The ultimate analysis of a coal sample gives the following data C = 84.5%, N= 0.5%, H=6% O =8.4% and S = 1%. calculate the high and low calorific values by using Dulong's formula **(6)**

OR

2. Write notes on any two of the following:
   (i) Proximate analysis of coal and its significance. 8
   (ii) Estimation of nitrogen in a coal sample. 8
   (iii) Jumper's calorimeter. 8
   (iv) Flue gas analysis by Orsat's apparatus and its significance. 8

Unit - III

3. a) Discuss the polymerization mechanism of free radical polymerization 8
   b) Elastomers 8

OR

3. Write notes on any two of the following:
   (i) Natural Rubber and Vulcanization 8
   (ii) Synthetic Rubbers 8
   (iii) Fullerenes 8
   (iv) Organic Electronic materials. 8

Unit - IV

4. Describe the manufacturing of portland cement by Rotary kiln method 16

OR

4. Write notes on any four of the following:
   (i) Setting and Hardening of cement 4
   (ii) Basic constituents of cement 4
   (iii) Optical fibre grade glass 4
   (iv) Borosilicate glass 4
   (v) Safety glass 4
   (vi) Lead glass 4

Unit - V

5. a) What is Refractory. Discuss Requisites of a good Refractory. 8
   b) Types of lubrication. Discuss extreme pressure lubrication. 8

OR

5. Write notes on any four of the following:

(i) Viscosity and Viscosity index 4

(ii) Redwood viscometer 4

(iii) Flash and fire point 4

(iv) Cloud and pour point 4

(v) Classification of lubricants. 4

(vi) Sager cone test and RUL- test 4

1E2004

Roll No. _____ rtuonline.com [Total No. of Pages : 3

1E2004

B.Tech. I Semester (Main/Back) Examination, Dec. - 2016

104 Engineering Chemistry

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks (Old back) : 24

Min. Passing Marks (M/B): 26

Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) What is carbonization of coal? Describe OHo-Hoffmann's By - product oven method of coke manufacturing. **(8)**

   b) What is oil gas? Explain the manufacturing of oil gas and its uses. **(8)**

OR

1. a) What is cracking of fuel? Describe with diagram moving - bed catalytic cracking of petroleum. **(8)**

   b) Write short notes on any two of the following:

      i) Characteristics of good fuel.

      ii) Refining of petroleum

      iii) Pulverized coal and its advantages **(4+4)**

Unit - II

2. a) Describe the determination of calorific value of gaseous fuel by Junker's Calorimeter. **rtuonline.com** **(10)**

   b) The following data were obtained in a Junker's experiment

      i) Volume of gas used = 0.1 m^3 at STP

      ii) Weight of water heated = 26 kg

iii) Temperature of inlet water = 26°C

iv) Temperature of outlet water = 36°C

v) Weight of steam condensed = 0.030 kg.

Calculate the higher and lower calorific value at STP. Take latent heat of vaporization of water as 580 K cal/kg. **(6)**

OR

2. a) Write short notes on any two of the following:

i) Orsat's analysis of fuel gases.

ii) Ultimate analysis of coal

iii) Requirement of air in combustion of coal. **(5+5)**

b) Determine the theoretical weight of air required for the complete combustion of fuel having C = 75%, H = 8% and O=3% percentage composition. Assuming that 50% excess air is to be used calculate the weight of air supplied. **(6)**

Unit - III

3. a) Explain the mechanism of conductivity induced in poly aniline. **(8)**

b) Distinguish between addition and condensation polymerization. **(8)**

OR

3. Write notes on any four of the following:

i) Manufacture and uses of nylon.

ii) Classification of polymer.

iii) Manufacture and uses of Nitrile Rubbers

iv) Copolymerization

v) Fullerenes and its applications. **(4×4)**

Unit - IV

4. a) Describe the property of setting and hardening of cement. **(8)**

b) What is glass? Describe the steps involved in manufacture of glass. **(8)**

OR

4. a) What is optical fibre? Discuss the structure and working of optical fibres. **(6)**

b) Explain the significance of basic constituents of cement. (6)

c) Write a note on aluminosilicate glasses and its uses. (4)

Unit - V

5. a) Discuss the use of Seger's cone test and RUL tests for a good refractory (10)

b) Describe fire clay refractory its properties and uses. (6)

OR

5. Explain the following:

a) Steam emulsification number.

b) Functions of lubricants.

c) Viscosity Index.

d) Thin layer lubrication (4×4=16)

1E2004

Roll No. _____ Total No of Pages: 2

1E2004

B. Tech. I Sem. (Back) Exam., Dec. - 2017

104 (O) Engineering Chemistry

Common to all Branch

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT-I

Q.1 (a) What is cracking? What are advantages of catalytic cracking process? Describe moving bed catalytic cracking process with the help of neat diagram. [12]

(b) Write notes on octane number. [4]

OR

Q.1 (a) Define synthetic petrol. Describe Fischer Tropsch process with the help of diagram. [8]

(b) Write notes on – Oil gas and Anti knocking agents. [4+4=8]

UNIT-II

Q.2 (a) What is C.V.? Explain the determination of calorific value of solid fuels. [8]

(b) Calculate the minimum weight of O_2 and air required for complete burning of 5.0 kg of coal, which containing 80% carbon and 15% hydrogen & rest is oxygen. [8]

OR

Q.2 (a) Write short notes on -

(i) Flue gas analysis by Orsat's apparatus [4]

(ii) Ultimate analysis [4]

(b) A sample of coal was found to have the following percentage composition by weight - C = 80%, H = 5%, O = 12% S= 2% and ash = 1%. Calculate gross and net calorific value of coal sample by using Dulong's formula. [8]

UNIT-III

Q.3 (a) Define conducting Polymers. Explain methods of preparing conducting Polymers. [8]

(b) Short notes on –

(i) Vulcanization [4]

(ii) Natural Rubber [4]

OR

Q.3 (a) Explain preparation, properties & uses of fullerenes. [8]

(b) Discuss the classification of polymers with examples. [8]

UNIT-IV

Q.4 What is Portland cement? Write its composition. Describe the manufacturing process of cement by Rotary Kiln Technology. [16]

OR

Q.4 What is glass? Describe the manufacturing process of ordinary glass and also discuss the uses of glass. [16]

UNIT-V

Q.5 (a) Define Refractories. How are they classified? Give the essential requirements of a good refractory. [12]

(b) Discuss RUL Test. [4]

OR

Q.5 (a) Define the term lubricant and lubrication. What are the different type of lubricants? Discuss extreme pressure lubrication. [12]

(b) Explain Flash and Fire Point. [4]

PAGE NO. 1.

PGC

DETAILED LECTURE NOTES DATE:.....

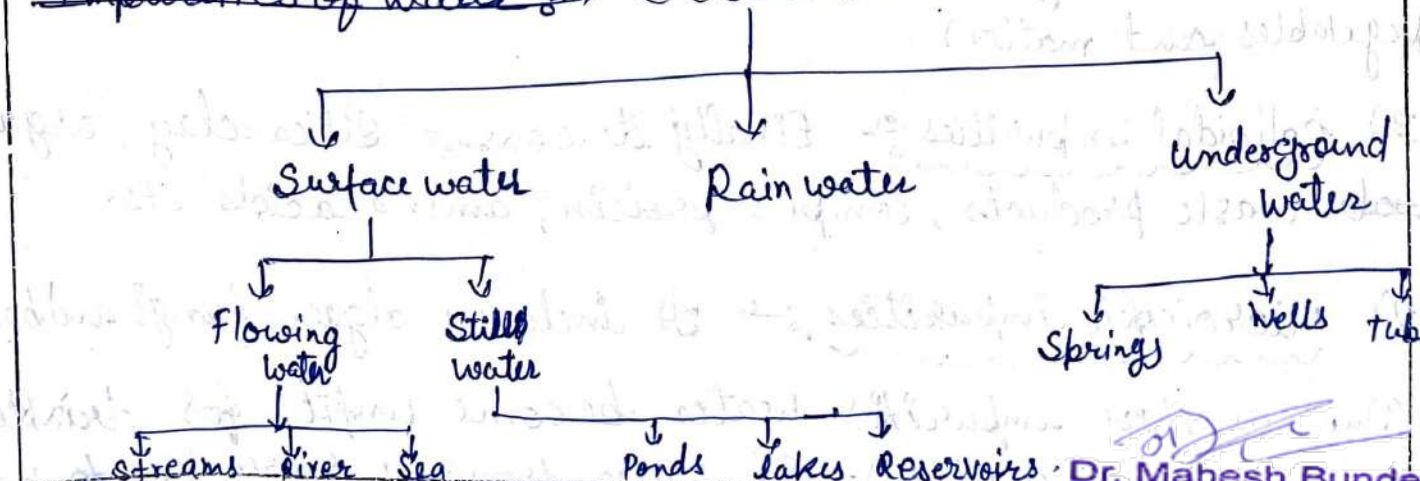
Name of Faculty: Meena Tekriwal College: P.C.E Branch: All

Name of Subject with Code: Engineering chemistry(.....) Dept.: chemistry Class: I^st year (I^st Sem.)

Introduction :- Water is nature's most wonderful most abundant and useful compound. This is not only the combination of acid (H^+) + base (OH^-) ($H_2O = H^+ + OH^-$) but is also the foundation of life, the heart of our community. It also creats a sustainable biomass based economy. It has no substitute of drinking water. But quality of drinking water is deteorating hour by hour and day by day due to the constant discharge of pollutants from various resources into reservoirs. It is not only essential for lives but also very important part of engineering material such as 'steam generation' and also used as coolant in power and chemical plants.

There are many sources of water like - Surface water, River water, Lake water, Sea water, underground water, Spring and well water etc.

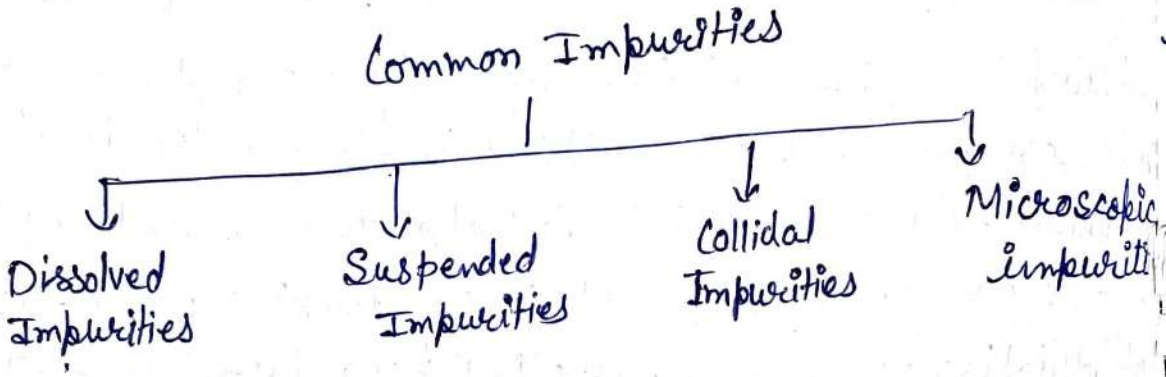
~~**Impurities of water :-**~~ **Sources of water**



Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Maintaining an adequate supply of water for municipal ... industrial purposes requires the efforts of scientists and eng...

Impurities of water :→ Water is an excellent solvent and ... it is very easily contaminated by its natural environ... rock and other materials.



(1) Dissolved impurities :→ It consist Inorganic salts, organic salts, dissolved gases etc.

(2) Suspended impurities :→ Suspended impurities impart turbidity, colour and odour of water. These are of two types – Inorganic (clay and sand) and organic (oil globules vegetables and matter)

(3) Colloidal Impurities :→ Finally it consist Silica clay, organic waste products, complese protein, amino acids etc.

4) Microscopic impurities :→ It includes algae, fungi and bacteria. Due to these impurities water become unfit for drinking and domestic purposes. So water from many ... that to be treated before it is used. which depend on its ... weather it is for industrial purposes or ...

DETAILED LECTURE NOTES DATE:.....

Name of Faculty:.....Meena Tekriwal..College:.....PGI.....Branch:.....BE.....

Name of Subject with Code:...Engg. Chemistry (1.0.6).Dept.:.....Chemistry.....Class:.....B.Tech. I st year

Sources of impurities in water are of two type point sources. and diffused sources.

1) Point sources :→ These sources which can be indentified at single location like - sewerage system, industrial effluent etc. It can contaminate the ground water and cause water pollution. It can be treated by central collection of sewage and industrial effluent and treament of these upto requisite acceptable levels and refused for different beneficial purposes.

2) Diffused Sources :→ those sources whose location cannot be easily indetified. like the pollutant scattered on the ground ultimately reach the water sources and cause pollution such as pesticides, fertilizers, mining, construction etc. It can be only treated by changing cropping patterns and advanced farm management practices.

Disadvantages of Hard or polluted water :→

1) Hard water cannot be used for domestic purposes.
2) It is harmful for many industries such as textile, sugar paper etc. because dissolved salts effect many properties.
3) It is not suitable for Laboratries work also.

Dr. Mahesh Bundele
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Hardness of water :→

A sample of water which produces lather readily with soap is called soft water and it is not produces lather readily with soap is called hard water So Hardness defined as the soap consuming capacity of water sample.

Soap :- Soap is the sodium salt of higher fatty acid e.g. Sodium stearate.

$2\,C_{17}H_{35}COONa \longrightarrow (C_{17}H_{35}COO)_2Ca + 2NaCl$

Sodium stearate
(Soap)

When soap is added to soft water it dissolves and lathers readily.

$C_{17}H_{35}COONa + H_2O \longrightarrow C_{17}H_{35}COOH + NaOH$

soap. stearic acid (soluble in water)

But when soap is added to Hard water which contains Ca^{+2} or Mg^{+2} ions. Soap is precipitated as insoluble salt which prevents the formation of lather and results in wastage of soap.

$2\,C_{17}H_{35}COONa + CaCl_2 \longrightarrow (C_{17}H_{35}COO)_2Ca + 2NaCl$

Soap. Calcium Steatrate (curdy precipitate)

Types of Hardness of water :→

These are of two types.

1) Temporary or carbonates hardness
2) Permanent or non-carbonate hardness

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DETAILED LECTURE NOTES DATE:...../...../.....

Name of Faculty:..... Meena Tekriwal ...College:..... PCET .....Branch:..... All .....

Name of Subject with Code:..... Engg. chemistry (106) .....Dept.:..... chemistry .....Class:..... B.Tech. I st year

(i) Temporary Hardness of waters :→

This is caused due to presence of bicarbonates and carbonates of Ca^{+2} and Mg^{+2} in water and it can be removed simply by boiling. Because bicarbonates are decomposed on boiling which yield insoluble carbonates and hydroxides which deposited at the bottom of vessel.

$$Ca(HCO_3)_2 \longrightarrow CaCO_3\downarrow + H_2O + CO_2$$
$$Mg(HCO_3)_2 \longrightarrow MgCO_3\downarrow + H_2O + CO_2$$

It can also be removed by adding $Ca(OH)_2$ lime.

$$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3\downarrow + 2H_2O$$
$$Mg(HCO_3)_2 + Ca(OH)_2 \rightarrow MgCO_3\downarrow + CaCO_3\downarrow + 2H_2O$$

Permanent or non carbonate hardness :→

Permanent hardness is due to the presence of sulphate and chlorides of Ca, Mg and other heavy metals. It can not be removed by boiling. It is removed by the use of chemical agents.

Degree of hardness.

The degree of hardness of water is usually expressed in terms of equivalent amount of $CaCO_3$, though the

hardness is caused by bicarbonates, chlorides and su
of Ca and Mg, because this permits easy addition and
- traction of concentration of hardness. CaCO3 has bee
taken as standard for expressing hardness. It's molecul
weight is 100 and is insoluble ppt in water.

Equivalent of CaCO3 for hardness producing substance
can be calculated by formula :-

$$\frac{\text{mass of hardness producing substance}}{\text{chemical equivalent of hardness producing substance}} \times \text{chemical equivalent of } CaCO_3 \text{ (precipitate)}$$

$$= \text{mass of hardness producing substance (mg/l)} \times \left[\frac{100}{2 \times \text{chemical equivalent of hardness producing substance}} \right]$$

where - $\frac{50 \times 2 = 100 \text{ (molecular weight of } CaCO_3\text{)}}{2 \times \text{chemical equivalent of hardness producing substance}}$ ⇒ Multiplication

Calculation of multiplication factor ⇒

$$\frac{100}{2 \times \text{chemical equivalent of hardness causing substance}}$$

for Example = Find out multiplication factor of $Mg(HCO_3)$

equivalent weight of $Mg(HCO_3) = 73$

Molar mass of $CaCO_3 = 100$

multiplication factor = $\frac{100}{2 \times 73}$

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DETAILED LECTURE NOTES DATE:.....

ame of Faculty:.....meena.....College:.....BGI.....Branch:.....EC.....

lame of Subject with Code:.....Engg. chem. (106).....Dept.:...Chemistry.....Class:.....B.Tech I st year

	Dissolved salt	Mol. mass	equivalent weight	multiplication
.	$Ca(HCO_3)_2$	162	81	$\frac{100}{81\times2}$ factor (into eq $CaCO_3$)
2.	$CaSO_4$	136	68	$\frac{100}{68\times2}$
3.	$MgSO_4$	120	60	$\frac{100}{60\times2}$
4.	$MgCl_2$	95	47.5	$\frac{100}{47.5\times2}$
5.	$CaCl_2$	111	55.5	$\frac{100}{55.5\times2}$

Units of hardness :→

There are four units in which hardness can be expressed :-

1) Parts per million (PPm) — It is defined as the number of parts by weight of $CaCO_3$ present per million or per 10 lacs (10^6) parts by weight of water

1 PPm = 1 Part of $CaCO_3$ equivalent hardness in 10^6 parts of water

2) Milligram per litre (mg/lit) —

1 mg/lt. = 1 mg of $CaCO_3$ equivalent hardness in one litre of H_2O

3) Degree clark (°cl) — 1 Parts of $CaCO_3$ eq. hardness per 70,000 parts of water.-

1°cl = 1 grain of $CaCO_3$ per gallon of water.

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No. of grains = $\left(\frac{lb}{7000}\right)$

1 lb (libra) = 7000 grains and 1 gallon = 70,000 grains.

Degree clark (°cl) = 1 Part of $CaCO_3$ per 70,000 parts of H_2O

4). Degree French (°fr) =

$1°fr$ = 1 Part of $CaCO_3$ equivalent per to 10^5 parts

Inter-relationship of units of hardness :-

These all four units of hardness of water are interrelated to each other and so can be change into one to another units.

Relation -

1 PPm = 1 Part Per 10^6 parts of H_2O

$1°cl$ = 1 Part per 70,000 Parts of H_2O

$1°fr$ = 1 Part Per 100,000 (10^5) Parts of H_2O

Or 100 PPm = $7°cl$ = $10°fr$

or 1 mg/lit = 1 PPm = $0.07°cl$ = $0.1°Fr$.

units	PPm	mg/l	°F	°cl
PPm	1	1	0.1	0.07
mg/l	1	1	0.1	0.07
°f	10	10	1	0.7
°cl	14.3	14.3	1.43	1.

Date → 6-2-2014.

DETAILED LECTURE NOTES

Name of Faculty: Meena Tekriwal College: PCE Dept: I year

Name of Subject with Code: Chem.+Env.Engg(204) Branch: All. Class: B.Tech

Difference b/w Hard and Soft water.

Hard water.	Soft water.
⇒ Water which does not produce lather with soap solution, but forms a white curdy ppt. is called "Hard water"	Water which lathers easily on shaking with soap solution is called "Soft water".
⇒ Hard water contains dissolved Ca^{2+} and Mg^{2+} salt in it	Soft water does not contain dissolved Ca^{2+} and Mg^{2+} salt in it
⇒ In hard water, cleansing quality of soap is decreased and a lot of it is wasted during washing and bathing.	In soft water, cleansing quality of soap is not decreased and soap is not wasted during washing and bathing.
⇒ The taste of H_2O is usually better due to Mg^{2+} and Ca^{2+} ions	Less better than hard water.

Hard water having Mg^{2+}, Ca^{2+} ions so it helps in forming strong teeth and bones specially in children.

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PGC **DETAILED LECTURE NOTES** DATE:.....

Name of Faculty:..Meena Tekriwal..College:..PGT..Branch:.....

Name of Subject with Code:..Engineering chemistry 106..Dept.:..chemistry..Class:..I st year (I st Sem.)

Municipal water supply

Requisites of drinking water :→

Essential Standard parameters of drinking H_2O

The standards parameters of drinking H_2O can be adjusted constantly according to technology and information available to water board and other agencies such as:

1) Indian standards Institution (ISI)
2) World health Organisation (WHO)
3) Indian Council of Medical Reseach (ICMR)
4) United States Public health science (US PHS)
5) Ministry of work and housing (MWH)
6) National Drinking water mangement (NDWM, DRD Gov. of India)

Different Parameter according to W.HO are →

Physical Parameters	Max. Permissible limit
1) Colour	50 PCU (Platinum Cobalt Unit)
2) Taste and odour	U.O
3) Turbidity	25 JTU (Justify turbidity unit)
4) TDS (mg/l) (total dissolve salts)	1500
5) PH	6.5 - 9.2

Refrence - Rekha Nair (Neelkanth Publication) (Pg - 2.5)

JTU :- Turbidity Unit

Parameters	max. Permissible limit
1. $CaCo_3$ (mg/l)	500
2. Ca	200
3. mg	150
4. Cl.	600
5 So_4	400
6. NO_3	-
7. F	1
8. Fe	1
9. Hg	.001
10 Pb	.05

Requisites of drinking H_2O

Drinking / Potable water, fit for human consum-ption, should satisfy the following essential requirem

Physical characteristics

1.) It should be colourless
2) It should be pleasant in taste
3) It should be odourless
4) It should be perfectly cool.
5) Its turbidity should not exceed 10 PPm.

Chemical characteristics

1) It should be free from objectionable dissolved gases like H_2S
2.) It should be free from objectionable minerals such as Pb, As, Cr and mg salts.
3) Its alkalinity should not be high. Its PH should be 7.0 - 8.5
4) Cl and So_4 should be less than 250 ppm.
5) Total hardness and total dissolved solides should be less than 500 PPm
6.) El content should be less than 1.5 ppm.

Biological / Bio-Chemical characteristics -

1.) It should be free from disease producing bacteria.
2) E. Coli should be under permis-

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Name of Faculty:.....neeng.....College:.....Ph.I.....Branch:.....

Name of Subject with Code:....Engg. chemistry (106).....Dept.:.....Chemistry.....Class:....B.Tech. I st year

Purification of H_2O

To make the H_2O fit for human consumption proper treatment has to be given. Actual treatment method adopted, depend upon the ~~most~~ exact nature of impurities present in raw water.

Types of impurities and the process to be employed for ~~following~~ removing them :-

Impurities present in H_2O	Process used for removal
Floating matter like leaves, twigs etc	Screening
Suspended matter like sand, clay	Sedimentation
Fine suspended inorganic matter	Sedimentation with coagulation
Colloidal impurities and large size micro organisms	Filtration
Bacteria and micro-organism	sterlisation and disinfection

1. Sedimentation :-

* Sedimentation is a process for retention of H_2O for certain period in a deep tank ($\simeq$ 5 meter) or to flow quietly at low velocities
* Most of the suspended particles settle down at the bottom, due to the force of gravity.

* It takes 2 to 8 hours.
* The clear supernatant water is removed perio
* The process removes 70-75% suspended impur

2. Screening :-
water is passed through screens having h
where floating material is held by them.

3. Sedimentation with coagulation :-
When water contains fine clay particles and colloidal
it becomes necessary to apply sedimentation with
for removing such impurities. In this process, fine
suspended and colloidal impurities are removed b
the addition of requisite amount of chemicals (co
to the before sedimentation. Coagulants produce ion
right electric charge that neutralize the oppositely
colloidal impurities. after losing their charge, these in
come nearer to one another and combine to form de
particles which settle down due to the force of gravi

some common coagulants —
1) Alum ($K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$)
2) Sodium aluminate ($NaAlO_2$)
3) Ferrous sulphate ($FeSO_4 \cdot 7H_2O$)
4) Polyaluminium chloride (PAC)

for alkaline H_2O -

$$Al_2(SO_4)_3 + 3Ca(HCO_3)_2 \rightarrow Al(OH)_3 \downarrow + 3CaSO_4$$

($Al_2(SO_4)_3$: Coagulant; $Ca(HCO_3)_2$: calcium bicarbonate present in H_2O; $Al(OH)_3$: Flocculent ppt)

For acidic H_2O

$$NaAlO_2 + 2H_2O \longrightarrow Al(OH)_3 \downarrow + 2NaO$$

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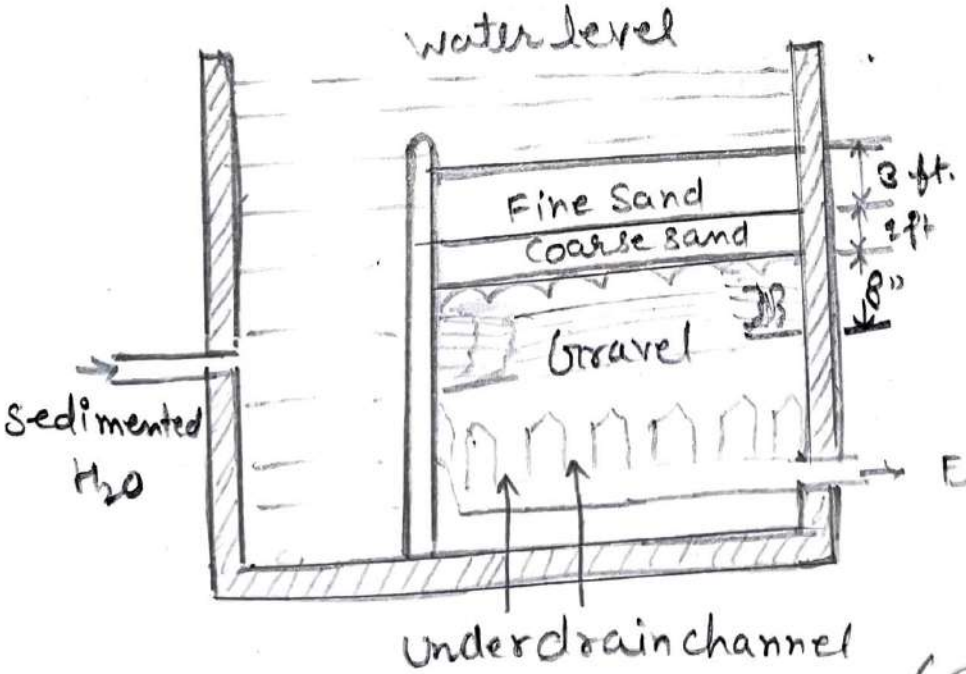
ne of Faculty:.....Meena Te Kriwal.....College:.....Branch:.....

ne of Subject with Code:.....Engineering Chemistry.....Dept.:.....Class:.....I^st year (I^st sem.)

Filtration :-

Filtration is the process of removing colloidal matter and most of the bacteria, micro-organisms etc, by passing sedimented H_2O through a bed of fine sand and other proper-sized granular materials. Filtration is carried out by using sand filter and Pressure filter.

Sand filter :- A Sand filter consists of a tank with top layer of fine sand placed over coarse sand layer and gravels. During filtration, the sand pores get clogged, due to retention of impurities in the process, which can be removed by regeneration process.



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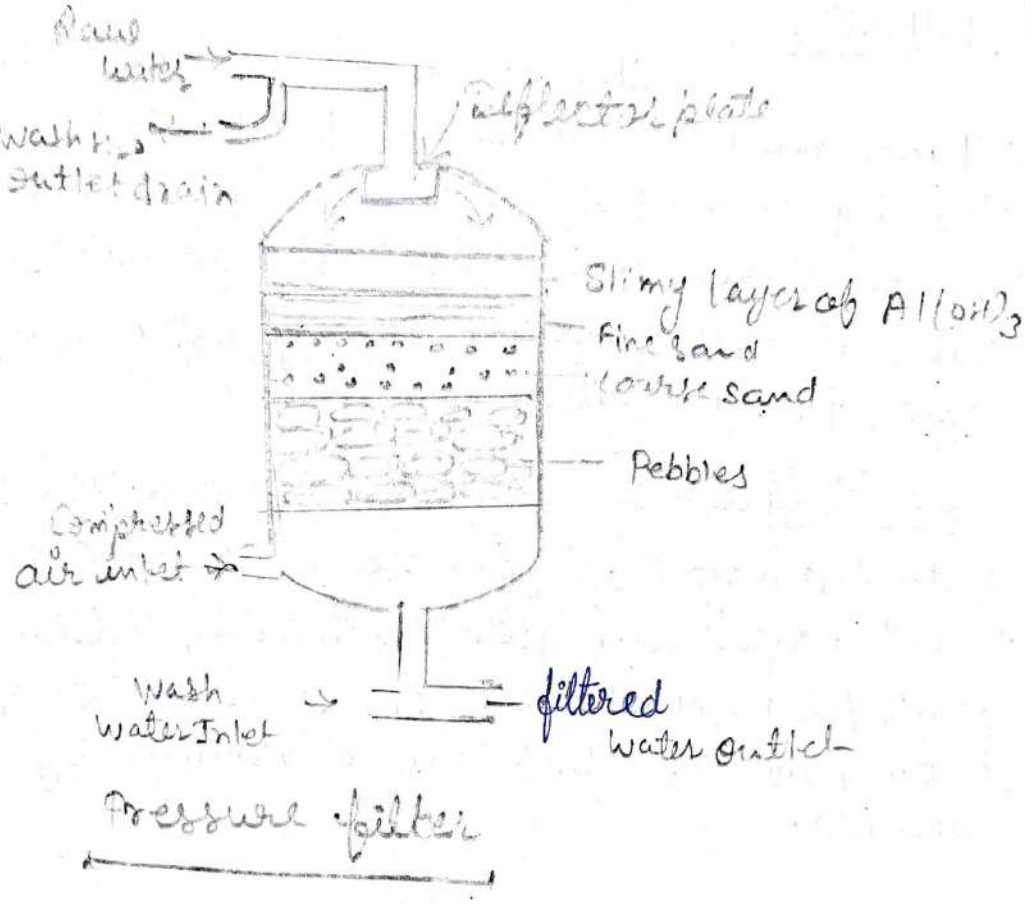
Pressure filter :-

The arragement of filter materi is same as the sand filter. this material is kept in a close cylinder and H_2O is forced through filte bed under pressure.

These filter are very widely used for industrial purpose



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DETAILED LECTURE NOTES

Name of Faculty: Meena Tekriwal College: PCE Dept: I year

Name of Subject with Code: Chem. Env. Engg 204 Branch: All Class: B Tech

Standard specification of drinking water

(i) Primary standard : Those are the standards which specify the maximum contaminated levels (MCL) of various dissolved minerals based on their effect on human health.

(ii) Secondary standards: Secondary standards may vary from place to place depending upon the taste, odour, colour and hardness of water etc. They do not have any anticipated effect the human health.

In sedimentation with coagulation (the coagulant and their pH rang

Chemical coagulant	Ideal pH range of use
$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ (alum)	6.5 – 8.5
$NaAlO_2$ (Sodium aluminate)	5.5 – 8.0
$FeSO_4 \cdot 7H_2O$ (ferrous sulphate)	above 8.5

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Name of Faculty:.....meeng.....College:.....PhT.....Branch:.....

Name of Subject with Code:....Engg.chemistry (105)....Dept.:....Chemistry....Class:....B.Tech.I^st year

Disinfection and Sterilization

The process of destroying the pathogenic i.e, disease producing bacteria, micro-organism etc. from the water and making it safe for use, is called disinfection. The chemicals or substances, which are added to H2O for killing the baterias, etc. are known as disin-factants. Though both the terms disinfection and sterilization are interchangeably used in practice but disinfection doesn't ensure total destruction of all living microorganisms.

On the other hand, sterilization means complete destruction of all living micro-organisms which is achieved by boiling the water over a period of time.

Disinfection can be carried out by following methods:-

(A) By Boiling water
(B) By adding bleaching Powder
(C) By chlorination
(D) By using chloramine ($ClNH_2$)
(E) Disinfection by Ozone.

(A) By Boiling water :- This method provides the safeguard against existing germs only. moreover it can not be applied on large scale. i.e at municipal level.

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(B) By adding bleaching powder :

1 kg bleaching powder + 1000 kilo litres of H_2O → Stand for some time (2-5 hrs)

The chemical action produces a powerful germicide (hypochlorous acid)

$$CaOCl_2 + H_2O \rightarrow Ca(OH)_2 + Cl_2$$

(bleaching powder)

$$Cl_2 + H_2O \rightarrow HCl + HOCl$$

hypochlorous acid.

Germs + HOCl → Germs are killed.

~~But~~ enzymes in cell of organism deactivated by reacting with HOCl. So ~~microorganism~~ their inactivation results in the death of micro-organisms and HOCl produces OCl^- (hypochlorite) ions.

$$HOCl \rightleftharpoons H^+ + OCl^-$$

HOCl is 80 times more destructive than OCl^- ion. So it a powerful disinfectant.

Drawback →

(a) Excess of bleaching powder, if used, impart bad taste and smell to treated H_2O.

(b) it produces Ca in H_2O and thus increases hardness.

(c) not stable so it deteriorates due to its continuous decomposition during storage.

(C) By chlorination :- The molecular chlorine can be applied to the H_2O in liquid or gaseous form, though liquid form is generally ~~prefer~~ preferred. these days. The liquid Cl is 1½ times ~~heavier~~ than H_2O

$$Cl_2 + H_2O \rightarrow HCl + HOCl$$

$$HOCl + Beterias \rightarrow Bacterias\ are$$

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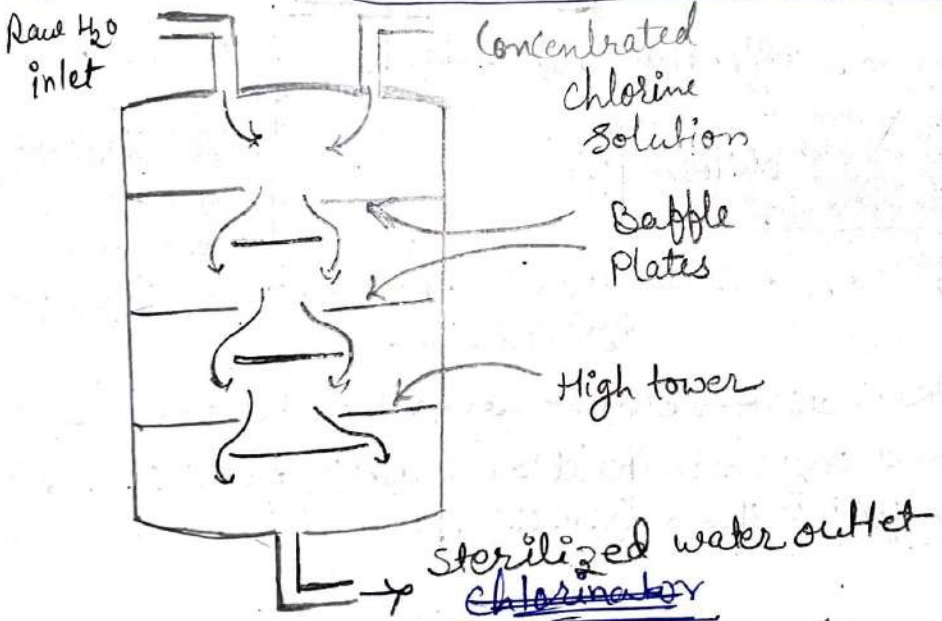
Name of Faculty:.....meena Tekriwal.....College:.....PCI.....Branch:.....

Name of Subject with Code:..Engineering chemistry (105) Dept.:.....chemistry.....Class:.....I st sem.....

Apparatus used for disinfection by Cl is known as chlorinator.

For filtered H_2O, about 0.3 – 0.5 ppm of Cl_2 is sufficient



Chlorinator

Advantages :

1) It can be easily stored for long period, without any risk of deterioration.

2) It is cheap and easily available and occupies less space for storage.

(3) It is very powerful disinfectant and may remain in H_2O as residual for long time.

(4) Unlike bleaching powder, it doesn't introduce any hardness in treated water.

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Disadvantages:-

1) Excess of chloine, if added, produce unpleasant taste and odour.

2) It is less effective at higher pH value.

(D) By chloramine ($ClNH_2$) :-

$$ClNH_2 + H_2O \rightarrow HOCl + NH_3$$

Disinfectant.

It is weaker disinfectant- compared to free Cl.

It is obtained by mixing (Cl) and (NH_3) in 2:1. Dichloramine ($NHCl_2$) is more effective than (NH_2Cl).

(E) Disinfection By Ozone :- It is an excellent disinfectant. It is highly unstable and breaks down, liberating nascent O.

$$O_3 \rightarrow O_2 + [O]$$

Nascent oxygen.

This Nascent oxygen is powerful agent and kills all the bacterias.

disinfection of H_2O by ozone is carried out in ozone sterilizer.

Disinfection by O_3 has certain advantages but it is quite expensive method.

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me of Subject with Code:...Engg. chemistry (105)..Dept.:....Chemistry.....Class:....B.Tech. I St Year

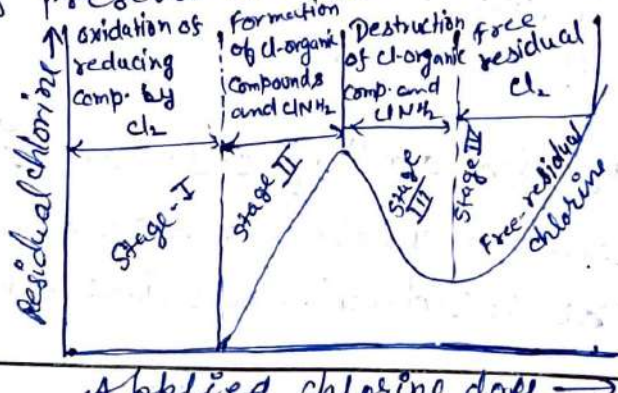
Disinfection by UV rays :-

UV radiations emitted from electric mercury vapour lamp are capable of disinfection of water. This process is particularly useful for disinfection of swimming pool water. This process is highly expensive.

Break-Point chlorination :-

Breake point chlorination is the chlorination of H_2O to such ~~that~~ an extent that not only living organisms but also other organic impurities in H_2O are destroyed. The stages involved on increasing the Cl_2 dose, as follows—

Stage I :- For lower dosages of Cl_2 initially, all the amount of Cl_2 is consumed and not residual Cl_2 is observed. The Cl_2 applied oxidises the oxidisable substances present in H_2O.



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Name of Faculty: aneeq College: P.C.E Branch:.....

Name of Subject with Code: Engg. chem. (106) Dept.: Chemistry Class: B. Tech 1st Fyear

Stage -II → In this the amount of Cl_2 doses is increased, amount of residual Cl_2 also shows steady increase. This stage corresponds to the formation of chloro-organic compounds and chloramines without under-going oxidation. the curve represents the residual chlorine available from combined chloramines ~~Stage-III~~ chloramines are stable and remain in H_2O for longer time and kills the micro-organism. These are responsible for bad taste and odour in the

Stage -III :- Further increase in Cl_2 dose cause oxidation of chloro-organic compounds and chloramines. Therefore, residual Cl_2 seems decreasing. It reaches to the minimum point known as break-point. when the oxidative destruction is complete. At break-point, destruction of organic compounds, which gives odour, bad taste, odour, and all disease producing bacterias are ensured.

Stage -IV → Further add° of chlorine increases the amount of residual chlorine which remain in H_2O, this free or residual chlorine should not

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me of Faculty:.....Praveen.....College:.....P.G.I.....Branch:.....Civil...

ame of Subject with Code:.....Engg chemistry (05).....Dept.:.....Chemistry.....Class:.....B.Tech I 1st year

be more than 0.2 ppm, since it causes bad odour and taste and also create irritation in the mucus mebrane.

Break point chlorination removes completely the organic compounds. It removes colour, bad taste and odour. It ensure 100% destruction of disease producing bacterias

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PGC **DETAILED LECTURE NOTES** DATE:.....

Name of faculty ....Meena Tekriwal.... College.....P.G.E... Deptt. .....Chemistry

Name of Subject with code. Engg. Chemistry 206 Branch....ME/EC.....Class ...I st year II nd sem.

FUELS

Introduction →

Fuels are necessary for burning purposes. Combustion Concerns with the mechanism of burning. Energy can be generated by burning fuels. A fuel can be defined as a combustible substance containing carbon as a major constituent which is capable of releasing large amount of heat (or energy) that can be used for industrial as well as for domestic purposes. charcoal; wood, Petrol, diesel, oil gas etc. are fuels.

Mechanism of heat production

combustion is a process of burning fuel in presence of air (or O_2). During this process, the atoms of carbon, hydrogen etc, react with O_2 with simultaneous liberation of heat. This energy is the by-product of rearrangement of valency electrons in these atoms resulting in the formation of CO_2, H_2O etc. These products are of less energy content and therefore the heat (energy) released during combustion is the difference in the energy of reactants (C, H and O) and that of the product H_2O, CO_2 etc)

Fuels + O_2 $\xrightarrow{\text{combustion}}$ Products + heat
(CO_2, H_2O etc.)

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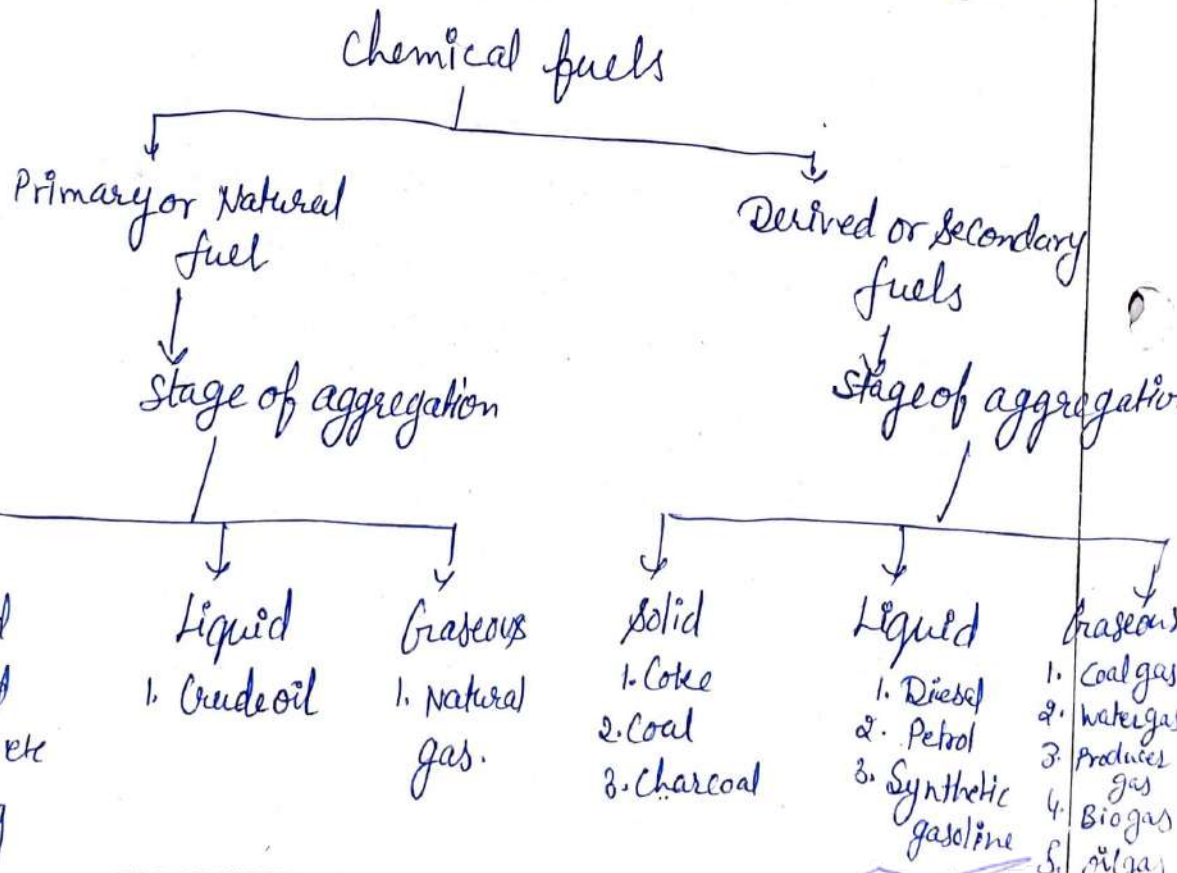
Name of Subject with code.... Branch..... Class .....

Classification of fuels

The classification of fuels is based on their occurence and state of aggregation. According to the first classification we have two categories, (a) Primary or Natural fuels, those occuring as such in nature, such as wood, Peat Petroleum etc. and (b) derived or Secondary fuels, those which are derived from the primary fuels, such as coke, charcoal, coal gas, Petrol etc.

The second classification is based on their state of aggregation as solid, liquid and gaseous fuels. The classification of fuels is summurized as-



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Name of faculty ....Meena Tekriwal... College.....P.G.E... Deptt. .....Chemistry

Name of Subject with code. Engg. Chemistry 206 Branch....ME/EC.....Class ...I...year...II...sem.

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Fuels + O_2 $\xrightarrow{\text{Combustion}}$ Products + heat
(CO_2, H_2O etc.)

PGC **DETAILED LECTURE NOTES** DATE:.....

Name of faculty .....Meeng..... College.....PCE..... Deptt. .....

Name of Subject with code....Engg chem. 1st Branch.....ME/EE Class .....

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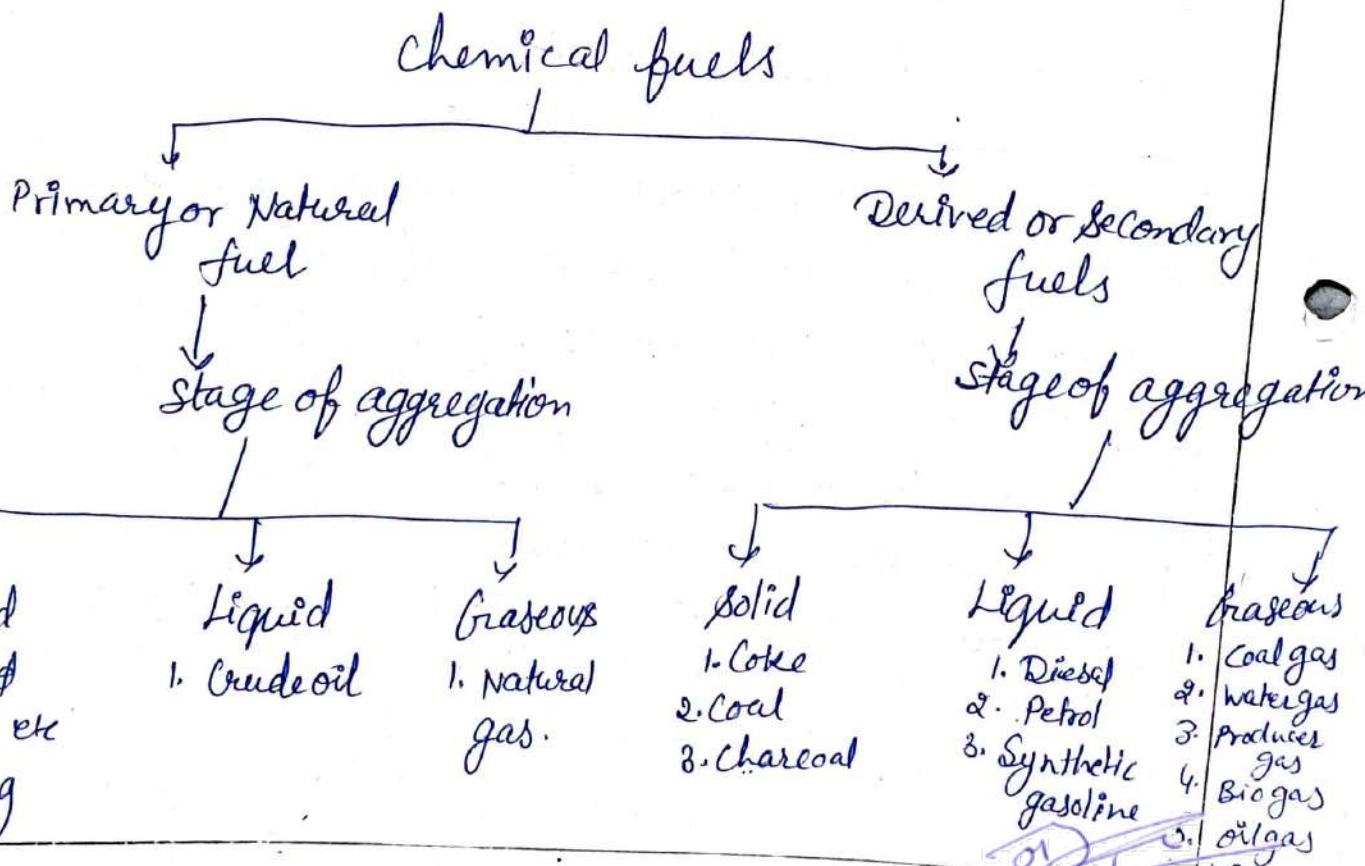
The classification of fuels is based on their occurence and state of aggregation. According to the first classifica we have two categories, (a) Primary or Natural fuels, those occuring as such in nature, such as wood, Peat Petroleum etc. and (b) derived or Secondary fuels, those which are derived from the primary fuels, such as coke, charcoal, coal gas, Petrol etc.

The second classification is based on their state of aggregation as solid, liquid and gaseous fuels. The classification of fuels is summurized as-



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CHARACTERISTICS OF A GOOD FUEL

1. HCV (Higher calorific value) → Since, the amount of heat liberated and temperature attained depends upon the calorific value of the fuel. So, a fuel should possess a high calorific value.

2. Low cost → A good fuel should be cheap.

3. Easy to transport → Fuel must be easy to handle, store and transport at a low cost.

4. Moderate Ignition temperature → Ignition temperature is the lowest temperature to which the fuel must be pre-heated so that it starts burning smoothly. Low ignition temperature is dangerous, since it can cause fire accidents. High ignition temperature causes difficulty in igniting the fuel. Hence, an ideal fuel should have moderate ignition temperature.

5. Low moisture content → The moisture of the fuel reduces the calorific value and makes loss of money. Hence, fuel should have low moisture

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content.

6. Low Concentration of non-combustible matter → Non combustible matters are generally ash and clinkers. Such matter also reduces the heating value (Calorific value). Each present of non-combustible matter means heat loss about 1.5% hence, a fuel should have low concentration of non-combustible matter.

7. Products of combustion should be harmless → The gaseous products of combustion should not pollute the environment. CO, SO_2, PH_3, H_2S, CO_2 etc, are some of the harmful gases.

8. moderate velocity of combustion → If the velocity of combustion is low, then the required high temp. is impossible because a part of that heat liberated may get radiated, instead of increasing the temperature high combustion rate is also not required. Hence, a fuel should have moderate rate of combustion.

9. Combustion should be easily controllable → Combustion should be easy to start to stop, as and when required

10. Size :- In case of solid fuels, the size should be uniform so that combustion is regular and intense.

Comparison of Solid, liquid and gaseous fuels.

	Solid fuels	Liquid fuels	Gaseous fuels
1.	Cheap and easily available.	Costly than solid fuels	Except natural gas, other gaseous fuel are costly.
2.	Transportation and storage is easy without any risk of spontaneous explosion	Can be transported easily by pipelines. But do not store them in open	Must be stored in leak proof containers and can be transported through pipelines
3.	Combustion is slow but its control and stop is not easy	Quickly combustible and can be controlled and stopped, when required	Rapidly combustible and controlled and stopped easily.
4.	There is least risk of fire accidents	There is greater risk	very high risk or hazards, due to their highly inflammable nature
5.	They cannot be used in internal combustion engines	They can be used	They can also be used as internal combustion engine fuels.
6.	Produce ash and its disposal is big problem Smoke is also produced	No ash .. But high Carbon or aromatic liquid fuels may produce smoke	Neither ash nor smoke is produced.
7.	Calorific value is least	C.V higher	
8.	Thermal efficiency is least	higher	

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Solid fuel :

	% C	H	N	O	Calorific value
Wood	50	6	.5	43.5	4000 - 4500
Peat	57	5.7	2.0	85.3	4125 - 5400
Lignite	67	5.0	1.5	26.5	6500 - 7100
Sub bituminous Coal	77	5.0	1.8	16.2	7000 - 7500
bituminous Coal	83	5.0	2.0	10.0	8000 - 8500
Semi bituminous Coal	90	4.5	1.5	4.0	8350 - 8500
Anthracite coal	93.3	3.0	0.7	3.0	8650 - 8700

Change in composition from wood to Anthracite Coal.

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(PLAIN SHEET) | TOPIC Fuel

Solid Fuels

Wood is the primary solid fuel, it is no longer used as fuel except in forests where it is available in abundance. About 25-50% water is present in green wood which becomes 15-10% moisture after drying. The calorific value of air-dried wood is about 3,500 to 4,500 kcal/kg. It burns readily, producing a long and non-smoky flame. It leaves behind a very little amount of ash. The average composition of air dried wood is: C-50%, H-6%, O-43% Ash-1%

Coal

The origin of coal in nature is considered due to the gradual decomposition of wood and other vegetable debris under conditions of high temperature and pressure over millions of years. The nature of coal depends on the type of original deposits and on the conditions the prevailed at the different stages during the process of conversion from wood to coal. During conversion to coal the proportion of hydrogen and oxygen decreases while that of C- increases with the result that calorific value is increased.

Types of Coal →

The different kind upon their stage of coalification

1. Peat 2. Lignite 3. Bituminous 4. Anth

1. Peat :— Peat is the first of coal formation Cellulose. It is not considered as coal. It is formed by gradual decaying of vegetables matter in moist places. The colour of these upper layers is brown. It is not economical fuel due to cost involved in drying and handling. It is sometimes used as fertilizer and also as a packing material.

2. Lignite :— It forms an intermediate stage b/w Peat and coal. It is also known as brown coal. It is compact in texture and contains about 60% moisture in it. Lignite on exposure to air absorbs oxygen readily and gets ignited. These are employed as house hold and boiler fuel. Calorific value is about 6500 – 7100 kcal/kg.

The air dried lignite contains about 70% carbon and 20% oxygen. It burns with a long smoky flame. But these are better than peat. Lignite is used for manufacture of producer gas. On carbonization, lignite give tar and ammonium sulphate. Tar can be used in road making and ammonium sulphate is used as a fertilizer.

3. Bituminous coal :— This is a common coal. It is a compact black material. they show laminated structure of alternate bright

Calorific value is about 8000 kcal/kg. They are widely used in industries for making metallugical cokes, coal gas, steam preparation and in domestic heating.

On the basis of carbon content, they may be subclassified into 3 tykes.

Sub-bituminous Coal: It is homogeneous, smooth and black in colour. Carbon content is 78 -90%. the calorific value is around 6800 - 7600 kcal/kg. Like lignite it ignites easily on exposure to atmosphere. It appear like banded bituminous coal. The bands joined and can be easily split in to slabs They are non caking coals.

These are most common and widely used under the name "Koela". These are brittle. Carbon contest varies from 78- 90% calorific value on ash-free basis is about 8000 - 8500 kcal/kg. It is used in industries for making metallurgical coke, coal gas, steam raising and in domestic heating.

Semi-bituminous Coal: carbon content 90- 95%. These are used for coke-manufacture. It is the highest grade bituminous coal. Their calorific values is about 8500- 8600 kcal/kg.

(iv) Anthracite:- It is highest rank coal.

is more than 90%. They are black in colour a hard but brittle. It has lowest volatile matter and moisture, calorific value is about 8650 - 8750 Kcal/ They burn with short flame without smoke. They are used for steam raising, metallurgical processes etc.

Selection of Coal

Better Coal should have following characteristics.

1. It should have high calorific value.
2. It should have low moisture content
3. It should have low ash content.
4. It should have high calorific intensity.
5. Size of coal should be uniform.
6. Coking quality should be high.
7. It should have very low content of sulphur and phosphorous.

Requisites of a good metallurgical coke / Metallurgical Coke

metallurgical coke should have following characteristics :-

1. Purity :- Low amount of moisture, ash, sulphur & phosphorous should be present.
2. Porosity :- It should be porous so that O_2 comes in contact with coke and complete combustion take place.

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(PLAIN SHEET) | TOPIC: Carbonization

3. Apparent density – It should be high.

4. Strength and hardness – It should have high strength and hardness to withstand heavy loads in furnace.

5. Calorific value – It should be high.

6. Size – It should not be so big or so small. It should have a uniform size. If it ~~it~~ is too small it may cause choking and if the size is very big uniform heating is not possible.

7. Combustibility – Coke should burn quickly i.e It should have high combustibility.

8. Reactivity – The coke may be reactive to steam air or Co_2. With the increase in reaction temperature the reactivity towards steam increase. Whereas the reactivity towards steam decreases with increase in carbonisation temperature. High reactivity towards steam is necessary for manufacture of H_2O gas. Coke from non-caking coals are more reactive to steam than the coke from caking coal.

9. It should be of low cost.

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Liquid fuels

Liquid fuels are widely used for industrial and domestic purposes. Almost all internal combustion engines run on liquid fuels. Liquid fuels are also used in heat generation in ovens and furnace. The largest source of liquid fuels is petroleum. It is also called mineral oil. Petroleum products are obtained from the refining of crude oil.

Petroleum or crude oil is dark greenish brown or black viscous and inflammable oil found in earth's crust. It is formed from organic matters like animals, vegetables etc. buried by sand. These matters get decayed and decomposed under reducing conditions and due to increased pressure and temperature. The main constituents of petroleum are paraffins, cycloalkanes aromatic hydrocarbons, and small amount of other compounds containing S, N and O. Approximately C = 80-87%, H = 11-15%, N = 0.4 — 0.9%, S = 0.1 — 3.5%; O = 0.1 — 0.9%

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Advantages and Disadvantages in Using Liquid fuels

Advantages

1. Liquid fuels are free from ash and is clean.
2. It requires less excess air for combustion.
3. Combustion can be controlled and can be used as an economic fuel.
4. Storage and handling of liquid fuels is easy. Oils can be stored in ~~test~~ tanks and can be handled with pumps (economic)
5. Storage space required is less compared to solid or gaseous fuel.
6. The thermal efficiency of liquid fuels is higher than that of solid fuels.

Disadvantages —

1) It is more costlier than solid fuels
2) Due to high volatility and inflammability it causes fire hazards.
3) Greater care must be taken to store them in closed containers.
4) The liquid fuels which contain high Carbon and aromatic content may produce Smoke.

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Refining of Crude oil

Crude oil reaching the surface as such is of little importance and it is a viscous crude oil which usually contains mixture of solid, liquid and gaseous hydrocarbons, containing sand and water. So it refines. The crude oil obtained from earth's crust is refined by following steps.

(I) Seperation of H_2O :- Cottrell's process is used for seperation of H_2O. Crude oil is an emulsion of oil and salt H_2O. The crude is allowed to flow b/w two highly charged electrodes. The colloidal H_2O droplets combine to form bigger drops and seperates out from the oil.

(II) Removal of Sulphur compounds :- Sulphur compounds can be removed by treating it with copper oxide. S. compounds react to form copper sulphide (solid) which can be removed by filtration.

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Step III :-

Fractional Distillation :- The crude oil after the removal of H_2O and S-compounds are heated to about 400°C. Except the residue i.e. asphalt and coke, all the constituents volatilizes. These vapours are passed in a fractionating column. Fractionating column is a tall cylindrical tower containing a number of horizontal stainless steel trays. The tray is provided with a small chimney, covered with loose cap.

As the vapours rises up in the tower, they becomes cool and condense. The compounds having higher boiling points are condensed at the lower part of column where as the compounds having lower boiling fractions will condense at top of the tower.

Fraction Name	Boiling temp.	Composition Range	Applications
1. Uncondensed fuel gases	< 30°C	C_1-C_4	Domestic fuel (LPG), synthesis of organic chemicals.
2. Petroleum ether	30°C-70°C	C_5-C_7	Solvent for fats, essential oils, used in dry cleaning.
3. Gasoline or petrol or motor fuel.	40°C-120°C	C_5-C_9	As a motor fuel for I.C. engines.

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Sl. No.	Fraction name	Boiling temp.	Composition Range	Application
4.	Naptha or Solvent spirit	120°C-180°C	C_9-C_{10}	As a solvent and in dry Cleaning feed -stock for Petro -chemicals
5.	Kerosene oil	180°C-250°C	$C_{10}-C_{16}$	Illuminants, fuel for stoves for making oil gas, more volat Portion as jet fue
6.	Diesel oil	250°-320°C	$C_{10}-C_{18}$	Diesel engine fuel carbur -tting of H.C.
7.	Heavy oil	320°-400°C	$C_{17}-C_{30}$	fuel for ships metallurgica furnace, feed -stock for Cracking Processes
	On vaccum distillation heavy oil gives			
	a) Lubricating oil		$C_{17}-C_{20}$	- Lubricating oil - used in cosmati and medicine - As lubricant
	b) Petroleum Jelly			
	c) Greases		$C_{20}-C_{28}$	Lubri
	d) Paraffin wax.			wax

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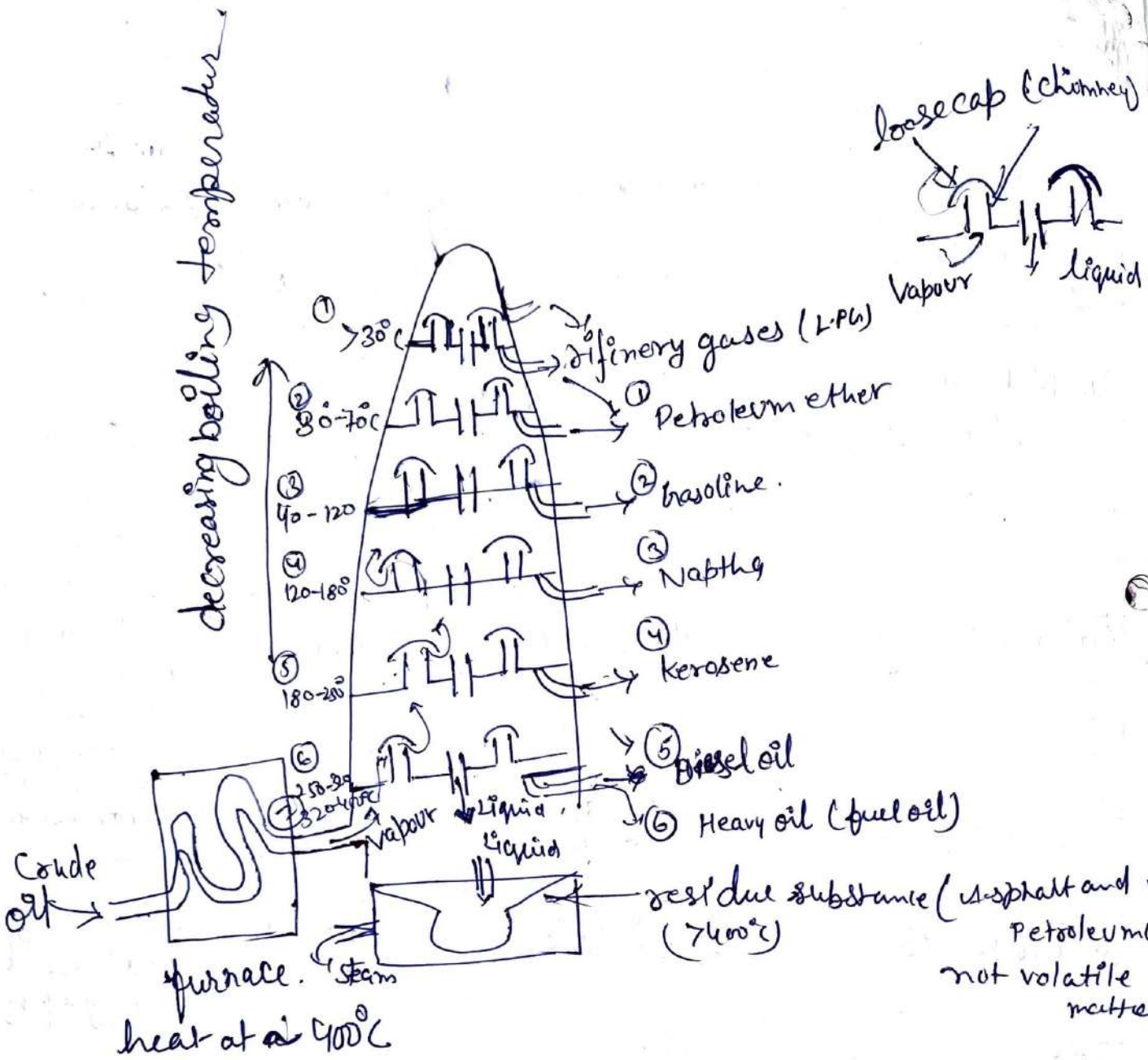

Fractional distillation of Petroleum or Crude oil.

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Name of Faculty: Meenu College: PCET Branch: ME/EC

Name of Subject with Code: Engg. chemistry 206 Dept.: Chemistry Class: I^st Year II^nd Sem.

- Synthetic Petrol

Introduction :-

A large amount of gaseous saturated and unsaturated hydrocarbons are produced as by-products by fractional distillation and cracking process. These can be processed to give gasoline which is found suitable as fuel for internal combustion engine. Such gasoline is known as synthetic petrol.

Petrol is synthesized by any of the following three methods :-

i) Polymerization
ii) Fischer - Tropsch method
iii) Bergius process.

i) Polymerisation :- In this method, smaller molecules of hydrocarbons are combined to form heavier molecule resembling gasoline.

There are two type of polymerisation -

a) Thermal polymerisation :- It is carried out at temp. ~ 500 - 600°C and P about - 70 - 350 kg/cm²

(b) catalytic polymerisation :- It is carried out at tempo 150 - 200°C, in low P and in presence of catalyst like phosphoric acid. Rate of reaⁿ is increased. Gasoline obtained by this process is high antiknoking properties than the gasoline obtain by thermal polymerisation.

(2) Fischer - Tropsch method

The raw material is the hard coke which is converted into H_2O gas ($CO + H_2$) by passing steam over red hot coke.

$$C + H_2O \xrightarrow{1200^\circ C} CO + H_2$$
(Water gas)

water gas ($CO + H_2$) mixed with H_2 is passed over Fe_2O_3 to remove H_2S, then passing over a mixture of $Fe_2O_3 + Na_2CO_3$ to remove organic S compounds. the purified gas is compressed to 5 - 25 atm. P at 200°C - 300°C then passed through a converter containing catalyst which is a mixture of -

CO (100 parts), Th (5), MgO (8) and Kieselguhur earth (200).

A mixture of saturated and unsaturated hydrocarbons.

$$n CO + 2n H_2 \longrightarrow C_nH_{2n} + n H_2O$$

$$n CO + (2n+1) H_2 \longrightarrow C_nH_{2n+2} + n H_2O$$

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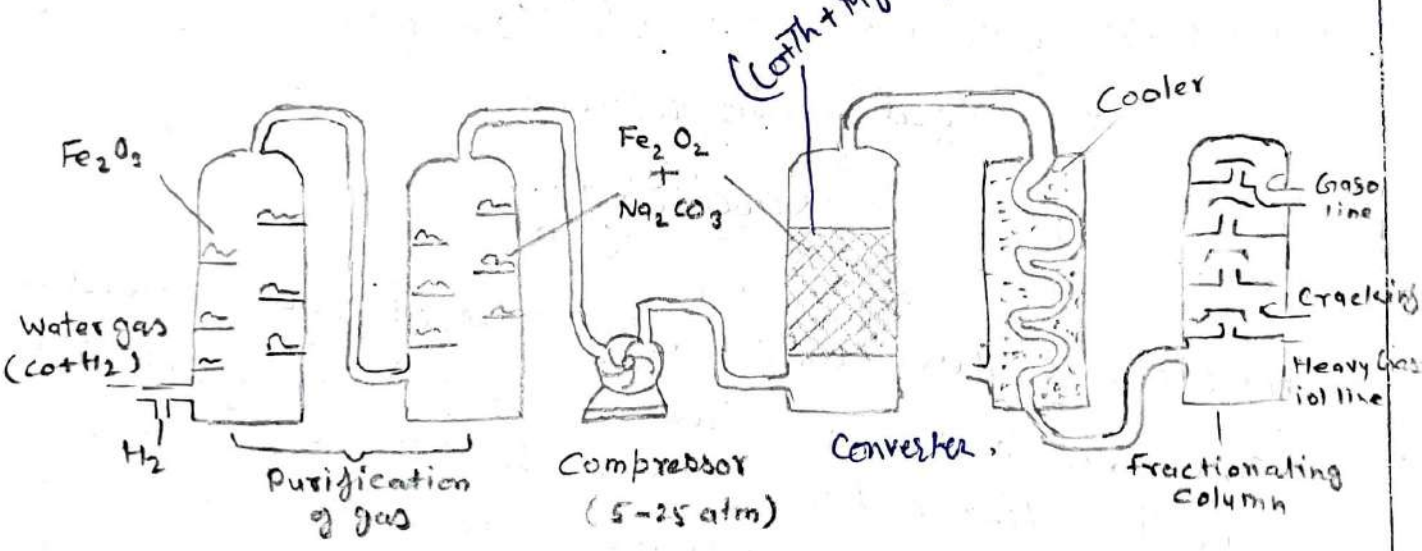
The outcoming hot gaseous mixtures from the exothermic reaction are led to a cooler, where a liquid resembling crude oil is obtained. The crude oil thus obtained is then fractionated to yield:

i) Gasoline and (ii) High boiling heavy oil

The heavy oil can be reused for cracking to get more gasoline.



Fisher - Tropsch method

(3) Bergius process :-

In this process, the low ash coal is powdered well and make into a paste with heavy oil, and catalyst (composed of Sn and Ni oleate) is incorporated.

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The paste is heated with H_2 at 450°c and 200–250 for about 1.5 hours. The coal undergoes hydrogenation form saturated hydrocarbons, which decompose at prevailing high temp. and P to yield low-boiling liquid hydrocarbons.

The resulting gases (from reaction vessel) are led to the condenser, where a liquid resembling crude oil is obtained. The liquid is then fractionated to get i) gasoline ii) middle oil and iii) heavy oil.

Heavy oil is used again for making paste with fresh coal dust. The middle oil is hydrogenated in vapour-phase in the presence of solid catalyst to yield more gasoline. The yield of gasoline is about 60% of the coal dust used.

Knocking

Gasoline is used as a fuel in the internal combustion engine. In normal case, the combustion of fuel air mixture is initiated by spark in the cylinder. As the compressed fuel air mixture burns considerable expansion take place. This results in the movement of piston and the ~~ten~~ transmission of the force to the wheels of motorcar. The ratio of the original volume of the fuel mixture, to that of final volume after compression is called compression ratio. The efficiency of engine depends upon the extent to which the fuel air mixture is compressed, higher the compression ratio (CR), higher the ~~effici~~ efficiency of the engine. But the increa

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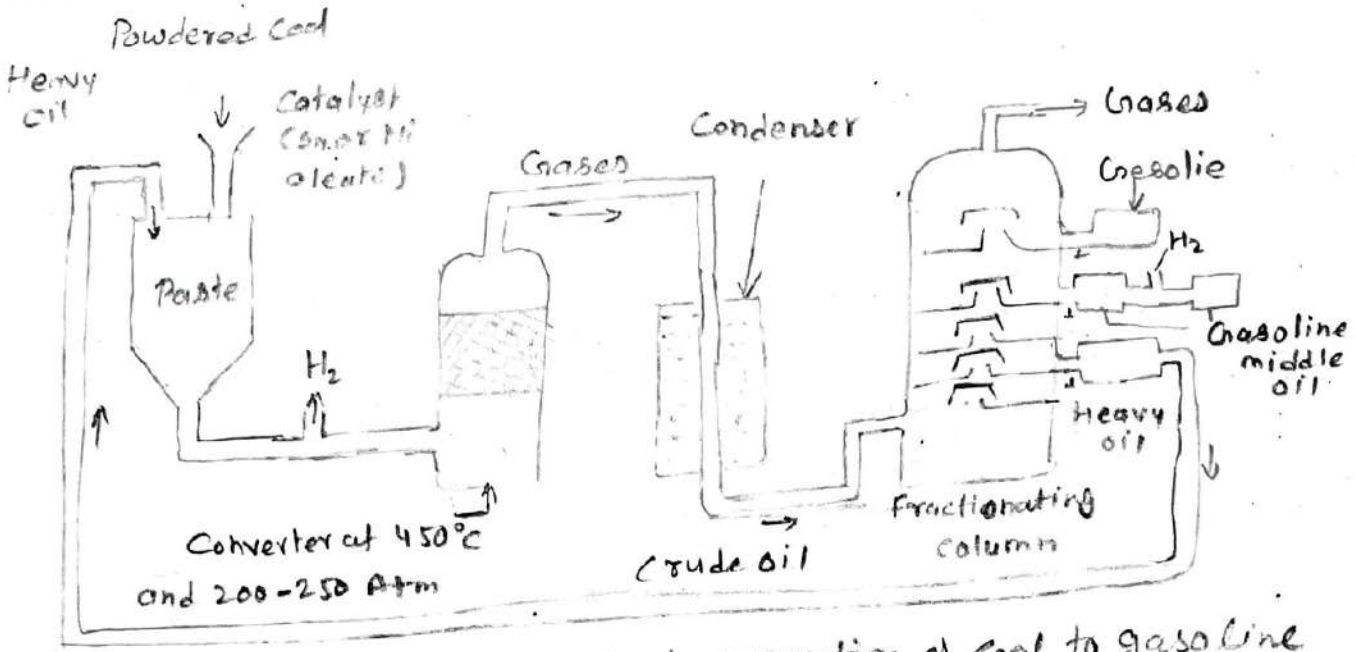
Name of Subject with Code:.....Engg Chem. 104.....Dept.:.....Chemistry.....Class:.....B.Tech. I^st Yr.



Bergius Process of hydrogeneration of coal to gasoline

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Name of Subject with Code:.....Engg. Chemistry (No.6).....Branch:.....ME/EE.....Class:.....I st year.

Introduction

Cement :- cement is essential bonding material in concrete which is most widely used non-metallic material of construction. Concrete is used for the construction of building, bridge, highways, dams, run-way etc.

Definition :- Cement is any substance which have adhesive and cohesive properties and capable of bonding materials like bricks, stones, building block etc.

Types of cement :- There are mainly six types of cements generally used in engineering construction.

i) Natural cement
ii) Pozzolana cement
iii) High Alumina
iv) Super-sulphate cement
v) Special cement
vi) Portland cement

1) **Natural cement :-** This is produced by calcining and pulverizing natural cement rocks consisting of clay and limestone.

properties :- Natural cement- posses hydraulic qualities. The setting is quick and ~~have~~ low strength

properties of Pozzolana cement :- Pozzolana cement possess hydraulic properties.

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ii) Pozzolana Cement :- This is the most ancient among the types of manufactured cements. It was first made from volcanic ash around a place called Pozzuoli in Italy.

iii) Slag cement :- It is made from hydrated lime and blast furnace slag. It is slow-setting and has lower strength. Therefore it has very limited application.

iv) Portland cement :- It is made by calcining (at about 1500°) an intimate and properly proportioned mixture of clay and lime containing raw materials. After calcination, retarder like gypsum is added. It is widely used for construction purpose.

The main varieties of portland cement are :-

A) Regular portland cement
B) modified portland cement
C) High early strength (HES) Portland cement
d) Low heat Portland cement
e) Sulphate resisting portland cement

(V) Super-sulphate Cement :- Super sulphate cement is prepared by grinding blast furnace slag with $CaSO_4$ in ratio 80 : 10 ratio. It develops high early strength and has good mechanical strength.

Propeoties of Slag cement → The rate of setting of slag cement is low. They have lower strength and hence find ... in the areas where strength is relatively unimportant.

Portland properties :- Most imp and reliable cementing ... for constructional work.

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Faculty:.....Meena Tekriwal.....College:.....PCE.....Dept:.....Chemistry.....

Subject with Code:.....Engg. Chemistry (106).....Branch:.....Class:.....1st year.....

vi) Special Cements :- These are mainly two tipkes :-

a) Quick setting cement

b) Expanding Cement

Basic Constituents and their Significance

i) Lime - Lime provides strength to cement but excess of lime reduce the strength of cement because it expands and disintegrates the cement. Lesser amount of lime makes the cement quick setting and it also reduces the cement strength

ii) Silica - Silica also provides strength to cement.

iii) Alumina - Presence of alumina makes the cement quick setting. Excess of alumina weakens the cement.

iv) Gypsum ($CaSO_4$) - Role of gypsum is actually to retard the setting action of cement. It works actually enhancing the initial setting of cement.

v) Iron oxide - Imparts colour, strength and hardness to cement.

vi) SO_3 - It is required in small proportions. Excess of SO_3 reduces the soundness of cement i.e an excessive expansion of the hardened cement paste upon storage in water or moist air.

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e of Faculty:.....Mr. R.N.A. Tekriwal.....College:.....PCNJ.....Dept:.....Chemistry

me of Subject with Code:.....Engg. chemistry (106).....Branch:.....ME/EC.....Class:...B.Tech. I^st year.

Glass

Introduction :- Glass is an important engineering material because of its certain physical and chemical properties.

Definition

Glass is hard, brittle, amorphous, transparent, supercooled highly viscous liquid. It has no sharp melting point. It is a good electrical insulator, it can absorb, reflect and transmit light it is not attacked by acids (except HF) and is a vitrified product.

Glass by view of chemical composition is:

$$x R_2O \cdot y MO \cdot 6SiO_2$$

where x and y are numbers. R stands for monovalant metal. Na or K and M stands for divalent metal. Ca Pb etc. In addition it may contain Boron and traces of transition metals

Properties.

Physical properties :-

i) They are usually transparent amorphous solids.
ii) Glass is completely vitrified product.
iii) They are hard, rigid and have no definite melting point.

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iv) They have sufficiently high viscosity (greater than 10^{13} Poise)

v) They are insulators of heat and electricity.

vi) They can incorporate colouring material, Preserving transparency.

Chemical properties :-

i) Glass is not attacked by air and oxidising agent.

ii) Ordinary glass is readily attacked by alkalies. If NaOH solution is kept in a burette for some days, stopper will stick to the socket and can not be opened.

iii) Glass is very resistant to acids (hydrofluoric acid is exception which dissolve the glass)

$$Na_2 \cdot SiO_2 + 6HF \longrightarrow 2NaF + SiF_4 + 3H_2O$$

$$CaO \cdot SiO_2 + 6HF \longrightarrow CaF_2 + SiF_4 + 3H_2O$$

iv) Ordinary glass is alkaline in nature. Thus water slowly reacts on glass to form NaOH. This reaction is enhanced in presence of acids. If bottles containing acids are kept for a long period, Silicic acid has been found to be deposited on the glass bottles.

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Name of Subject with Code:..Engg. Chemistry (1a6)...Branch:.....ME/EC.....Class:...B.Tech 1st year

Types of Glass and Uses

1) Sodaline or soft Glass :-

The raw materials are Silica (sand), $CaCO_3$ and Soda ash. their approx. composition is $Na_2O.CaO.6SiO_2$. They are low in cost, resistant to devitrification and relatively resistent to water. Such glasses can be attacked by common reagent like acids.

Uses :- Widely used as window glasses, electric bulbs, bottles, building blocks and cheaper table wares etc.

2). Potash-lime or hard Glass :-

Obtained from silica, $CaCO_3$ and K_2CO_3. It's composition is $K_2O.CaO.6SiO_2$. Posses high M.P, fuse with difficulty and are less attacked by acids, alkalis and other solvents.

Uses :- These glasses are used for chemical apparatus, combustion tubes, etc.

3) Lead Glass or Elint Glass

It's made by PbO, instead of CaO, for fusing together with silica. It's approx. composition is $K_2O.PbO.6SiO_2$

It is more expansive than other 1-3 Glasses. It has high refractive index and excellent electrical properties.

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Uses

Lead glasses are used for high-quality table ware, optical purposes, Cathode ray tubes, electrical insulators and in art objects, because of their high lustre. high dens lead glasses used for shield to protect from X-Rays and γ-rays in medical and ~~of~~ atomic energy fields respectively.

4. Borosilicate Glass :-

These glasses contain only Silica and boron, with a small amount of alumina and some alkali oxides. approx. composition is -

SiO_2 (80%) B_2O_3 (13·5%) Al_2O_3 (3%) K_2O (3%) Na_2O (0·5%)

Borasilicate glasses have high softening points and excellent resistivity.

Uses

They are used extensively in industry for pipelines for corrosive liquids, superior lab. apparatus, kitchenwares, T.V tubes, electrical insulators, gauge glasses and in chemical plants.

5. Vitreasil (99.5% Silica glass)

It is produced by heating pure sand (SiO_2) to its M.P because of absence of fluxing agents, it is difficult to get rid of all air bubbles. Final product is translucent and Softening temp. is about 1650°C

When it heated above its M.P it become transparent known as 'clear Silica glass'.

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USES

It is mainly used for chemical plants furnaces chemical laboratory wares, electrical insulating materials in electrical heaters etc.

7. **Safety Glass**

It is made by taking two or three flat sheets of glass and in between them alternate thin layer of vinyl plastic is introduced and subjected to slight pressure then heated, till the glass layers and plastic layers merge into one another to give a sandwich.

Uses

It is mostly used in automobile and aeroplane industries as wind shields, etc.

8.) **Optical Glasses (Crooke's Glasses)**

Optical or crookes glasses contain phosphorous and lead silicate, together with a little cerium oxide. These optical glasses have low M.P and relatively soft.

Uses:- They are used for making lenses.

9.) **Polycrystalline Glass**

Polycrystalline glass or Pyroceram is produced by adding one or more nucleating agent to conventional glass batch which is then shaped into a desired forms. The material is

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then subjected to a controlled heat-treatment. It exhibits high strength and considerable hardness and can be formed and shaped into articles by moulding.

10. Toughened Glass

It is made by dipping articles still hot in an oil bath, so that some chilling may take place. Such a glass is more elastic and capable of withstanding mechanical and thermal shocks. When such a glass breaks, does not fly, but a fine powder is formed.

Uses It is used for window shields of fast moving vehicles, window shields of furnaces, automatic opening doors etc.

11. Insulating Glass

It is prepared by using two or more plates of glass seperated by 6-13 mm thick gap, filled with air then, sealing around the edges. It does not transmit heat and the apartments will remain cool, during summer and warm, during winter.

12. Wired Glass

It is formed by inserting a wire mesh at the centre of the glass sheet, during Casting. fire resistant.

Uses For making fire resisting doors, windows, roofs etc.

13. Laminated Glass. It is made by sandwiching glass sheet with one or more alternative layer of.

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- bonding materials. Two types — ① shatter proof ② shock proof.

Uses - As an ideal material for use as safety in aircrafts, automobiles, helicopters, submarines etc.

14. Neutral Glasses

Includes glasses which are highly resistant to chemical attack and are used in the manufacture of syringe.

15. Glass wool.

It is a fibrous wool-like material, composed of intermingled fine threads or filaments of glass. It has low density and its tensile strength is about eight times that of steel.

Uses — It is used for insulation (sound, heat, metal pipelines, motors, vaccum cleaners, roofs of houses etc) used for filtration of corrosive liquids like acid and acidic solutions.

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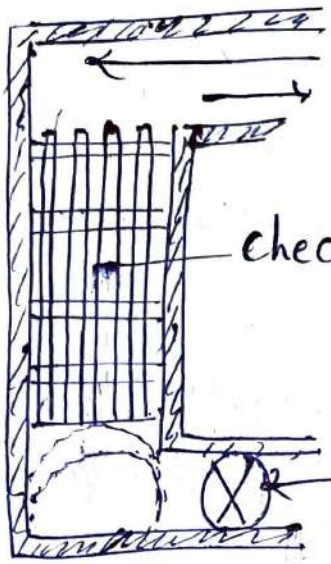
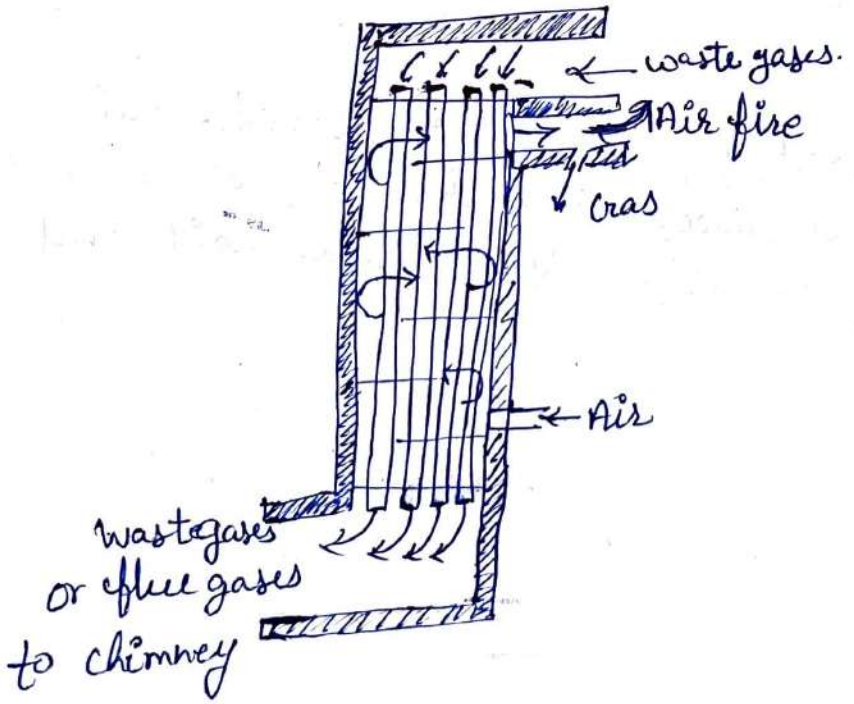
(1) Regenerator :-



(2) Recuperator :-



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Name of Faculty: Meena Tekriwal College: PCE Branch: me/ee

Name of Subject with Code: Engchemistry (106) Dept.: chemistry Class: B.Tech 1st year

Disinfection or sterilization

Vitrification :- Glass has the characteristics of a transparent amorphous solid. As the glass is formed by heating the ingredients, a transparent mobile (viscous) liquid is formed. The liquid on slow cooling assume the form of a transparent or translucent amorphous solid. The whole process of not forming the crystalline solid is called vitrification and opposite process is crystallisation of glass is known as devitrification. It is to be avoided since the devitrified glass loses plasticity and hence, the ability to be shaped.

Normally cheap glass which is usually unannealed and glass containing some nuclei for helping the deposition of crystallisation, gradually and slowly undergoes devitrification. The devitrification may also result from very slow cooling.

Effect of different constituent in glass :-

1) Alkali oxides, Na_2O as fuses and facilitates the melting of silica and reduces viscosity but resistance to chemicals, weathering and H_2O are greatly reduced. High % of silica produces best glass but it increases (1723°C) and viscosity on melting is very [illegible]

but add^{n} of 25% Na_2O to SiO_2 reduces its M.P to 8
but makes it H_2O soluble. the alkaline earth
metal oxide like lime (CaO), make glass resistent
to H_2O, weathering and chemicals. the SiO_2, soda and
lime are most widely used raw materials in glass manu
-facture. the common glass is made by these raw materia
and is k/a soda lime glass.

(2) K_2O :- increases the softening and makibe temperat

(3). Alkaline earth metal oxides :- Lime (CaO) makes glass
resistant to H_2O, weathering and chemicals.

(4) PbO - It increased the refractive index of glass.
hence glass containg PbO is used for optical purpos
and suitable for making brilliant-cut glass wares and
crystals. So it used to make electrical light bulbs

(5) B_2O_3 — It increases resitance to chemical attack
and also increases the hardness and refractory character
of glass. like Borosil, Pyrex and Jena glasses are boro-
-silicate glass, used for making high class labora-
-tory wares.

(6) Fe_2O_3 - Due to presence of Fe_2O_3 and FeO ordinary
glass is unable to transmit u.v light. Using iron
free raw material; the glass capable of transmitting
u.v light.

Raw material

① Na_2CO_3 ② $CaCO_3$ ③ Sand (SiO_2) quartz.

④ Borax. ($Na_2B_4O_7 \cdot 10H_2O$)

⑤ Litharge or red Pb (Pb_2O_3)

⑥ modifiers. (Alkalis)

⑦ melting and refining agent (Carbon, CaF_2, As_2O_3, NaCl)

⑧. Colouring and decolouring agents

⑨. Cullet (broken peices of glass which ... glass

10) Opalizing agents = which permit ... on the normal way.

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Name of Subject with Code: Engg. Chemistry (105) Branch: EE/EC Class: B.Tech I st year

MANUFACTURE OF GLASS

Introduction

To manufacturing glass raw material added in Tank furnace. And then by some manufacturing steps. Glass are formed.

Raw materials used for manufacture of Glass.

(a) Sodium is Soda, (Na_2CO_3) {soft Glass}
(b) Potassium is Potash K_2CO_3 (Hard Glas)
(c) Calcium are limestone, chalk and lime
(d) Lead are litharge and red lead (Flint glass)
(e) Silica are quartz, white sand, and ignited flint
(f) Zinc is Zinc oxide (heat and shock proof glass)
(h) Cullets or pieces of broken glass to increase the furibility.
(i) Colours - Yellow (ferric salt), Green (Cr^{3+} and Fe^{2+} salt), Blue (Co^{2+}) Purple (MgO_2); Red - (Ni^{2+} salts or Cu_2O) Lemon yellow (CdS) milky white - Cryolite (Na_3AlF_6) or Ca_3POw_2.

Manufacturing steps

1. melting steps
2. Forming and shaping
3. Annealing Process
4. Finishing

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(1) MELTING.

It can be carried out in —

1) Pot furnace { Regenerative, Recuperative.

2) Tank furnace { Regenerative, Recuperative.

The raw materials are mixed in proper proportions and mixed with cullets. These are finely powdered and mixture called batch is fused in tank in the open hearth furnace. Heating is done by burning producer gas and air mixture over the charge.

The reactions taking place are given below -

a) For Soda Glass (Soft Glass) (Batch - Na_2CO_3, $CaCO_3$, SiO_2)

At $<600^\circ C$ moisture. oxides of As, Pb, B etc. and cl of Na, K etc evaporated.

At $700-900^\circ C$ $Na_2CO_3 + SiO_2 \longrightarrow Na_2SiO_3 + CO_2$

$900-960^\circ C$ $CaCO_3 \longrightarrow CaO + CO_2$

$1100^\circ C$ $CaO + SiO_2 \longrightarrow CaSiO_3$.

b) Flint Glass: (Batch - Pb_3O_4; K_2CO_3, SiO_2)

At $600^\circ C$ $Pb_3O_4 \longrightarrow 3PbO + O$

$650-730^\circ C$ $PbO + SiO_2 \longrightarrow PbSiO_3$

$750^\circ C$ $K_2CO_3 + SiO_2 \longrightarrow K_2SiO_3 + CO_2$

At $850^\circ C$ $PbSiO_3$ dissolve in K_2CO_3.

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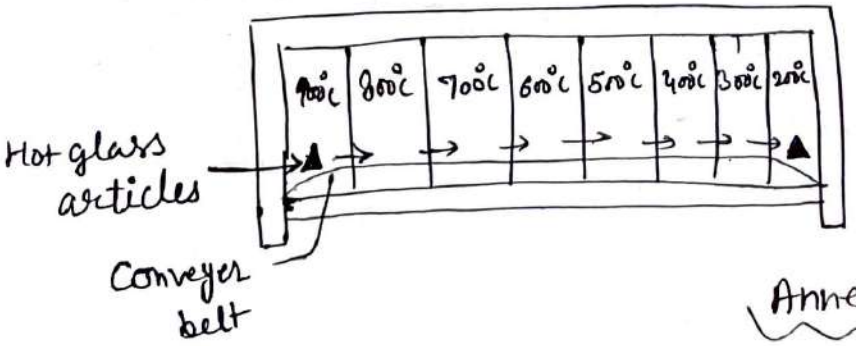
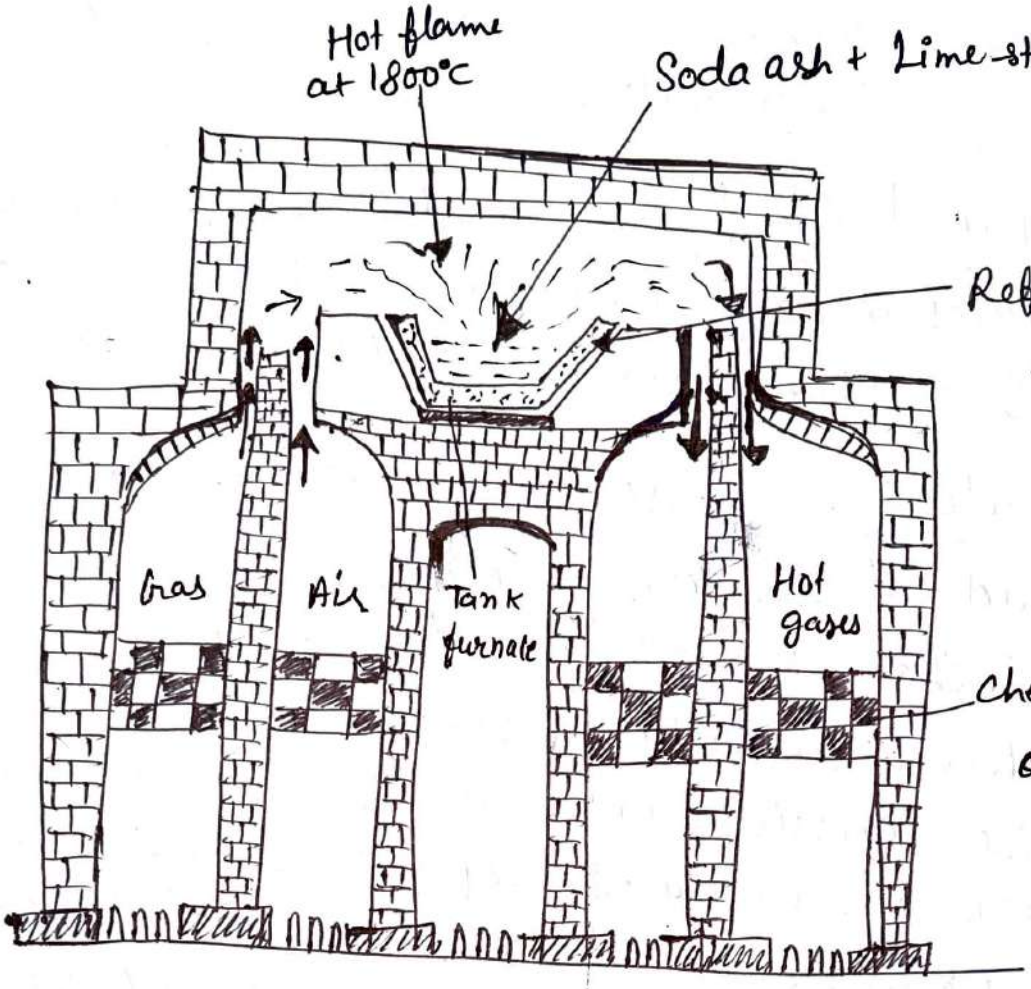
(ii) **Forming and Shaping** - Molten glass is then worked into articles of desired shapes by either blowing or moulding or pressing between rollers.

(iii) **Annealing** - Glass articles are then allowed to cool gradually to room temperature by passing through different chambers with descending temperatures. If allowed to cool rapidly, glass being bad conductor of heat, the superficial layer cools down first; leaving the interior portion in a state of strain. Owing to this unequal expansion, the articles are likely to crack to pieces. So the longer annealing period, the better the quality of the glass.

(iv) **Finishing** - All glass articles, after annealing, are subjected to finishing processes such as cleaning, grinding, polishing, cutting, sand-blasting etc.



Annealing process.



Manufacture of glass in tank furnace.

*

Pot furnace – A number of different types of glasses, are handled at a time in different pots.

* Tank furnace – At one time, only one types of glasses, ~~are handled at a time~~ is produced but in large scale.

[** Regeneration :- Utilization of heat of waste gases for heating the incoming fuel gas and air. The directions of passes of waste gases and fuel gases are changed.

** Recuperation :- The heat of waste gases is utilized in heating the furnace. But the incoming gases flow continuously in one direction.

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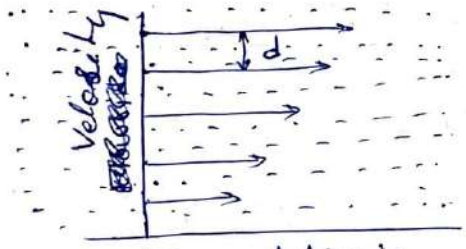
Name of Subject with Code: Engg. chemistry 04 Dept.: chemistry Class: B.Tech 1st year

Viscosity :-

"It is the property of a liquid or fluid by virtue of which it offers resistance to its own motion or flow." It is flowing capacity of any fluid (liquid) which arises due to cohesive force existing between the molecules of liquid. When a liquid flows on a surface at a steady rate, its flow actually consists of a flow of series of parallel layers moving one above the other. Velocity of different layers are also different. The top layer moves faster than the next lower layer due to internal friction.



Flow of liquid

Let us consider a flowing liquid whose two adjacent layers separated by a distance 'd' moves with a relative velocity difference 'V'. To maintain their velocity difference the force 'F' required per unit area is :

$F = \eta \frac{V}{d}$ where, η = Viscosity Coefficient.

When $d = 1$ cm and $V = 1$ cm/sec.

Then, $F = \eta$

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Hence, coefficient of viscosity may be defined as the force required per unit area to maintain a difference of 1 unit velocity in the two adjacent layer of a liquid separated by 1 cm.

Unit of viscosity : Unit of viscosity is poise of centi poise.

Kinematic Viscosity :

The viscosity which is measured by determining time of the flow of a given quantity of liquid from a given height, through a calibrated capillary tube under its own weight is called kinematic viscosity.

Significance of viscosity :

viscosity is the main property of lubricant, as it determines the operating characteristic of the lubricant.

(1) If viscosity is too high, excessive friction due to the shearing of oil itself would result and the heat would be generated in the system.

(2). If viscosity is too low, a liquid oil film can't exist between two metal surfaces. This may cause excessive wear.

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Determination of Viscosity :

The viscosity of an oil is measured by an apparatus called viscometer. Mainly three types of viscometers are used :

(1). Redwood viscometer
(2) Engler viscometer
(3) Saybolt viscometer

Viscosity is measured in terms of time (in seconds) taken by the oil to flow through a particular standard apparatus used. Commonly Redwood viscometers are used.

Redwood viscometer (RW) : These are of two types :

(A) Redwood viscometer No. 1
(B) Redwood viscometer No. 2

Both are similar in principle, shape and working. They differ in dimensions of orifice.

Viscometer	Diameter of the orifice	Length of the jet	Used for
RW 1	1.62 mm	10 mm	Low viscous oil
RW 2	3.8 mm	50 mm	Highly viscous oil

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The essential parts of RW 1 are given below:

(A) Oil cup: It is a silver plated brass cup which is open at the upper end. The bottom of the cylinder is fitted with an agate jet that can be kept closed or open by a valve rod fitted with a ball made of brass. The lid of the cup is provided with a thermometer which indicates the oil temperature.

(B) Heating bath: oil cup is surrounded by a cylindrical copper bath containing water (water bath) having an outlet for taking out water and a thermometer that indicates the temperature of water.

(C) Stirrer: A stirrer, carrying four blades is fitted in water bath for maintaining the uniform desired temperature.

(D) Levelling screws: The entire apparatus rests on three legs provided at their bottom with levelling screws.

(E) Kohlrausch Flask: It is a special type of receiver for receiving the oil. Its capacity is 50 ml to the mark in its neck.

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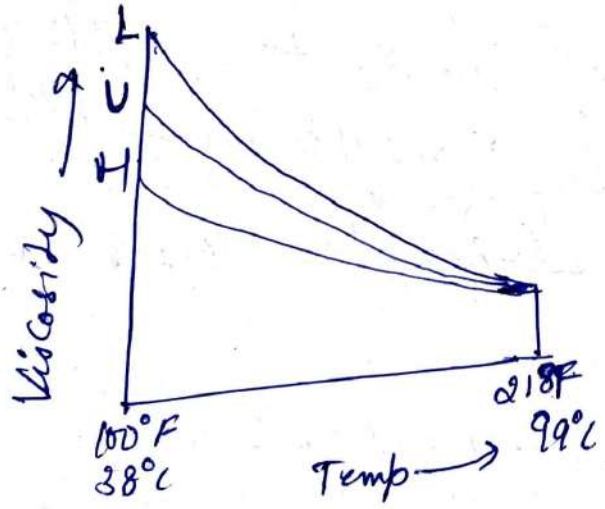
Name of Subject with Code:.....Engg chem. 104.....Dept.:.....Chemistry.....Class:.....B.Tech.

Variation of viscosity with temperature.

Viscosity Index :- Viscosity of lubrication oil is Inversely proportional to temperature because as the temp. increases the intermolecular force decreases and hence the viscosity decreases and fluidity increases.

The rate change of viscosity with temp. is expressed by an arbitrary scale known as viscosity index (V.I) which may be defined as the avg decrease in viscosity per degree rise of temperature between 100°F and 210°F or 38°C to 99°C.



Variation of viscosity with temp.

Determination of viscosity Index :-

Viscosity of an oil is determined with the help of type index.

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of standard oils. One type is Pennsylvanian or 'H' oil (Containing straight chain paraffins) with high viscosity index and the other one is Gulf oils or 'L' oils (containing naphthalenes) and assigned low viscosity index V.I 100 and 0 respectively.

Thus V.I of an oil 'x' is -

$$V.I = \frac{L - U}{L - H} \times 100$$

L = Viscosity of gulf oil at 38°C or 100°F

U = Viscosity of under test oil at 38°C or 100°F

H = Viscosity of Pennsylvanian oil at 38°C or 100°F

In case of most lubricants, V.I ranges from -50°C to +110°C

Significance of viscosity index →

1. If the viscosity of an oil changes with temp low. K/a ~~high~~ V.I

2. If the viscosity of an oil does not change very much with respect to temp. called high viscosity Index oil. good lubricant ~~of~~ that high V.I.

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To improve V.I. Certain V.I improvers are added to the oil. Viscosity index improvers are high Polymers such as Polybutene.

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Name of Subject with Code: Engg. Chem. 104 Dept.: Chemistry Class: B.Tech I st year

Emulsification :

It can be defined as the property of oil to get intimately mixed with water forming a mixture called emulsion.

Emulsions are of two types :

(A) Oil in water emulsion

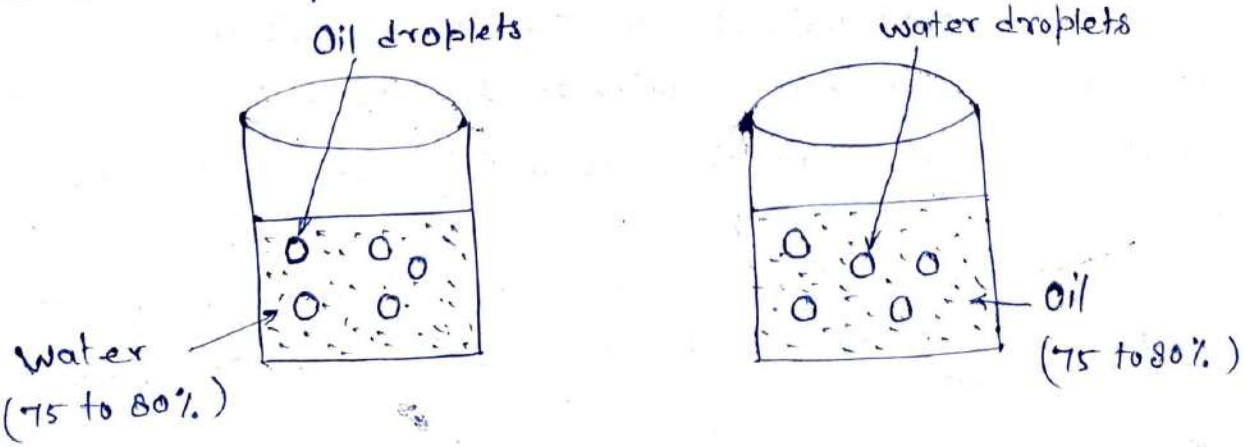
(B) water in oil emulsion

O/W type emulsion :

In which oil is dispersed phase and water is dispersion medium. Such emulsions are used as coolant as well as lubricant for cutting tools in I.C engines and diesel motor pistons.

W/O type emulsion :

In which water is the dispersed phase and oil is the dispersion medium. These emulsions have higher viscosity than that of oil from which they are prepared. Such emulsion are used in compressors and as fire resistant hydraulic fluids.



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Name of Faculty: meena College: PCE Branch: ME/EE

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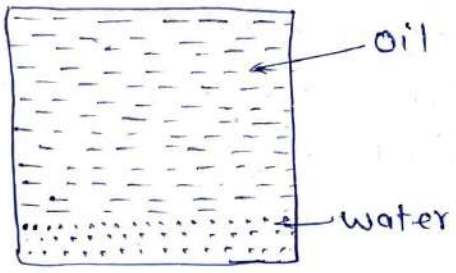
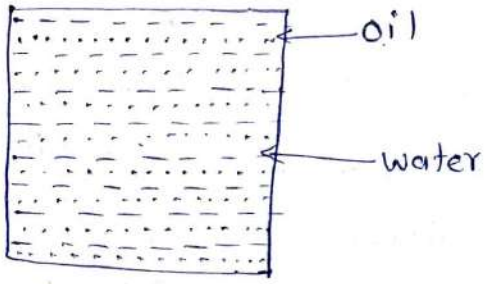
Significance :

Emulsions are capable to collect dirt, dust, foreign matter etc. thereby causing abrasion and wearing out of the lubricated parts of the machinery. Thus a good lubricating oil should form such an emulsion with water which breaks easily (demulsibility). This property is called emulsification.



Good Demulsibility
(water and oil separation quickly)



Poor Demulsibility
(water and oil do not separate quickly)

For example :.

1. oil along with steam can clog the oil lines and pumps. Thus, when the oil mixed with steam, the quicker the oil separtes out from emulsion formed, better is the lubricating oil.

2. Higher the E.N. better is the oil for application. In cutting operations, emulsion acts as coolant and lubricant also.

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" The time in seconds in which oil and water separate out in distinct layer is called steam emulsion number (S.E.N.) or demulsification number." A good lubricating oil should have low S.E.N.

Determination of S.E.N. :

S.E.N. of a lubricating oil can be determined by A.S.T.M. test. In this test, 20 ml of oil is taken in a test tube and steam at 100°C is bubbled through it till the temperature in raised to 90°C. The tube is then placed into the bath maintained at 90°C and the time in seconds is noted. When the oil and water separates out in distinct layers. This is the S.E.N. of that lubricating oil.

Precipitation Number :

Crude oil contains non-volatile constituents which on distillation concentrate in the residual products. Before using for lubrication, it is, therefore, essential to determine asphaltic number in terms of precipitation number.

The number of millilitres of asphaltic precipitate formed when 10 milliliters of petroleum - lubricating oil is mixed with 90 ml of a special quality petroleum naphtha and then centrifuged.

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Determination of Precipitation number; ASTM Method :

A definite volume of oil and precipitation naptha are heated in a prescribed Caliberated tube and then centrifuged at a rate of 600-700 rpm. The volume of asphalt or sludge present in oil, is packed at bottom of the tube due to centrifugal force and the amount is measured from the calibration on the tube.

Low solubility of asphalt in naptha is the basis for the precipitation test.

Significance :

It is used to determine the quantity of asphalt in petroleum - lubricating oil such as Steam cylinder Stocks, black oils and other lubricating oils.

Black oils used for lubricating gears have moderately high precipitation number.

filtered products such as bright stocks used in motor oils as negligible asphalt or low precipitations number.

Disadvantage :

Compactness of precipitate is not the same for all type of oils.

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Roll No.	Name of Students	Q.1	Q.2	Max. Marks
		15	20	35
		CO1	CO2	marks obtained
20/A/01	Aaradhaya Khandelwal	14	19	33
20/A/02	Aashita Jain	15	18	33
20/A/03	ABHAY PRATAP SINGH SAMBYAL	A	A	A
20/A/04	Abhay Singh Rathore	13	18	31
20/A/05	Abhilasha Chakraberty	13	17	30
20/A/06	Abhinav Anand	14	17	31
20/A/07	Abhishree Mundra	13	0	13
20/A/08	Adesh Shrivastav	13	16	29
20/A/09	Adit Jain	11	15	26
20/A/10	Aditya Kumar	11	16	27
20/A/11	Aditya Mishra	12	15	27
20/A/12	Aditya Nair	9	0	9
20/A/13	Amrit Agarwal	15	17	32
20/A/14	Akshat Gupta	12	17	29
20/A/15	Aman Choubey	12	16	28
20/A/16	Aman Goyal	11	16	27
20/A/17	Aman Kumar Singh	11	17	28
20/A/18	Amar Singh	10	16	26
20/A/19	Amit Mishra	10	16	26
20/A/20	Anchal Jain	14	18	32
20/A/21	Anjali Garg	14	19	33
20/A/22	Ankit Kumar	11	16	27
20/A/23	Anshul Sharma	10	14	24
20/A/24	Anshul Sharma	0	13	13
20/A/25	Anshuman Singh	11	15	26
20/A/26	Anubhav Anand	9	12	21
20/A/27	Anupam Anand	10	15	25

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20/A/28	Anurag Kumar	8	15	23
20/A/29	Anush Jain	9	14	23
20/A/30	Anvi Sahu	9	17	26
20/A/31	Arpit Gupta	12	16	28
20/A/32	Aryan Nama	11	19	30
20/A/33	Aryan Rana	13	15	28
20/A/34	ASHISH KUMAR PRAJAPATI	12	18	30
20/A/35	Ashutosh Upadhyay	11	19	30
20/A/36	Astha Sharma	14	18	32
20/A/37	Atharav Porwal	14	17	31
20/A/38	Avinash Dubey	13	16	29
20/A/39	Ayush Baluni	10	17	27
20/A/40	Ayush Jain	11	14	25
20/A/41	Ayush Singhal	12	16	28
20/A/42	Ayushi Gupta	13	17	30
20/A/43	Bharti Gupta	14	16	30
20/A/44	Bhavit Chaudhary	13	19	32
20/A/45	Bhavya Agarwal	14	17	31
20/A/46	Bhavya Lohami	13	16	29
20/A/47	Chaitanya Khurana	14	16	30
20/A/48	Chandan Jangir	12	16	28
20/A/50	Chetan Sharma	A	A	A
20/A/51	Daksh Kardam	13	17	30
20/A/52	Deepak Dayma	14	18	32
20/A/53	Deepak Kumar	A	A	A
20/A/54	Deepak Kumar Tiwari	14	18	32
20/A/55	Dev Soni	11	12	23
20/A/56	Devendra Singh Rao	13	18	31
20/A/57	Devesh Sharma	14	18	32
20/A/58	Dhruv Gaur	10	0	10
20/A/59	Divyansh Agarwal	12	18	30

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20/A/60	Divyanshi Choudhary	12	16	28
20/A/61	Divyanshu Tailor	14	17	31
20/A/62	Esha Kapoor	12	18	30
20/A/63	Fardeen Alam	15	19	34
20/A/64	Farhan Khan	12	15	27
20/A/65	Gagan Sharma	11	16	27
20/A/66	Gauransh Sharma	A	A	A
20/A/67	Gaurav Agrawal	12	16	28
20/A/68	Gaurav Parihar	13	14	27
20/A/69	Gautam Sharma	12	A	12
20/A/70	Gourav Joshi	13	17	30
20/A/71	Gunank Bansal	11	16	27
20/A/72	KHUSHI AGARWAL	14	18	32

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POORNIMA
COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 23-12-2020**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Assignment-I

Max. Marks=35 **Time: 2 hour**

S. NO.	CO	PO	Marks	QUESTIONS
1	1	1	3	What are the Ion exchange resins? Give its Structure.
2	1	1	3	What are the different boiler troubles, give their names?
3	1	1	3	What is annealing of glass?
4	1	1	3	Define Priming and foaming with its causes and prevention.
5	1	1	3	Describe role of Gypsum in Portland cement with chemical reaction involved.
6	2	1	4	The EDTA method was used to find out permanent & temporary types of hardness in given used water sample. Following observations are recorded- (I) **45 ml** of EDTA solution was consumed by **100 ml** of standard hard water **1.5 mg** of $CaCO_3$ per ml. (II) **100 ml** water sample used up **2 ml** of EDTA solution (III) **100 ml** water sample after boiling, filtering etc. used up **10 ml** EDTA solution.

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7	2	1	6	Calculate the amount of lime and soda required for softening 30,000 liters of hard water which was analyzed as follows - Analysis of raw water Analysis of treated water Ca^{+2} = 400 ppm, OH^{-}- = 34 ppm, HCO_3- = 158.6 ppm CO_3^{2}- = 30 ppm, Mg^{+2} = 288 ppm, $FeSO_4.7H_2O$ = 139 ppm. CO_2 = 88 ppm Purity of lime is 94% and that of soda is 86% Explain the steps with equations.
4	2	1	10	What is the water softening? Explain water softening by lime soda method and compare this method by other methods of water softening.

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Roll No.	Name of Students	Q.1	Q.2	Max.Marks
		5	10	15
		CO-1	CO-2	obtained
20/A/01	Aaradhaya Khandelwal	4	9	13
20/A/02	Aashita Jain	4	10	14
20/A/03	ABHAY PRATAP SINGH SAMBYAL	A	A	A
20/A/04	Abhay Singh Rathore	5	8	13
20/A/05	Abhilasha Chakraberty	5	8	13
20/A/06	Abhinav Anand	4	7	11
20/A/07	Abhishree Mundra	5	8	13
20/A/08	Adesh Shrivastav	4	7	11
20/A/09	Adit Jain	4	7	11
20/A/10	Aditya Kumar	4	7	11
20/A/11	Aditya Mishra	A	7	7
20/A/12	Aditya Nair	4	7	11
20/A/13	Amrit Agarwal	5	9	14
20/A/14	Akshat Gupta	3	8	11
20/A/15	Aman Choubey	3	8	11
20/A/16	Aman Goyal	3	7	10
20/A/17	Aman Kumar Singh	3	7	10
20/A/18	Amar Singh	3	8	11
20/A/19	Amit Mishra	4	7	11
20/A/20	Anchal Jain	4	9	13
20/A/21	Anjali Garg	3	9	12
20/A/22	Ankit Kumar	3	7	10
20/A/23	Anshul Sharma	2	6	8
20/A/24	Anshul Sharma	A	A	A
20/A/25	Anshuman Singh	3	7	10
20/A/26	Anubhav Anand	3	6	9

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20/A/27	Anupam Anand	4	6	10
20/A/28	Anurag Kumar	3	A	3
20/A/29	Anush Jain	3	7	10
20/A/30	Anvi Sahu	3	8	11
20/A/31	Arpit Gupta	4	8	12
20/A/32	Aryan Nama	5	9	14
20/A/33	Aryan Rana	4	7	11
20/A/34	ASHISH KUMAR PRAJAPATI	4	9	13
20/A/35	Ashutosh Upadhyay	4	8	12
20/A/36	Astha Sharma	4	9	13
20/A/37	Atharav Porwal	3	8	11
20/A/38	Avinash Dubey	3	8	11
20/A/39	Ayush Baluni	4	7	11
20/A/40	Ayush Jain	3	8	11
20/A/41	Ayush Singhal	4	7	11
20/A/42	Ayushi Gupta	4	10	14
20/A/43	Bharti Gupta	4	7	11
20/A/44	Bhavit Chaudhary	3	8	11
20/A/45	Bhavya Agarwal	3	8	11
20/A/46	Bhavya Lohami	4	8	12
20/A/47	Chaitanya Khurana	4	9	13
20/A/48	Chandan Jangir	3	8	11
20/A/50	Chetan Sharma	A	A	A
20/A/51	Daksh Kardam	A	8	8
20/A/52	Deepak Dayma	4	9	13
20/A/53	Deepak Kumar			
20/A/54	Deepak Kumar Tiwari	4	9	13
20/A/55	Dev Soni	3	7	10
20/A/56	Devendra Singh Rao	4	8	12
20/A/57	Devesh Sharma			0
20/A/58	Dhruv Gaur	3	8	11

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20/A/59	Divyansh Agarwal	4	7	11
20/A/60	Divyanshi Choudhary	4		4
20/A/61	Divyanshu Tailor	3	8	11
20/A/62	Esha Kapoor	4	8	12
20/A/63	Fardeen Alam	4	8	12
20/A/64	Farhan Khan	4	7	11
20/A/65	Gagan Sharma		7	7
20/A/66	Gauransh Sharma	3	7	10
20/A/67	Gaurav Agrawal			0
20/A/68	Gaurav Parihar	3	6	9
20/A/69	Gautam Sharma	3	8	11
20/A/70	Gourav Joshi	3	9	12
20/A/71	Gunank Bansal	4	8	12
20/A/72	KHUSHI AGARWAL	3	8	11

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POORNIMA
COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 26-12-2020**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Class test-I

Max. Marks=15 **Time: 1 hour**

S. NO.	**CO**	PO	Marks	QUESTIONS
1	**1**	1	2	What is water softening? Explain the basic principle of Lime Soda Method.
2	**1**	1	3	What are the Ion exchange resins? Give its Structure.
3	**2**	1	2	Differentiate dry mixing and wet mixing process of cement manufacturing.
4	**2**	1	3	If 32 ml. of standard hard water containing 0.6 mg of pure $CaCO_3$ per ml of water and consumed 13 ml of EDTA. 32 ml of water sample consumed 9 ml of EDTA using EBT as indicator. Calculate the total hardness of water sample.
5	**2**	1	5	How cement is manufactured by Rotary kiln process? Explain with chemical reactions and neat diagram of rotary kiln.

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Attainment table for CO-1:1FY2-03

	CO1: 1FY2-03: Attainment Table					
S. No.	Student	Assignment 15	Class Test 5	Total 20	% 0f Marks	Level of Attainment
1	Aaradhaya Khandelwal	14	4	18	90	3
2	Aashita Jain	15	4	19	95	3
3	ABHAY PRATAP SINGH SAMBYAL					
4	Abhay Singh Rathore	13	5	18	90	3
5	Abhilasha Chakraberty	13	5	18	90	3
6	Abhinav Anand	14	4	18	90	3
7	Abhishree Mundra	13	5	18	90	3
8	Adesh Shrivastav	13	4	17	85	3
9	Adit Jain	11	4	15	75	3
10	Aditya Kumar	11	4	15	75	3
11	Aditya Mishra	12		12	80	3
12	Aditya Nair	9	4	13	65	3
13	Amrit Agarwal	15	5	20	100	3
14	Akshat Gupta	12	3	15	75	3
15	Aman Choubey	12	3	15	75	3
16	Aman Goyal	11	3	14	70	3
17	Aman Kumar Singh	11	3	14	70	3
18	Amar Singh	10	3	13	65	3
19	Amit Mishra	10	4	14	70	3
20	Anchal Jain	14	4	18	90	3

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21	Anjali Garg	14	3	**17**	**85**	**3**
22	Ankit Kumar	11	3	**14**	**70**	**3**
23	Anshul Sharma	10	2	**12**	**60**	**3**
24	Anshul Sharma					
25	Anshuman Singh	11	3	**14**	**70**	**3**
26	Anubhav Anand	9	3	**12**	**60**	**3**
27	Anupam Anand	10	4	**14**	**70**	**3**
28	Anurag Kumar	8	3	**11**	**55**	**2**
29	Anush Jain	9	3	**12**	**60**	**3**
30	Anvi Sahu	9	3	**12**	**60**	**3**
31	Arpit Gupta	12	4	**16**	**80**	**3**
32	Aryan Nama	11	5	**16**	**80**	**3**
33	Aryan Rana	13	4	**17**	**85**	**3**
34	ASHISH KUMAR PRAJAPATI	12	4	**16**	**80**	**3**
35	Ashutosh Upadhyay	11	4	**15**	**75**	**3**
36	Astha Sharma	14	4	**18**	**90**	**3**
37	Atharav Porwal	14	3	**17**	**85**	**3**
38	Avinash Dubey	13	3	**16**	**80**	**3**
39	Ayush Baluni	10	4	**14**	**70**	**3**
40	Ayush Jain	11	3	**14**	**70**	**3**
41	Ayush Singhal	12	4	**16**	**80**	**3**
42	Ayushi Gupta	13	4	**17**	**85**	**3**
43	Bharti Gupta	14	4	**18**	**90**	**3**
44	Bhavit Chaudhary	13	3	**16**	**80**	**3**
45	Bhavya Agarwal	14	3	**17**	**85**	**3**
46	Bhavya Lohami	13	4	**17**	**85**	**3**
47	Chaitanya Khurana	14	4	**18**	**90**	**3**

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48	Chandan Jangir	12	3	15	75	3
49	CHANDAN JANGIR					
50	Chetan Sharma	13		13	65	3
51	Daksh Kardam	14	4	18	90	3
52	Deepak Dayma	14	4	18	90	3
53	Deepak Kumar					
54	Deepak Kumar Tiwari	11	3	14	70	3
55	Dev Soni	13	4	17	85	3
56	Devendra Singh Rao	14		14	93	3
57	Devesh Sharma	10	3	13	65	3
58	Dhruv Gaur	12	4	16	80	3
59	Divyansh Agarwal	12	4	16	80	3
60	Divyanshi Choudhary	14	3	17	85	3
61	Divyanshu Tailor	12	4	16	80	3
62	Esha Kapoor	15	4	19	95	3
63	Fardeen Alam	12	4	16	80	3
64	Farhan Khan	11		11	73	3
65	Gagan Sharma	12	3	15	75	3
66	Gauransh Sharma					
67	Gaurav Agrawal	13	3	16	80	3
68	Gaurav Parihar	12	3	15	75	3
69	Gautam Sharma	13	3	16	80	3
70	Gourav Joshi	11	4	15	75	3
71	Gunank Bansal	14	3	17	85	3
72	KHUSHI AGARWAL	12	3	15	75	3
No. of Students attained level 3=			66	**% of Students Attained Level 3=**		**98.5**
No. of Students attained level 2=			01	**% of Students Attained Level 2=**		**1.5**

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No. of Students attained level 1=	0	**% of Students Attained Level 1=**	**0**
Target Achieved=	**YES**	**Gap=**	**0.01**
Mark X for absent- (Take avg. of all present)= NA			

Attainment table for CO-2:1FY2-03

	CO2: 1FY2-03: Attainment Table					
S. No.	**Student**	**Assignment** 20	**Class Test** 10	**Total** 20	**% 0f Marks**	**Level of Attainment**
1	Aaradhaya Khandelwal	19	9	**28**	**93**	**3**
2	Aashita Jain	18	10	**28**	**93**	**3**
3	ABHAY PRATAP SINGH SAMBYAL					
4	Abhay Singh Rathore	18	8	**26**	**87**	**3**
5	Abhilasha Chakraberty	17	8	**25**	**83**	**3**
6	Abhinav Anand	17	7	**24**	**80**	**3**
7	Abhishree Mundra		8	**8**	**80**	**3**
8	Adesh Shrivastav	16	7	**23**	**77**	**3**
9	Adit Jain	15	7	**22**	**73**	**3**
10	Aditya Kumar	16	7	**23**	**77**	**3**
11	Aditya Mishra	15	7	**22**	**73**	**3**

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12	Aditya Nair		7	**7**	**70**	**3**
13	Amrit Agarwal	17	9	**26**	**87**	**3**
14	Akshat Gupta	17	8	**25**	**83**	**3**
15	Aman Choubey	16	8	**24**	**80**	**3**
16	Aman Goyal	16	7	**23**	**77**	**3**
17	Aman Kumar Singh	17	7	**24**	**80**	**3**
18	Amar Singh	16	8	**24**	**80**	**3**
19	Amit Mishra	16	7	**23**	**77**	**3**
20	Anchal Jain	18	9	**27**	**90**	**3**
21	Anjali Garg	19	9	**28**	**93**	**3**
22	Ankit Kumar	16	7	**23**	**77**	**3**
23	Anshul Sharma	14	6	**20**	**67**	**3**
24	Anshul Sharma	13		**13**	**65**	**3**
25	Anshuman Singh	15	7	**22**	**73**	**3**
26	Anubhav Anand	12	6	**18**	**60**	**3**
27	Anupam Anand	15	6	**21**	**70**	**3**
28	Anurag Kumar	15	0	**15**	**50**	**2**
29	Anush Jain	14	7	**21**	**70**	**3**
30	Anvi Sahu	17	8	**25**	**83**	**3**
31	Arpit Gupta	16	8	**24**	**80**	**3**
32	Aryan Nama	19	9	**28**	**93**	**3**
33	Aryan Rana	15	7	**22**	**73**	**3**
34	ASHISH KUMAR PRAJAPATI	18	9	**27**	**90**	**3**
35	Ashutosh Upadhyay	19	8	**27**	**90**	**3**
36	Astha Sharma	18	9	**27**	**90**	**3**
37	Atharav Porwal	17	8	**25**	**83**	**3**
38	Avinash Dubey	16	8	**24**	**80**	**3**

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39	Ayush Baluni	17	7	**24**	**80**	**3**
40	Ayush Jain	14	8	**22**	**73**	**3**
41	Ayush Singhal	16	7	**23**	**77**	**3**
42	Ayushi Gupta	17	10	**27**	**90**	**3**
43	Bharti Gupta	16	7	**23**	**77**	**3**
44	Bhavit Chaudhary	19	8	**27**	**90**	**3**
45	Bhavya Agarwal	17	8	**25**	**83**	**3**
46	Bhavya Lohami	16	8	**24**	**80**	**3**
47	Chaitanya Khurana	16	9	**25**	**83**	**3**
48	Chandan Jangir	16	8	**24**	**80**	**3**
49	CHANDAN JANGIR					
50	Chetan Sharma	17	8	**25**	**83**	**3**
51	Daksh Kardam	18	9	**27**	**90**	**3**
52	Deepak Dayma	18	9	**27**	**90**	**3**
53	Deepak Kumar					
54	Deepak Kumar Tiwari	12	7	**19**	**63**	**3**
55	Dev Soni	18	8	**26**	**87**	**3**
56	Devendra Singh Rao	18		**18**	**90**	**3**
57	Devesh Sharma		8	**8**	**80**	**3**
58	Dhruv Gaur	18	7	**25**	**83**	**3**
59	Divyansh Agarwal	16		**16**	**80**	**3**
60	Divyanshi Choudhary	17	8	**25**	**83**	**3**
61	Divyanshu Tailor	18	8	**26**	**87**	**3**
62	Esha Kapoor	19	8	**27**	**90**	**3**
63	Fardeen Alam	15	7	**22**	**73**	**3**
64	Farhan Khan	16	7	**23**	**77**	**3**
65	Gagan Sharma	16	7	**23**	**77**	**3**

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66	Gauransh Sharma					
67	Gaurav Agrawal	14	6	**20**	**67**	**3**
68	Gaurav Parihar		8	**8**	**80**	**3**
69	Gautam Sharma	17	9	**26**	**87**	**3**
70	Gourav Joshi	16	8	**24**	**80**	**3**
71	Gunank Bansal	18	8	**26**	**87**	**3**
72	KHUSHI AGARWAL	17	7	**24**	**80**	**3**
No. of Students attained level 3=			66	**% of Students Attained Level 3=**		**98.5%**
No. of Students attained level 2=			01	**% of Students Attained Level 2=**		**1.5%**
No. of Students attained level 1=			0	**% of Students Attained Level 1=**		**0**
Target Achieved=			**YES**	**Gap=**	**0.01**	
Mark X for absent- (Take avg. of all present)= NA						

CO-GAP IDENTIFICATIONS

COs	CO1	CO2
Target	**1.00**	**2.00**
Achieved	**1.00**	**1.99**
Gap	**0.00**	**0.01**

Gaps Identified:

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1. 0.01 gap, which is very less so can fill easily.

ACTIVITIES DECIDED TO BRIDGE THE GAP

1. Questions will be practiced in the tutorial sessions.

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Date-13 Jan. 2021

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I Year-B.TECH. (I Sem.)

FIRST MID TERM EXAMINATION 2020-21

Code: 1FY2-03 Category: BSC Subject Name–Engineering Chemistry

(BRANCH –Computer Science)

SET- 1

Max. Time: 90 minutes
Max. Marks: 50

Q No.	CO	PO	BL	PI	Marks	Questions
Q1.	**CO -1, CO-2**	**PO -1**	L1, L2	1.2.1	6+4=10	a. What is softening of water? Explain softening of water by Zeolite method. b. The standard water was prepared by dissolving 1.0 gm of pure and dry $CaCO_3$ in 1 litre distilled water. 150 ml of this solution required 46 ml of EDTA solution while 150 ml of hard water sample required 35 ml of EDTA solution. Boiled sample of water consumed 18 ml of EDTA solution. Determine the temporary, permanent and total hardness of water in ppm of $CaCO_3$ equivalents
Q2.	**CO -2, CO-3**	**PO -1**	L1, L2	1.2.1	6+4=10	(a)What is scale and sludge boiler trouble? Give its reasons, preventions and removal methods. **(b)** The hardness of 1500 litre of water was completely removed by zeolite softener. The zeolite had required 35 litre of NaCl solution,

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						containing 43 gm/lit of NaCl for regeneration. Calculate the hardness of water sample.
Q3.	**CO -2**	**PO -1**	L2, L3	1.2.1	10	**Study of water analysis of Banswara district is :** CO_2- 20 ppm, $Ca(HCO_3)_2$ - 35ppm, $Mg(NO_3)_2$ - 40 ppm, $CaCl_2$ - 84 ppm, $Mg(HCO_3^-)_2$ - 5ppm HCl - 9 ppm, $CaSO_4$ - 40 ppm, Turbidity - 25 ppm. Calculate the amount of **lime** which is **87%** pure and **soda** which is **92%;** required to soften **1 million liter** of water. If this consumption of lime is for one day then calculate lime and soda required for softening of water for one month.
Q4.	**CO -4**	**PO -2**	L3	2.1.1	7+3=10	(a)What is cement? Describe manufacturing of Portland cement by Rotary Kiln process with neat diagram. (b) Explain role of gypsum in manufacturing of cement with involved chemical reaction.
Q5.	**CO -3**	**PO -1**	L1, L2	1.2.1	6+4=10	(a)What is lubrication? Explain fluid film or hydrodynamic lubrication with its applications. (b)Explain following : (i) Need of annealing of glass

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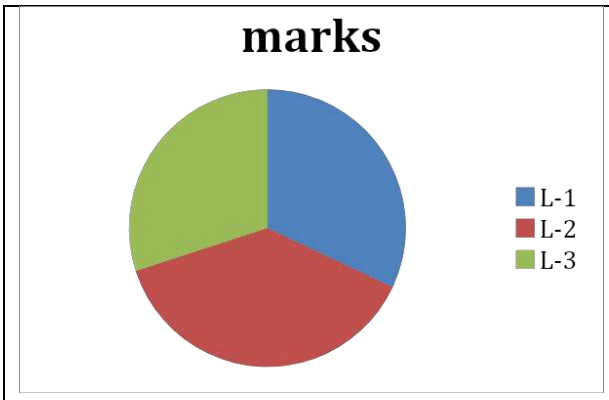

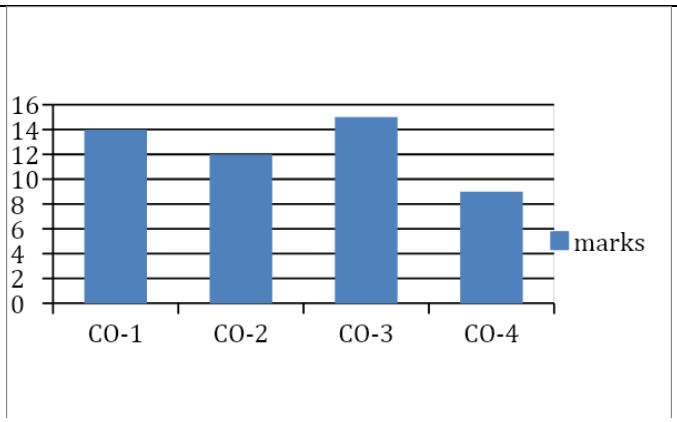

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes; PI-Performance Indicator

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Date-13 Jan. 2021

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I Year-B.TECH. (I Sem.)

FIRST MID TERM EXAMINATION 2020-21

Code: 1FY2-03 Category: BSC Subject Name–Engineering Chemistry

(BRANCH –Computer Science)

SET- 2

Max. Time: 90 Min.
Max. Marks: 50

NOTE:- **All questions carry equal marks**

Instruction:

1. Write your answer on a clean A4 size or any paper and mention your Name, Roll no., Reg. no, Subject name, subject code, Section, Set number. Date and time on the top of the sheet and page no on bottom of the sheet.
2. Scan and upload your hand written answer copy to the class room only (do not mail).
3. Make sure that the scanned document (PDF) is readable for evaluation purposes and you have additional 15 minutes to upload the PDF.
4. Save documents with your Name, Reg No., and Subject Name.
   (Exp. – Abhishek_PCE20CS310_ENGINEERING CHEMISTRY)
5. The answer-sheet uploaded after the specified time duration shall be rejected and not be evaluated.
6. Follow the sequence to upload as General tab-> Assignment -> select Assignment-> Add work -> upload file> click onTurn in
7. Keep your hard copy of the answer sheet intact as it will be submitted after college resumes.

Q No.	CO	PO	BL	PI	Marks	Questions
Q1.	**CO -1, CO-2**	**PO -1**	L1, L2	1.2.1	6+4=10	a. What is softening of water? Explain softening of water by Demineralization method.

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						b. 77 ml of standard water required 100 ml of EDTA solution while 57 ml of sample of water required 49ml of EDTA. 37ml of sample water when boiled, titrated against EDTA consumed 20ml of solution. Calculate total hardness of water if strength of standard hard water is 1mg/1ml
Q2.	**CO -2, CO-3**	**PO -1**	L1, L2	1.2.1	5+5=10	(a)What is Caustic embrittlement? Give its reasons, preventions. (b) A sample of water of Jaiselmer (Rajasthan) on analysis has been found to contain as given following data. Mg $(HCO_3)_2$ = 16.6ppm, $MgSO_4$ = 9.6ppm, CaSO4 = 26.20ppm, Ca $(HCO_3)_2$ = 88.6ppm, $CaCl_2$ = 5.52ppm, Na_2SO_4= 60 ppm, SiO_2= 40ppm **Calculate the temporary, permanent and total hardness of water of given Jaiselmer.**
Q3.	**CO -2**	**PO -1**	L2, L3	1.2.1	10	**Study of water analysis of Jaipur area is:** CO_2- 10 ppm, $Ca(HCO_3)_2$ - 25ppm, $Mg(NO_3)_2$ - 25 ppm, $CaCl_2$ - 12 ppm, $Mg(HCO_3\text{-})_2$ -20 ppm HCl - 3 ppm, $CaSO_4$ - 15 ppm, SiO_2- 30 ppm. Calculate the amount of **lime** which is **80%** pure and **soda** which is **90%;** required to soften **1 million liter** of water.
Q4.	**CO -4**	**PO -2**	L3	2.1.1	7+3=10	(a)What is cement? Describe manufacturing of Portland cement by Rotary Kiln process with neat diagram. (b) Explain Annealing process in manufacturing of glass.
Q5.	**CO -3**	**PO -1**	L1, L2	1.2.1	5+5=10	(a)What is lubrication? Explain Extreme pressure lubrication. (b)Explain following with significance: (i)Role of Gypsum in Portland cement (ii)Flash and fire point

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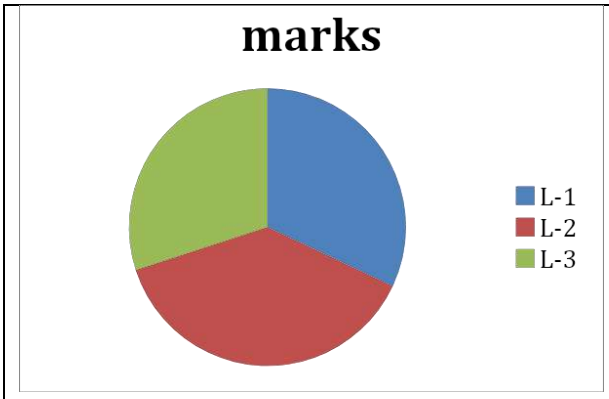

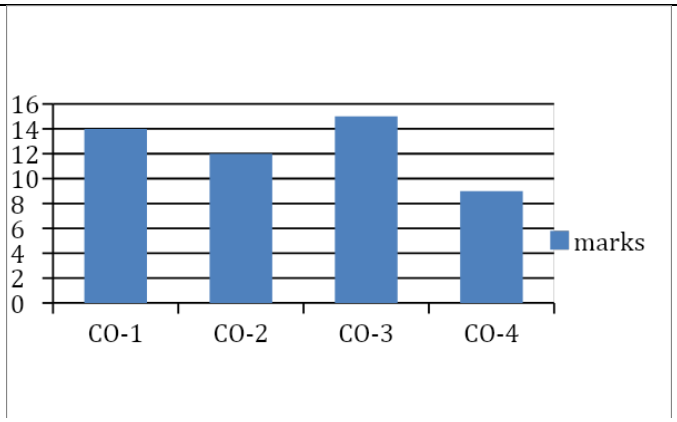

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

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Date-13 Jan. 2021

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I Year-B.TECH. (I Sem.)

FIRST MID TERM EXAMINATION 2020-21

Code: 1FY2-03 Category: BSC Subject Name–Engineering Chemistry

(BRANCH –Computer Science)

SET- 3

Max. Time: 90 Min.
Max. Marks: 50

All questions carry equal marks

NOTE:-

Instruction:

1. Write your answer on a clean A4 size or any paper and mention your Name, Roll no., Reg. no, Subject name, subject code, Section, Set number. Date and time on the top of the sheet and page no on bottom of the sheet.
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3. Make sure that the scanned document (PDF) is readable for evaluation purposes and you have additional 15 minutes to upload the PDF.
4. Save documents with your Name, Reg No., and Subject Name.
   (Exp. – Abhishek_PCE20CS310_ENGINEERING CHEMISTRY)
5. The answer-sheet uploaded after the specified time duration shall be rejected and not be evaluated.
6. Follow the sequence to upload as General tab-> Assignment -> select Assignment-> Add work -> upload file> click onTurn in
7. Keep your hard copy of the answer sheet intact as it will be submitted after college resumes.

Q No.	CO	PO	BL	PI	Marks	Questions
Q1.	**CO -1, CO-2**	**PO -1**	L1, L2	1.2.1	6+4=10	a. What is softening of water? Explain softening of water by demineralization method.

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						b. 166 ml. of standard hard water containing 1.5 mg of pure $CaCO_3$ per ml. of water, consumed 70 ml of EDTA solution. 166 ml of water sample consumed 40 ml of EDTA using EBT as indicator. Calculate the total hardness of water sample
Q2.	**CO -2, CO-3**	**PO -1**	L1, L2	1.2.1	6+4=10	(a)What is scale and sludge boiler trouble? Give its reasons, preventions and removal methods. **(b)** A Zeolite softener was 75% exhausted, when 10,000 L of hard water was passed through it. The softener required 200 L of NaCl solution of strength 20,000 mg/L of NaCl solution. What is the hardness of water?
Q3.	**CO -2**	**PO -1**	L2, L3	1.2.1	10	A sample of water was analyzed. The following data were obtained. (in mg/L) $CaSO_4$=20.4, $MgCO_3$=5.44, $Ca(HCO_3)_2$=2.0, MgSO4=9.8, $MgCl_2$=3.78, SiO_2=2.4, NaCl =12.5. Calculate the amount of lime and soda required to soften 90,000 liters of water if Purity of lime and soda is 90%. Also calculate the cost of lime and soda if Lime is 5Rs/kg and soda is 6Rs/kg.
Q4.	**CO -4**	**PO -2**	L3	2.1.1	7+3=10	(a)What is cement? Describe manufacturing of Portland cement by Rotary Kiln process with neat diagram. (b) Explain role of gypsum in manufacturing of cement with involved chemical reaction.
Q5.	**CO -3**	**PO -1**	L1, L2	1.2.1	6+4=10	(a)What is lubricant? Explain thin film or boundary lubrication with its applications. (b)Explain Annealing of glass.

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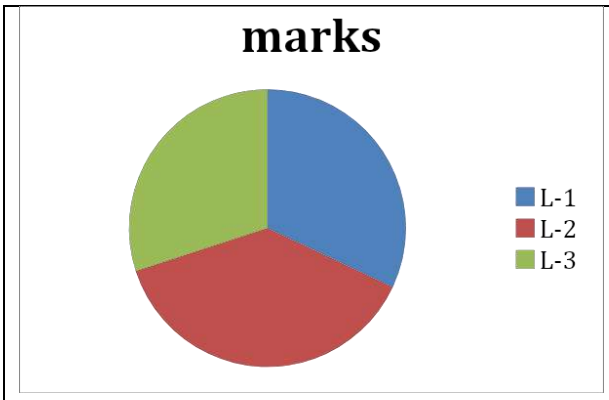

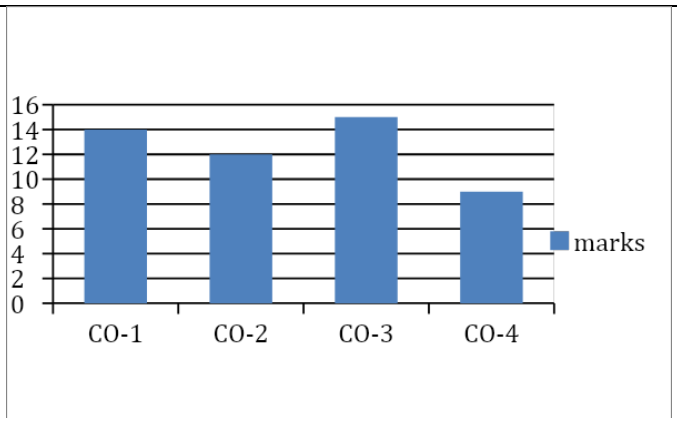

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Date-13 Jan. 2021

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I Year-B.TECH. (I Sem.)

FIRST MID TERM EXAMINATION 2020-21

Code: 1FY2-03 Category: BSC Subject Name–Engineering Chemistry

(BRANCH –Computer Science)

SET- 4

Max. Time: 90 Min.
Max. Marks: 50

All questions carry equal marks

NOTE:-

Instruction:

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Q No.	CO	PO	BL	PI	Marks	Questions

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Q1.	**CO -1, CO-2**	**PO -1**	L1, L2	1.2.1	7+3=10	a. What is softening of water? Explain softening of water by Lime Soda method. b. A Zeolite softener was completely exhausted and was regenerated by passing 300L of NaCl solution containing 55g/L of NaCl. How many of liters of water sample of hardness 220 ppm can be softened by this softener?
Q2.	**CO -2, CO-3**	**PO -1**	L1, L2	1.2.1	5+5=10	(a)What is Priming and Foaming? Give its reasons, preventions and removal methods. **(b)** The EDTA method was used to find out permanent & temporary types of hardness in given used water sample. Following observations are recorded - (I) 40 ml of EDTA solution was consumed by 50 ml of standard hard water 1 mg of CaCO3 per ml. (II) 50 ml water sample used up 24 ml of EDTA solution. (III) 50 ml water sample after boiling, filtering etc. used up 12 ml EDTA.
Q3.	**CO -2**	**PO -1**	L2, L3	1.2.1	10	**Study of water analysis of Barmer is as following:** CO_2- 10 ppm, $Ca(HCO_3)_2$ - 25ppm, $Mg(HCO_3)_2$ -10 ppm, $CaSO_4$ - 15 ppm, SiO_2 - 20 ppm. Calculate the amount of **lime** and **soda** required to soften **5 million liter** of water. Also calculate the cost of lime and soda, if Lime is5Rs/Kg and Soda is 8Rs/Kg.
Q4.	**CO -4**	**PO -2**	L3	2.1.1	7+3=10	(a)What is cement? Describe manufacturing of Portland cement by Rotary Kiln process with neat diagram. (b) Write short note on Annealing of glass
Q5.	**CO -3**	**PO -1**	L1, L2	1.2.1	4+6=10	(a)What is Viscosity and viscosity index? Explain determination of viscosity by Redwood viscometer. (b) Setting and hardening of cement.

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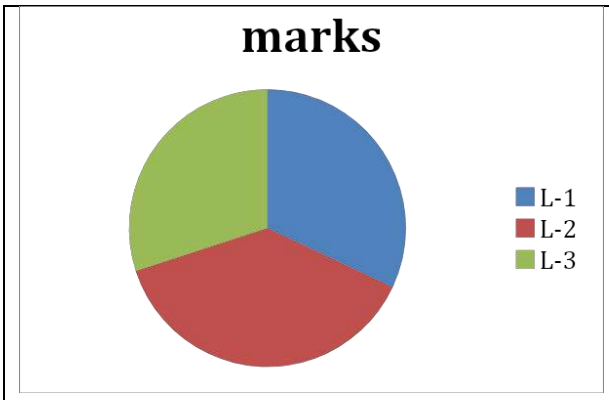

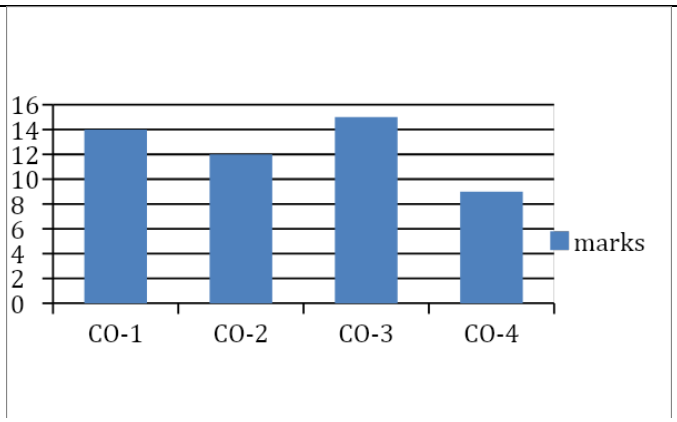

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S. No.	Roll No.	Name of Students	Q.1	Q.2	Q.3	Q.4	Q.5	TOTAL	Marks %
			10	10	10	10	10	Max. Marks 50	
			CO1	CO2	CO2	CO3	CO4		
1	20/A/01	Aaradhaya Khandelwal	9	9	10	9	9	46	92
2	20/A/02	Aashita Jain	10	10	10	9	9	48	96
3	20/A/03	ABHAY PRATAP SINGH SAMBYAL	A						
4	20/A/04	Abhay Singh Rathore	8	6	8	7	9	38	76
5	20/A/05	Abhilasha Chakraberty	10	9	10	9	7	45	90
6	20/A/06	Abhinav Anand	8	7	7	6	7	35	70
7	20/A/07	Abhishree Mundra	10	10	9	8	8	45	90
8	20/A/08	Adesh Shrivastav	8	6	7	5	4	30	60
9	20/A/09	Adit Jain	7	7	7	8	4	33	66
10	20/A/10	Aditya Kumar	7	7	7	6	5	32	64
11	20/A/11	Aditya Mishra	10	9	8	10	10	47	94
12	20/A/12	Aditya Nair	9	8	6	5	4	32	64
13	20/A/13	Amrit Agarwal	9	8	10	6	7	40	80
14	20/A/14	Akshat Gupta	9	8	8	7	6	38	76
15	20/A/15	Aman Choubey	9	8	7	6	6	36	72
16	20/A/16	Aman Goyal	8	7	8	7	5	35	70
17	20/A/17	Aman Kumar Singh	9	7	9	7	6	38	76
18	20/A/18	Amar Singh	6	6	5	4	7	28	56
19	20/A/19	Amit Mishra	8	7	8	6	9	38	76
20	20/A/20	Anchal Jain	9	8	8	5	6	36	72

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21	20/A/21	Anjali Garg	9	9	10	9	8	**45**	90
22	20/A/22	Ankit Kumar	9	7	8	4	6	**34**	68
23	20/A/23	Anshul Sharma	8	8	0	7	7	**30**	60
24	20/A/24	Anshul Sharma	8	7	0	7	7	**29**	58
25	20/A/25	Anshuman Singh	8	8	9	6	7	**38**	76
26	20/A/26	Anubhav Anand	8	7	9	7	6	**37**	74
27	20/A/27	Anupam Anand	9	8	10	7	8	**42**	84
28	20/A/28	Anurag Kumar	7	6	5	5	7	**30**	60
29	20/A/29	Anush Jain	8	8	6	8	7	**37**	74
30	20/A/30	Anvi Sahu	8	6	4	7	7	**32**	64
31	20/A/31	Arpit Gupta	9	8	10	7	8	**42**	84
32	20/A/32	Aryan Nama	9	9	10	8	8	**44**	88
33	20/A/33	Aryan Rana	8	6	9	6	6	**35**	70
34	20/A/34	ASHISH KUMAR PRAJAPATI	9	8	10	8	7	**42**	84
35	20/A/35	Ashutosh Upadhyay	10	9	10	9	9	**47**	94
36	20/A/36	Astha Sharma	10	9	10	10	9	**48**	96
37	20/A/37	Atharav Porwal	9	6	9	6	6	**36**	72
38	20/A/38	Avinash Dubey	10	9	10	9	9	**47**	94
39	20/A/39	Ayush Baluni	10	9	10	8	8	**45**	90
40	20/A/40	Ayush Jain	10	8	10	8	8	**44**	88
41	20/A/41	Ayush Singhal	9	8	10	7	8	**42**	84
42	20/A/42	Ayushi Gupta	9	9	10	9	9	**46**	92
43	20/A/43	Bharti Gupta	9	8	0	6	7	**30**	60
44	20/A/44	Bhavit Chaudhary	9	9	9	8	5	**40**	80
45	20/A/45	Bhavya Agarwal	9	9	10	9	7	**44**	88
46	20/A/46	Bhavya Lohami	10	9	10	9	8	**46**	92
47	20/A/47	Chaitanya Khurana	10	9	10	9	10	**48**	96

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48	20/A/48	Chandan Jangir	10	9	10	9	9	**47**	94
49	20/A/49	CHANDAN JANGIR	A						
50	20/A/50	Chetan Sharma	10	7	9	7	5	**38**	76
51	20/A/51	Daksh Kardam	10	9	10	8	8	**45**	90
52	20/A/52	Deepak Dayma	10	10	10	9	9	**48**	96
53	20/A/53	Deepak Kumar	A						
54	20/A/54	Deepak Kumar Tiwari	9	8	8	7	7	**39**	78
55	20/A/55	Dev Soni	8	7	7	6	7	**35**	70
56	20/A/56	Devendra Singh Rao	8	8	9	8	9	**42**	84
57	20/A/57	Devesh Sharma	8	8	9	7	7	**39**	78
58	20/A/58	Dhruv Gaur	10	9	10	10	9	**48**	96
59	20/A/59	Divyansh Agarwal	8	8	8	6	6	**36**	72
60	20/A/60	Divyanshi Choudhary	9	9	10	8	9	**45**	90
61	20/A/61	Divyanshu Tailor	9	6	7	6	4	**32**	64
62	20/A/62	Esha Kapoor	10	10	7	7	8	**42**	84
63	20/A/63	Fardeen Alam	9	8	8	7	6	**38**	76
64	20/A/64	Farhan Khan	9	7	8	5	6	**35**	70
65	20/A/65	Gagan Sharma	9	8	9	7	6	**39**	78
66	20/A/66	Gauransh Sharma	8	6	8	9	6	**37**	74
67	20/A/67	Gaurav Agrawal	9	8	7	7	7	**38**	76
68	20/A/68	Gaurav Parihar	9	8	10	7	8	**42**	84
69	20/A/69	Gautam Sharma	10	9	10	9	9	**47**	94
70	20/A/70	Gourav Joshi	10	9	10	10	9	**48**	96
71	20/A/71	Gunank Bansal	10	8	10	6	7	**41**	82
72	20/A/72	KHUSHI AGARWAL	7	7	0	8	6	**28**	56

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POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Campus: Poornima College of Engineering **Class/Section: I YEAR, I SEMESTER**

Course: B.Tech. **Year/ Section - A**

Name of Faculty: Dr. MeenaTekriwal **Name of Subject :Engineering Chemistry** **Code: 1FY2-03**

ATTAINMENT OF CO THROUGH MIDTERM-I EXAM

CO1: 1FY2-03: Attainment Table

S. No.	Student	CO-1 Midterm I Marks (10)	% CO-1 of Marks	Overall CO Level of Attainment
1	Aaradhaya Khandelwal	9	90	3
2	Aashita Jain	10	100	3
3	ABHAY PRATAP SINGH SAMBYAL			
4	Abhay Singh Rathore	8	80	3
5	Abhilasha Chakraberty	10	100	3
6	Abhinav Anand	8	80	3
7	Abhishree Mundra	10	100	3
8	Adesh Shrivastav	8	80	3
9	Adit Jain	7	70	3
10	Aditya Kumar	7	70	3
11	Aditya Mishra	10	100	3
12	Aditya Nair	9	90	3
13	Amrit Agarwal	9	90	3
14	Akshat Gupta	9	90	3
15	Aman Choubey	9	90	3

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16	Aman Goyal	8	80	3
17	Aman Kumar Singh	9	90	3
18	Amar Singh	6	60	3
19	Amit Mishra	8	80	3
20	Anchal Jain	9	90	3
21	Anjali Garg	9	90	3
22	Ankit Kumar	9	90	3
23	Anshul Sharma	8	80	3
24	Anshul Sharma	8	80	3
25	Anshuman Singh	8	80	3
26	Anubhav Anand	8	80	3
27	Anupam Anand	9	90	3
28	Anurag Kumar	7	70	3
29	Anush Jain	8	80	3
30	Anvi Sahu	8	80	3
31	Arpit Gupta	9	90	3
32	Aryan Nama	9	90	3
33	Aryan Rana	8	80	3
34	ASHISH KUMAR PRAJAPATI	9	90	3
35	Ashutosh Upadhyay	10	100	3
36	Astha Sharma	10	100	3
37	Atharav Porwal	9	90	3
38	Avinash Dubey	10	100	3
39	Ayush Baluni	10	100	3
40	Ayush Jain	10	100	3
41	Ayush Singhal	9	90	3
42	Ayushi Gupta	9	90	3

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43	Bharti Gupta	9	90	3
44	Bhavit Chaudhary	9	90	3
45	Bhavya Agarwal	9	90	3
46	Bhavya Lohami	10	100	3
47	Chaitanya Khurana	10	100	3
48	Chandan Jangir	10	100	3
49	CHANDAN JANGIR			
50	Chetan Sharma	10	100	3
51	Daksh Kardam	10	100	3
52	Deepak Dayma	10	100	3
53	Deepak Kumar			
54	Deepak Kumar Tiwari	9	90	3
55	Dev Soni	8	80	3
56	Devendra Singh Rao	8	80	3
57	Devesh Sharma	8	80	3
58	Dhruv Gaur	10	100	3
59	Divyansh Agarwal	8	80	3
60	Divyanshi Choudhary	9	90	3
61	Divyanshu Tailor	9	90	3
62	Esha Kapoor	10	100	3
63	Fardeen Alam	9	90	3
64	Farhan Khan	9	90	3
65	Gagan Sharma	9	90	3
66	Gauransh Sharma	8	80	3
67	Gaurav Agrawal	9	90	3
68	Gaurav Parihar	9	90	3
69	Gautam Sharma	10	100	3

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70	Gourav Joshi	**10**	**100**	**3**
71	Gunank Bansal	**10**	**100**	**3**
72	KHUSHI AGARWAL	**7**	**70**	**3**
No. of Students attained level 3=		**69**	**% of Students Attained Level 3=**	**100**
No. of Students attained level 2=		00	**% of Students Attained Level 2=**	
No. of Students attained level 1=		00	**% of Students Attained Level 1=**	
Target Achieved= YES			**Gap=**	**NIL**
Mark X for absent- (Take avg. of all present)= NA				

CO2: 1FY2-03: Attainment Table

S. No.	Student	CO-2 Midterm I Marks (20)	% CO-2 of Marks	Overall CO Level of Attainment
1	Aaradhaya Khandelwal	19	95	3
2	Aashita Jain	20	100	3
3	ABHAY PRATAP SINGH SAMBYAL			
4	Abhay Singh Rathore	14	70	3
5	Abhilasha Chakraberty	19	95	3
6	Abhinav Anand	14	70	3
7	Abhishree Mundra	19	95	3
8	Adesh Shrivastav	13	65	3
9	Adit Jain	14	70	3
10	Aditya Kumar	14	70	3
11	Aditya Mishra	17	85	3
12	Aditya Nair	14	70	3
13	Amrit Agarwal	18	90	3
14	Akshat Gupta	16	80	3

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15	Aman Choubey	15	75	3
16	Aman Goyal	15	75	3
17	Aman Kumar Singh	16	80	3
18	Amar Singh	11	55	2
19	Amit Mishra	15	75	3
20	Anchal Jain	16	80	3
21	Anjali Garg	19	95	3
22	Ankit Kumar	15	75	3
23	Anshul Sharma	8	40	2
24	Anshul Sharma	7	35	1
25	Anshuman Singh	17	85	3
26	Anubhav Anand	16	80	3
27	Anupam Anand	18	90	3
28	Anurag Kumar	11	55	2
29	Anush Jain	14	70	3
30	Anvi Sahu	10	50	2
31	Arpit Gupta	18	90	3
32	Aryan Nama	19	95	3
33	Aryan Rana	15	75	3
34	ASHISH KUMAR PRAJAPATI	18	90	3
35	Ashutosh Upadhyay	19	95	3
36	Astha Sharma	19	95	3
37	Atharav Porwal	15	75	3
38	Avinash Dubey	19	95	3
39	Ayush Baluni	19	95	3
40	Ayush Jain	18	90	3
41	Ayush Singhal	18	90	3

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42	Ayushi Gupta	19	95	3
43	Bharti Gupta	8	40	2
44	Bhavit Chaudhary	18	90	3
45	Bhavya Agarwal	19	95	3
46	Bhavya Lohami	19	95	3
47	Chaitanya Khurana	19	95	3
48	Chandan Jangir	19	95	3
49	CHANDAN JANGIR			
50	Chetan Sharma	16	80	3
51	Daksh Kardam	19	95	3
52	Deepak Dayma	20	100	3
53	Deepak Kumar			
54	Deepak Kumar Tiwari	16	80	3
55	Dev Soni	14	70	3
56	Devendra Singh Rao	17	85	3
57	Devesh Sharma	17	85	3
58	Dhruv Gaur	19	95	3
59	Divyansh Agarwal	16	80	3
60	Divyanshi Choudhary	19	95	3
61	Divyanshu Tailor	13	65	3
62	Esha Kapoor	17	85	3
63	Fardeen Alam	16	80	3
64	Farhan Khan	15	75	3
65	Gagan Sharma	17	85	3
66	Gauransh Sharma	14	70	3
67	Gaurav Agrawal	15	75	3
68	Gaurav Parihar	18	90	3

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69	Gautam Sharma	**19**	**95**	**3**
70	Gourav Joshi	**19**	**95**	**3**
71	Gunank Bansal	**18**	**90**	**3**
72	KHUSHI AGARWAL	**7**	**35**	**1**
No. of Students attained level 3=		62	**% of Students Attained Level 3=**	**90%**
No. of Students attained level 2=		05	**% of Students Attained Level 2=**	**7%**
No. of Students attained level 1=		02	**% of Students Attained Level 1=**	**3%**
Target Achieved= YES			**Gap=**	**0.1**
Mark X for absent- (Take avg. of all present)= NA				

CO3: 1FY2-03: Attainment Table

S. No.	Student	CO-3 Midterm I Marks (10)	% CO-3 of Marks	Overall CO Level of Attainment
1	Aaradhaya Khandelwal	9	**90**	**3**
2	Aashita Jain	9	**90**	**3**
3	ABHAY PRATAP SINGH SAMBYAL			
4	Abhay Singh Rathore	7	**70**	**3**
5	Abhilasha Chakraberty	9	**90**	**3**
6	Abhinav Anand	6	**60**	**3**
7	Abhishree Mundra	8	**80**	**3**
8	Adesh Shrivastav	5	**50**	**2**
9	Adit Jain	8	**80**	**3**
10	Aditya Kumar	6	**60**	**3**
11	Aditya Mishra	10	**100**	**3**
12	Aditya Nair	5	**50**	**2**

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13	Amrit Agarwal	6	**60**	**3**
14	Akshat Gupta	7	**70**	**3**
15	Aman Choubey	6	**60**	**3**
16	Aman Goyal	7	**70**	**3**
17	Aman Kumar Singh	7	**70**	**3**
18	Amar Singh	4	**40**	**2**
19	Amit Mishra	6	**60**	**3**
20	Anchal Jain	5	**50**	**2**
21	Anjali Garg	9	**90**	**3**
22	Ankit Kumar	4	**40**	**2**
23	Anshul Sharma	7	**70**	**3**
24	Anshul Sharma	7	**70**	**3**
25	Anshuman Singh	6	**60**	**3**
26	Anubhav Anand	7	**70**	**3**
27	Anupam Anand	7	**70**	**3**
28	Anurag Kumar	5	**50**	**2**
29	Anush Jain	8	**80**	**3**
30	Anvi Sahu	7	**70**	**3**
31	Arpit Gupta	7	**70**	**3**
32	Aryan Nama	8	**80**	**3**
33	Aryan Rana	6	**60**	**3**
34	ASHISH KUMAR PRAJAPATI	8	**80**	**3**
35	Ashutosh Upadhyay	9	**90**	**3**
36	Astha Sharma	10	**100**	**3**
37	Atharav Porwal	6	**60**	**3**

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38	Avinash Dubey	9	90	3
39	Ayush Baluni	8	80	3
40	Ayush Jain	8	80	3
41	Ayush Singhal	7	70	3
42	Ayushi Gupta	9	90	3
43	Bharti Gupta	6	60	3
44	Bhavit Chaudhary	8	80	3
45	Bhavya Agarwal	9	90	3
46	Bhavya Lohami	9	90	3
47	Chaitanya Khurana	9	90	3
48	Chandan Jangir	9	90	3
49	CHANDAN JANGIR			
50	Chetan Sharma	7	70	3
51	Daksh Kardam	8	80	3
52	Deepak Dayma	9	90	3
53	Deepak Kumar			
54	Deepak Kumar Tiwari	7	70	3
55	Dev Soni	6	60	3
56	Devendra Singh Rao	8	80	3
57	Devesh Sharma	7	70	3
58	Dhruv Gaur	10	100	3
59	Divyansh Agarwal	6	60	3
60	Divyanshi Choudhary	8	80	3
61	Divyanshu Tailor	6	60	3
62	Esha Kapoor	7	70	3

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63	Fardeen Alam	7	**70**	**3**
64	Farhan Khan	5	**50**	**2**
65	Gagan Sharma	7	**70**	**3**
66	Gauransh Sharma	9	**90**	**3**
67	Gaurav Agrawal	7	**70**	**3**
68	Gaurav Parihar	7	**70**	**3**
69	Gautam Sharma	9	**90**	**3**
70	Gourav Joshi	10	**100**	**3**
71	Gunank Bansal	6	**60**	**3**
72	KHUSHI AGARWAL	8	**80**	**3**
No. of Students attained level 3=		62	**% of Students Attained Level 3=**	**90%**
No. of Students attained level 2=		07	**% of Students Attained Level 2=**	**10%**
No. of Students attained level 1=		0	**% of Students Attained Level 1=**	**-**
Target Achieved= YES			**Gap=**	**0.1**
Mark X for absent- (Take avg. of all present)= NA				

CO4: 1FY2-03: Attainment Table

S. No.	Student	CO-4 Midterm I Marks (10)	% CO-4 of Marks	Overall CO Level of Attainment
1	Aaradhaya Khandelwal	**9**	**90**	**3**
2	Aashita Jain	**9**	**90**	**3**
3	ABHAY PRATAP SINGH SAMBYAL			
4	Abhay Singh Rathore	**9**	**90**	**3**
5	Abhilasha Chakraberty	**7**	**70**	**3**

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6	Abhinav Anand	7	70	3
7	Abhishree Mundra	8	80	3
8	Adesh Shrivastav	4	40	2
9	Adit Jain	4	40	2
10	Aditya Kumar	5	50	2
11	Aditya Mishra	10	100	3
12	Aditya Nair	4	40	2
13	Amrit Agarwal	7	70	3
14	Akshat Gupta	6	60	3
15	Aman Choubey	6	60	3
16	Aman Goyal	5	50	2
17	Aman Kumar Singh	6	60	3
18	Amar Singh	7	70	3
19	Amit Mishra	9	90	3
20	Anchal Jain	6	60	3
21	Anjali Garg	8	80	3
22	Ankit Kumar	6	60	3
23	Anshul Sharma	7	70	3
24	Anshul Sharma	7	70	3
25	Anshuman Singh	7	70	3
26	Anubhav Anand	6	60	3
27	Anupam Anand	8	80	3
28	Anurag Kumar	7	70	3
29	Anush Jain	7	70	3
30	Anvi Sahu	7	70	3
31	Arpit Gupta	8	80	3
32	Aryan Nama	8	80	3

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33	Aryan Rana	6	60	3
34	ASHISH KUMAR PRAJAPATI	7	70	3
35	Ashutosh Upadhyay	9	90	3
36	Astha Sharma	9	90	3
37	Atharav Porwal	6	60	3
38	Avinash Dubey	9	90	3
39	Ayush Baluni	8	80	3
40	Ayush Jain	8	80	3
41	Ayush Singhal	8	80	3
42	Ayushi Gupta	9	90	3
43	Bharti Gupta	7	70	3
44	Bhavit Chaudhary	5	50	2
45	Bhavya Agarwal	7	70	3
46	Bhavya Lohami	8	80	3
47	Chaitanya Khurana	10	100	3
48	Chandan Jangir	9	90	3
49	CHANDAN JANGIR			
50	Chetan Sharma	5	50	2
51	Daksh Kardam	8	80	3
52	Deepak Dayma	9	90	3
53	Deepak Kumar			
54	Deepak Kumar Tiwari	7	70	3
55	Dev Soni	7	70	3
56	Devendra Singh Rao	9	90	3
57	Devesh Sharma	7	70	3
58	Dhruv Gaur	9	90	3
59	Divyansh Agarwal	6	60	3

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60	Divyanshi Choudhary	**9**	**90**	**3**
61	Divyanshu Tailor	**4**	**40**	**2**
62	Esha Kapoor	**8**	**80**	**3**
63	Fardeen Alam	**6**	**60**	**3**
64	Farhan Khan	**6**	**60**	**3**
65	Gagan Sharma	**6**	**60**	**3**
66	Gauransh Sharma	**6**	**60**	**3**
67	Gaurav Agrawal	**7**	**70**	**3**
68	Gaurav Parihar	**8**	**80**	**3**
69	Gautam Sharma	**9**	**90**	**3**
70	Gourav Joshi	**9**	**90**	**3**
71	Gunank Bansal	**7**	**70**	**3**
72	KHUSHI AGARWAL	**6**	**60**	**3**
No. of Students attained level 3=		61	**% of Students Attained Level 3=**	**88%**
No. of Students attained level 2=		08	**% of Students Attained Level 2=**	**12%**
No. of Students attained level 1=		0	**% of Students Attained Level 1=**	**-**
Target Achieved= YES			**Gap=**	**0.12**
Mark X for absent- (Take avg. of all present)= NA				

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ATTAINMENT OF OVERALL CO THROUGH MIDTERM-I EXAM

Attainment of CO: 1FY2_03 : Subject: Engineering Chemistry

S. No.	Student	Midterm I Marks 50	% of Marks	Overall CO%	Overall CO Level of Attainment
1	Aaradhaya Khandelwal	46	92	91	3
2	Aashita Jain	48	96	95	3
3	ABHAY PRATAP SINGH SAMBYAL				
4	Abhay Singh Rathore	38	76	78	3
5	Abhilasha Chakraberty	45	90	89	3
6	Abhinav Anand	35	70	70	3
7	Abhishree Mundra	45	90	89	3
8	Adesh Shrivastav	30	60	59	2
9	Adit Jain	33	66	65	3
10	Aditya Kumar	32	64	63	3
11	Aditya Mishra	47	94	96	3
12	Aditya Nair	32	64	63	3
13	Amrit Agarwal	40	80	78	3
14	Akshat Gupta	38	76	75	3
15	Aman Choubey	36	72	71	3
16	Aman Goyal	35	70	69	3
17	Aman Kumar Singh	38	76	75	3
18	Amar Singh	28	56	56	2
19	Amit Mishra	38	76	76	3
20	Anchal Jain	36	72	70	3
21	Anjali Garg	45	90	89	3

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22	Ankit Kumar	34	68	66	3
23	Anshul Sharma	30	60	65	3
24	Anshul Sharma	29	58	64	3
25	Anshuman Singh	38	76	74	3
26	Anubhav Anand	37	74	73	3
27	Anupam Anand	42	84	83	3
28	Anurag Kumar	30	60	61	3
29	Anush Jain	37	74	75	3
30	Anvi Sahu	32	64	68	3
31	Arpit Gupta	42	84	83	3
32	Aryan Nama	44	88	86	3
33	Aryan Rana	35	70	69	3
34	ASHISH KUMAR PRAJAPATI	42	84	83	3
35	Ashutosh Upadhyay	47	94	94	3
36	Astha Sharma	48	96	96	3
37	Atharav Porwal	36	72	71	3
38	Avinash Dubey	47	94	94	3
39	Ayush Baluni	45	90	89	3
40	Ayush Jain	44	88	88	3
41	Ayush Singhal	42	84	83	3
42	Ayushi Gupta	46	92	91	3
43	Bharti Gupta	30	60	65	3
44	Bhavit Chaudhary	40	80	78	3
45	Bhavya Agarwal	44	88	86	3
46	Bhavya Lohami	46	92	91	3
47	Chaitanya Khurana	48	96	96	3
48	Chandan Jangir	47	94	94	3

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49	CHANDAN JANGIR				
50	Chetan Sharma	38	76	75	3
51	Daksh Kardam	45	90	89	3
52	Deepak Dayma	48	96	95	3
53	Deepak Kumar				
54	Deepak Kumar Tiwari	39	78	78	3
55	Dev Soni	35	70	70	3
56	Devendra Singh Rao	42	84	84	3
57	Devesh Sharma	39	78	76	3
58	Dhruv Gaur	48	96	96	3
59	Divyansh Agarwal	36	72	70	3
60	Divyanshi Choudhary	45	90	89	3
61	Divyanshu Tailor	32	64	64	3
62	Esha Kapoor	42	84	84	3
63	Fardeen Alam	38	76	75	3
64	Farhan Khan	35	70	69	3
65	Gagan Sharma	39	78	76	3
66	Gauransh Sharma	37	74	75	3
67	Gaurav Agrawal	38	76	76	3
68	Gaurav Parihar	42	84	83	3
69	Gautam Sharma	47	94	94	3
70	Gourav Joshi	48	96	96	3
71	Gunank Bansal	41	82	80	3
72	KHUSHI AGARWAL	28	56	61	3
No. of Students attained level 3= 67			**% of Students Attained Level 3=**		**97%**
No. of Students attained level 2= 02			**% of Students Attained Level 2=**		**3%**

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No. of Students attained level 1= NIL	% of Students Attained Level 1=	NIL
Target Achieved= YES	Gap= 0.03	
Mark X for absent- (Take avg. of all present)= NA		

Attainment of CO (MIDTERM-I) Component				
Overall CO Attainments	CO1	CO2	CO3	CO4
Targets	1.00	2.00	3.00	2.00
Attainments	1.00	1.91	2.90	1.92
Gap	0.00	0.09	0.10	0.08

Gaps in CO from MIDTERM-I component:

1. Very less gap due to CO-2, CO-3, CO-4.

Action to be taken:

1. Assignment based on CO-2, CO-3, CO-4 will be given to student.

	Attainment of PO through CO (MIDTERM-I) Component											
2FY2-03	PO											
	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO 8	PO 9	PO10	PO1 1	PO12
Targets	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Achieved	1.47	1.42	-	-	-	-	-	-	-	-	-	-
Gap	0.53	0.58	-	-	-	-	-	-	-	-	-	-

Gaps in PO through CO from MIDTERM-I component:

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1. Lack of understanding of basic concepts of chemistry.

Action to be taken:

1. To improve knowledge of basic chemistry more practical based lecture will be planned.

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POORNIMA
COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 28 -1-2021**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Max. Marks=35 **Time: 2 hour**

II Assignment marks

Roll No.	**Name of Students**	Q.3	Q4	**Max. Marks**
		20	15	**35**
		CO3	CO4	**marks obtained**
20/A/01	Aaradhaya Khandelwal	18	15	33
20/A/02	Aashita Jain	19	14	33
20/A/03	ABHAY PRATAP SINGH SAMBYAL	A	A	A
20/A/04	Abhay Singh Rathore	18	14	32
20/A/05	Abhilasha Chakraberty	17	15	32
20/A/06	Abhinav Anand	17	14	31
20/A/07	Abhishree Mundra	16	14	30
20/A/08	Adesh Shrivastav	16	14	30
20/A/09	Adit Jain	15	11	26
20/A/10	Aditya Kumar	16	12	28
20/A/11	Aditya Mishra	15	11	26
20/A/12	Aditya Nair	14	10	24
20/A/13	Amrit Agarwal	17	14	31
20/A/14	Akshat Gupta	17	11	28
20/A/15	Aman Choubey	16	13	29
20/A/16	Aman Goyal	16	12	28
20/A/17	Aman Kumar Singh	17	11	28
20/A/18	Amar Singh	16	12	28

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20/A/19	Amit Mishra	16	11	27
20/A/20	Anchal Jain	18	13	31
20/A/21	Anjali Garg	19	14	33
20/A/22	Ankit Kumar	16	10	26
20/A/23	Anshul Sharma	14	11	25
20/A/24	Anshul Sharma		12	12
20/A/25	Anshuman Singh	15	12	27
20/A/26	Anubhav Anand	12	10	22
20/A/27	Anupam Anand	15	11	26
20/A/28	Anurag Kumar	15	9	24
20/A/29	Anush Jain	14	8	22
20/A/30	Anvi Sahu	17	8	25
20/A/31	Arpit Gupta	16	13	29
20/A/32	Aryan Nama	19	12	31
20/A/33	Aryan Rana	15	12	27
20/A/34	ASHISH KUMAR PRAJAPATI	18	11	29
20/A/35	Ashutosh Upadhyay	19	12	31
20/A/36	Astha Sharma	18	13	31
20/A/37	Atharav Porwal	17	13	30
20/A/38	Avinash Dubey	16	14	30
20/A/39	Ayush Baluni	17	11	28
20/A/40	Ayush Jain	14	12	26
20/A/41	Ayush Singhal	16	12	28
20/A/42	Ayushi Gupta	17	14	31
20/A/43	Bharti Gupta	16	15	31
20/A/44	Bhavit Chaudhary	19	13	32
20/A/45	Bhavya Agarwal	17	14	31
20/A/46	Bhavya Lohami	16	13	29
20/A/47	Chaitanya Khurana	16	13	29
20/A/48	Chandan Jangir	16	13	29
20/A/50	Chetan Sharma	A	A	A
20/A/51	Daksh Kardam	17	12	29
20/A/52	Deepak Dayma	18	15	33
20/A/53	Deepak Kumar	A	A	A
20/A/54	Deepak Kumar Tiwari	18	15	33
20/A/55	Dev Soni	12	12	24

20/A/56	Devendra Singh Rao	18	14	32
20/A/57	Devesh Sharma	18	14	32
20/A/58	Dhruv Gaur	17	11	28
20/A/59	Divyansh Agarwal	18		18
20/A/60	Divyanshi Choudhary	16	13	29
20/A/61	Divyanshu Tailor	17	13	30
20/A/62	Esha Kapoor	18	13	31
20/A/63	Fardeen Alam	19	14	33
20/A/64	Farhan Khan	15	14	29
20/A/65	Gagan Sharma	A	12	12
20/A/66	Gauransh Sharma	A	A	A
20/A/67	Gaurav Agrawal	16	13	29
20/A/68	Gaurav Parihar	14	14	28
20/A/69	Gautam Sharma	16	11	27
20/A/70	Gourav Joshi	17	14	31
20/A/71	Gunank Bansal	16	A	16
20/A/72	KHUSHI AGARWAL	18	13	31

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POORNIMA
COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 28 -1-2021**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Assignment-II

Max. Marks=35 **Time: 2 hour**

S. NO.	CO	PO	Marks	QUESTIONS
1	4	1	3	How coke manufactured by coal? Give process of carbonization.
2	4	1	3	How is Petrol quality measure by Octane number? Explain with structure of hydrocarbons.
3	4	1	3	Explain preparation of Paracetamol with chemical reaction.
4	4	1	3	Describe Pilling Bedworth's rule and ratio for corrosion of metal.
5	4	1	3	Explain reforming process of gasoline to improve its quality.
6	3	1	4	A coal sample of 0.96 g was burnt in a Bomb calorimeter, the following data was obtained- H = 7%, Weight of water taken in calorimeter = 520 g Water equivalent of calorimeter = 2200 g, T1 = 23.4 °C, T2 = 25.4°C Fuse wire correction = 10 cal.

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				Acid correction=50cal. Calculate HCV and LCV in Kcal/Kg assuming the latent heat of steam is 580 cal/g
7	3	1	6	1Kg of coal contain following constituents- C = 80 % O = 2 % N = 3% H = 6% Ash = rest Calculate the min. weight of air required for complete combustion of 1 Kg of coal, if 40 % excess air is supplied.
4	3	1	10	How can we differentiate proximate and ultimate analysis of coal? Explain the steps involved in proximate and ultimate analysis of coal. State the significance of each.

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POORNIMA
COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 3 Feb--2021**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Max. Marks=15 **Time: 1 hour**

II Class test marks

Roll No.	**Name of Students**	Q3	Q4	Max.Marks
		10	5	15
		CO-3	CO-4	obtained
20/A/01	Aaradhaya Khandelwal	8	5	13
20/A/02	Aashita Jain	9	4	13
20/A/03	ABHAY PRATAP SINGH SAMBYAL	A	A	A
20/A/04	Abhay Singh Rathore	0	4	4
20/A/05	Abhilasha Chakraberty	8	5	13
20/A/06	Abhinav Anand	8	4	12
20/A/07	Abhishree Mundra	7	5	12
20/A/08	Adesh Shrivastav	A	A	A
20/A/09	Adit Jain	8	4	12
20/A/10	Aditya Kumar	8	4	12
20/A/11	Aditya Mishra	8	4	12
20/A/12	Aditya Nair	7	4	11
20/A/13	Amrit Agarwal	10	4	14
20/A/14	Akshat Gupta	A	A	A
20/A/15	Aman Choubey	7	4	11
20/A/16	Aman Goyal	7	4	11

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20/A/17	Aman Kumar Singh	6	3	9
20/A/18	Amar Singh	7	3	10
20/A/19	Amit Mishra	8	4	12
20/A/20	Anchal Jain	10	5	15
20/A/21	Anjali Garg	9	3	12
20/A/22	Ankit Kumar	8	3	11
20/A/23	Anshul Sharma	7	4	11
20/A/24	Anshul Sharma	7	4	11
20/A/25	Anshuman Singh	7	3	10
20/A/26	Anubhav Anand	8	4	12
20/A/27	Anupam Anand	8	3	11
20/A/28	Anurag Kumar	7	3	10
20/A/29	Anush Jain	8	4	12
20/A/30	Anvi Sahu	8	3	11
20/A/31	Arpit Gupta	8	4	12
20/A/32	Aryan Nama	10	5	15
20/A/33	Aryan Rana	7	5	12
20/A/34	ASHISH KUMAR PRAJAPATI	10	4	14
20/A/35	Ashutosh Upadhyay	9	4	13
20/A/36	Astha Sharma	10	5	15
20/A/37	Atharav Porwal	9	3	12
20/A/38	Avinash Dubey	9	4	13
20/A/39	Ayush Baluni	8	4	12
20/A/40	Ayush Jain	7	3	10
20/A/41	Ayush Singhal	9	4	13
20/A/42	Ayushi Gupta	9	5	14
20/A/43	Bharti Gupta	8	4	12
20/A/44	Bhavit Chaudhary	7	5	12
20/A/45	Bhavya Agarwal	8	4	12
20/A/46	Bhavya Lohami	8	4	12
20/A/47	Chaitanya Khurana	9	5	14
20/A/48	Chandan Jangir	8	4	12

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20/A/50	Chetan Sharma	A	A	A
20/A/51	Daksh Kardam	9	0	9
20/A/52	Deepak Dayma	9	4	13
20/A/53	Deepak Kumar	A	A	A
20/A/54	Deepak Kumar Tiwari	10	4	14
20/A/55	Dev Soni	6	3	9
20/A/56	Devendra Singh Rao	9	4	13
20/A/57	Devesh Sharma	8		8
20/A/58	Dhruv Gaur	8	3	11
20/A/59	Divyansh Agarwal	8	4	12
20/A/60	Divyanshi Choudhary	8	4	12
20/A/61	Divyanshu Tailor	8	3	11
20/A/62	Esha Kapoor	7	4	11
20/A/63	Fardeen Alam	0	4	4
20/A/64	Farhan Khan	7	4	11
20/A/65	Gagan Sharma	7	4	11
20/A/66	Gauransh Sharma	A	A	A
20/A/67	Gaurav Agrawal	8	3	11
20/A/68	Gaurav Parihar	7	3	10
20/A/69	Gautam Sharma	8	3	11
20/A/70	Gourav Joshi	9	3	12
20/A/71	Gunank Bansal	0	4	4
20/A/72	KHUSHI AGARWAL	9	3	12

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POORNIMA COLLEGE OF ENGINEERING

Campus: PCE. **Course: B.Tech.** **Class/Section: I year** **Date: 3-2-2021**

Name of Faculty: Dr. Meena Tekriwal **Name of Subject: Engineering Chemistry** **Course Code: 1FY2-03**

Class test-I

Max. Marks=15 **Time: 1 hour**

S. NO.	**CO**	PO	Marks	QUESTIONS
1	**4**	2	2	How is Aspirine prepared in lab, explain with chemical reaction.
2	**4**	2	3	How is synthetic petrol manufactured? explain
3	**3**	1	2	Why galvanization process preferred over tinning to protect iron metal articles.
4	**3**	1	3	The ultimate analysis of anthracite coal sample gives: C = 84.5%, N = 0.5%, H = 6%, O = 8%, S = 1% Calculate high and low calorific value by using Dulong's formula.

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5	**3**	1	5	Differentiate between HCV and LCV for fuel? Explain determination of calorific value of solid fuel by Bomb-Calorimeter with diagram.

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Attainment table for CO-3:1FY2-03

CO3: 1FY2-03: Attainment Table

S. No.	Student	Assignment 20	Class Test 10	Total 30	% 0f Marks	Level of Attainment
1	Aaradhaya Khandelwal	18	8	**26**	**87**	**3**
2	Aashita Jain	19	9	**28**	**93**	**3**
3	ABHAY PRATAP SINGH SAMBYAL					
4	Abhay Singh Rathore	18	A	**18**	**90**	**3**
5	Abhilasha Chakraberty	17	8	**25**	**83**	**3**
6	Abhinav Anand	17	8	**25**	**83**	**3**
7	Abhishree Mundra	16	7	**23**	**77**	**3**
8	Adesh Shrivastav	16	A	**16**	**80**	**3**
9	Adit Jain	15	8	**23**	**77**	**3**
10	Aditya Kumar	16	8	**24**	**80**	**3**
11	Aditya Mishra	15	8	**23**	**77**	**3**
12	Aditya Nair	14	7	**21**	**70**	**3**
13	Amrit Agarwal	17	10	**27**	**90**	**3**
14	Akshat Gupta	17	A	**17**	**85**	**3**
15	Aman Choubey	16	7	**23**	**77**	**3**
16	Aman Goyal	16	7	**23**	**77**	**3**
17	Aman Kumar Singh	17	6	**23**	**77**	**3**
18	Amar Singh	16	7	**23**	**77**	**3**
19	Amit Mishra	16	8	**24**	**80**	**3**
20	Anchal Jain	18	10	**28**	**93**	**3**
21	Anjali Garg	19	9	**28**	**93**	**3**

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22	Ankit Kumar	16	8	**24**	**80**	**3**
23	Anshul Sharma	14	7	**21**	**70**	**3**
24	Anshul Sharma		7	**7**	**70**	**3**
25	Anshuman Singh	15	7	**22**	**73**	**3**
26	Anubhav Anand	12	8	**20**	**67**	**3**
27	Anupam Anand	15	8	**23**	**77**	**3**
28	Anurag Kumar	15	7	**22**	**73**	**3**
29	Anush Jain	14	8	**22**	**73**	**3**
30	Anvi Sahu	17	8	**25**	**83**	**3**
31	Arpit Gupta	16	8	**24**	**80**	**3**
32	Aryan Nama	19	10	**29**	**97**	**3**
33	Aryan Rana	15	7	**22**	**73**	**3**
34	ASHISH KUMAR PRAJAPATI	18	10	**28**	**93**	**3**
35	Ashutosh Upadhyay	19	9	**28**	**93**	**3**
36	Astha Sharma	18	10	**28**	**93**	**3**
37	Atharav Porwal	17	9	**26**	**87**	**3**
38	Avinash Dubey	16	9	**25**	**83**	**3**
39	Ayush Baluni	17	8	**25**	**83**	**3**
40	Ayush Jain	14	7	**21**	**70**	**3**
41	Ayush Singhal	16	9	**25**	**83**	**3**
42	Ayushi Gupta	17	9	**26**	**87**	**3**
43	Bharti Gupta	16	8	**24**	**80**	**3**
44	Bhavit Chaudhary	19	7	**26**	**87**	**3**
45	Bhavya Agarwal	17	8	**25**	**83**	**3**
46	Bhavya Lohami	16	8	**24**	**80**	**3**
47	Chaitanya Khurana	16	9	**25**	**83**	**3**
48	Chandan Jangir	16	8	**24**	**80**	**3**

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49	CHANDAN JANGIR	A				
50	Chetan Sharma	17	9	26	87	3
51	Daksh Kardam	18	9	27	90	3
52	Deepak Dayma	14	10	24	80	3
53	Deepak Kumar					
54	Deepak Kumar Tiwari	12	6	18	60	3
55	Dev Soni	18	9	27	90	3
56	Devendra Singh Rao	18	8	26	87	3
57	Devesh Sharma	17	8	25	83	3
58	Dhruv Gaur	18	8	26	87	3
59	Divyansh Agarwal	16	8	24	80	3
60	Divyanshi Choudhary	17	8	25	83	3
61	Divyanshu Tailor	18	7	25	83	3
62	Esha Kapoor	19	A	19	95	3
63	Fardeen Alam	15	7	22	73	3
64	Farhan Khan	14	7	7	70	3
65	Gagan Sharma	10	8	18	60	3
66	Gauransh Sharma					
67	Gaurav Agrawal	14	7	21	70	3
68	Gaurav Parihar	16	8	24	80	3
69	Gautam Sharma	17	9	26	87	3
70	Gourav Joshi	16		16	80	3
71	Gunank Bansal	18	9	27	90	3
72	KHUSHI AGARWAL	17	8	25	83	3
No. of Students attained level 3=			68	**% of Students Attained Level 3=**		**100%**
No. of Students attained level 2=			NIL	**% of Students Attained Level 2=**		**NIL**
No. of Students attained level 1=			NIL	**% of Students Attained Level 1=**		**NIL**

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Target Achieved=	YES	Gap= NIL	
Mark X for absent- (Take avg. of all present)= NA			

Attainment table for CO-4:1FY2-03

	CO4: 1FY2-03: Attainment Table					
S. No.	Student	Assignment 15	Class Test 5	Total 20	% 0f Marks	Level of Attainment
1	Aaradhaya Khandelwal	15	5	20	100	3
2	Aashita Jain	14	4	18	90	3
3	ABHAY PRATAP SINGH SAMBYAL					
4	Abhay Singh Rathore	14	4	18	90	3
5	Abhilasha Chakraberty	15	5	5	25	1
6	Abhinav Anand	14	4	18	90	3
7	Abhishree Mundra	14	5	19	95	3
8	Adesh Shrivastav	14		14	70	3
9	Adit Jain	11	4	15	75	3
10	Aditya Kumar	12	4	16	80	3
11	Aditya Mishra	11	4	15	75	3
12	Aditya Nair	10	4	14	70	3

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13	Amrit Agarwal	14	4	**18**	**90**	**3**
14	Akshat Gupta	11	A	**11**	**55**	**2**
15	Aman Choubey	13	4	**17**	**85**	**3**
16	Aman Goyal	12	4	**16**	**80**	**3**
17	Aman Kumar Singh	11	3	**14**	**70**	**3**
18	Amar Singh	12	3	**15**	**75**	**3**
19	Amit Mishra	11	4	**15**	**75**	**3**
20	Anchal Jain	13	5	**18**	**90**	**3**
21	Anjali Garg	14	3	**17**	**85**	**3**
22	Ankit Kumar	10	3	**13**	**65**	**3**
23	Anshul Sharma	11	4	**15**	**75**	**3**
24	Anshul Sharma	12	4	**16**	**80**	**3**
25	Anshuman Singh	12	3	**15**	**75**	**3**
26	Anubhav Anand	10	4	**14**	**70**	**3**
27	Anupam Anand	11	3	**14**	**70**	**3**
28	Anurag Kumar	9	3	**12**	**60**	**3**
29	Anush Jain	8	4	**12**	**60**	**3**
30	Anvi Sahu	8	3	**11**	**55**	**2**
31	Arpit Gupta	13	4	**17**	**85**	**3**
32	Aryan Nama	12	5	**17**	**85**	**3**
33	Aryan Rana	12	5	**17**	**85**	**3**
34	ASHISH KUMAR PRAJAPATI	11	4	**15**	**75**	**3**
35	Ashutosh Upadhyay	12	4	**16**	**80**	**3**
36	Astha Sharma	13	5	**18**	**90**	**3**
37	Atharav Porwal	13	3	**16**	**80**	**3**
38	Avinash Dubey	14	4	**18**	**90**	**3**
39	Ayush Baluni	11	4	**15**	**75**	**3**

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40	Ayush Jain	12	3	**15**	**75**	**3**
41	Ayush Singhal	12	4	**16**	**80**	**3**
42	Ayushi Gupta	14	5	**19**	**95**	**3**
43	Bharti Gupta	15	4	**19**	**95**	**3**
44	Bhavit Chaudhary	13	5	**18**	**90**	**3**
45	Bhavya Agarwal	14	4	**18**	**90**	**3**
46	Bhavya Lohami	13	4	**17**	**85**	**3**
47	Chaitanya Khurana	13	5	**18**	**90**	**3**
48	Chandan Jangir	13	4	**17**	**85**	**3**
49	CHANDAN JANGIR	A				
50	Chetan Sharma	12	A	**12**	**60**	**3**
51	Daksh Kardam	15	4	**19**	**95**	**3**
52	Deepak Dayma	10	4	**14**	**70**	**3**
53	Deepak Kumar					
54	Deepak Kumar Tiwari	12	3	**15**	**75**	**3**
55	Dev Soni	14	4	**18**	**90**	**3**
56	Devendra Singh Rao	14		**14**	**70**	**3**
57	Devesh Sharma	11	3	**14**	**70**	**3**
58	Dhruv Gaur		4	**4**	**20**	**1**
59	Divyansh Agarwal	13	4	**17**	**85**	**3**
60	Divyanshi Choudhary	13	3	**16**	**80**	**3**
61	Divyanshu Tailor	13	4	**17**	**85**	**3**
62	Esha Kapoor	14	4	**18**	**90**	**3**
63	Fardeen Alam	14	4	**18**	**90**	**3**
64	Farhan Khan	12	4	**16**	**80**	**3**
65	Gagan Sharma	13	3	**16**	**80**	**3**
66	Gauransh Sharma					

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67	Gaurav Agrawal	14	3	**17**	**85**	**3**
68	Gaurav Parihar	11	3	**14**	**70**	**3**
69	Gautam Sharma	14	3	**17**	**85**	**3**
70	Gourav Joshi					
71	Gunank Bansal	13	3	**16**	**80**	**3**
72	KHUSHI AGARWAL	14	4	**18**	**90**	**3**
No. of Students attained level 3=			63	**% of Students Attained Level 3=**		**94%**
No. of Students attained level 2=			02	**% of Students Attained Level 2=**		**3%**
No. of Students attained level 1=			02	**% of Students Attained Level 1=**		**3%**
Target Achieved=			**YES**	**Gap=**	**NIL**	
Mark X for absent- (Take avg. of all present)= NA						

CO-GAP IDENTIFICATIONS

COs	CO3	CO4
Target	**3.00**	**2.00**
Achieved	**3.00**	**1.94**
Gap	**0.00**	**0.06**

Gaps Identified:

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1. 0.06 gap, which is very less so can fill easily.

ACTIVITIES DECIDED TO BRIDGE THE GAP

1. Questions will be practiced in the tutorial sessions.

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I B.TECH. (I Sem.) **Roll No. _____**

Date of Exam-8 March 2021

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

SECOND MID TERM EXAMINATION 2020-21

Code: 1FY2-03 Category: BSC Subject Name–Engineering Chemistry

(BRANCH – CS)

Max. Time: 2 hrs. **Max. Marks: 50**

NOTE:- **Read the guidelines given with each part carefully.**

PART - A: (All questions are compulsory) Max. Marks (10)

Q No.	CO	PO	BL (L_i)	PI	Marks	Questions
1.	CO-1	1	L1	1.2.1	2	What is calorific value? Differentiate between GCV and NCV.
2.	CO-1	1	L1	1.2.1	2	What is Knocking? Define anti-knocking agents with examples?
3.	CO-1	1	L1	1.2.1	2	What is Pilling Bedworth Rule and Ratio?
4.	CO-1	1	L1	1.2.1	2	Define Octane number with structure of hydrocarbons.
5.	CO-1	1	L1	1.2.1	2	Write preparation reaction and uses of Aspirin.

PART - B: (Attempt 2 questions out of 3 Max. Marks (20)

Q No.	CO	PO	BL (L_i)	PI	Marks	Questions
6.	CO-2,	1	L2,L3	1.2.1	5+5	(a) A coal sample of 0.98 g was burnt in a Bomb calorimeter, the following data was obtained- H = 5%, Weight of water taken in calorimeter = 5000 g

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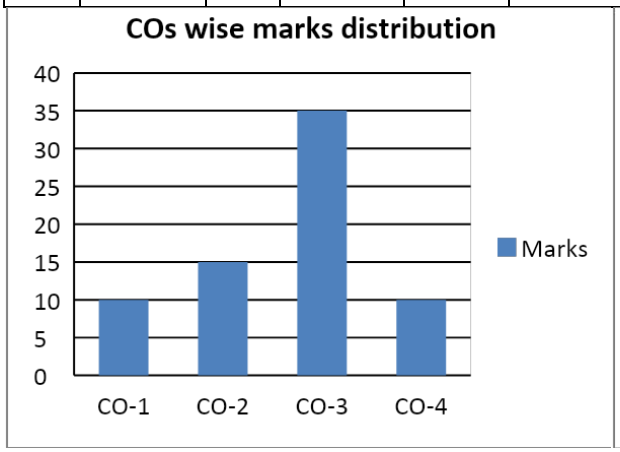
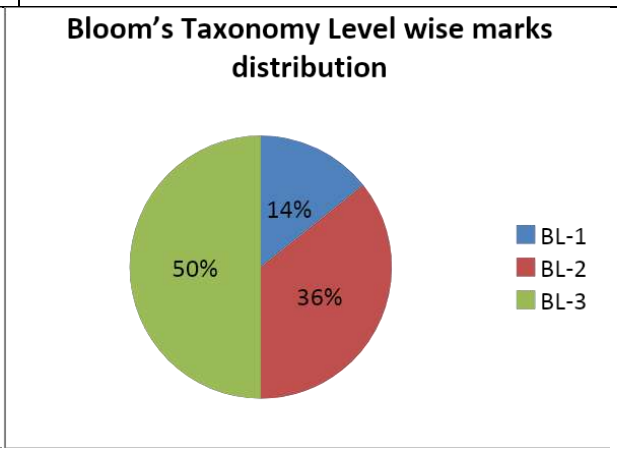
	CO-3					Water equivalent of calorimeter = 2250 g, T_1 = 23.40 C, T_2 = 25.40 C, Fuse wire correction = 15 cal., Acid correction = 40 cal., Calculate HCV and LCV in Kcal/Kg assuming the latent heat of steam is 570 cal/g (b) What is cracking and its significance? Explain moving bed or fluidized bed catalytic Cracking process.
7.	CO-2, CO-3	1	L2, L3	1.2.1	5+5	**(a)** The ultimate analysis of coal sample gives- C = 85 %, H = 5%, N = 5%, O = 3%, S = 2.0% Calculate NCV and GCV by using Dulong's formula. (b) Explain followings: (i) How can corrosion of buried water pipelines be prevented? (ii) How reforming increases anti-knocking properties of petrol?
8.	CO-2, CO-3	1	L2, L3	1.2.1	5+5	(a) What is synthetic petrol? Explain Fischer Tropsch process of synthetic Petrol. (b) 4.6 g of coal sample was heated in a silica crucible for one hour at 107°C. 4.0g residue was left behind. The residue obtained was then covered and heated for 7 minutes at 950°C, 3.5 g residue was obtained. The residue obtained is further heated at 700°C in muffle furnace till the constant mass of 1.1 g of residue was obtained. Calculate percentage results of the analysis and state to which type, the analysis belongs?

PART - C: (Attempt 2 questions out of 3) Max. Marks (20)

Q No.	CO	PO	BL (L_i)	PI	Marks	Questions
9	CO-4	2	L2, L3	**1.2.1**	**(10)**	What is meant by carbonization of coal? Describe manufacturing of metallurgical coke by Otto-Hoffmann's

						method with recovery of byproducts. Also give advantages of Otto-Hoffmann's method over Beehive's coke oven method.
10	CO-3	1	L3	**1.2.1**	**(10)**	Calculate the volume of air required for complete combustion of 1 m^3 of gaseous fuel having the composition H_2 = 12%, CH_4 = 22%, C_2H_2 = 18%, C_4H_{10} = 28%, C_2H_6 = 20% and 30% excess air is supplied. Also calculate the % composition of dry products.
11	CO-3	1	L2, L3	**1.2.1**	**(10)**	What are the causes of Corrosion? Explain electrochemical or Wet theory of corrosion with mechanism and examples.





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Campus: Poornima College of Engineering **Class/Section: I YEAR, I SEMESTER**

Course: B.Tech. **Year/ Section – A**

Name of Faculty: Dr. MeenaTekriwal **Name of Subject :Engineering Chemistry** **Code: 1FY2-03**

ATTAINMENT OF CO THROUGH MIDTERM-I &II EXAM CUMULATIVE

CO1: 1FY2-03: Attainment Table

S. No.	Student	Midterm I Marks (10)	Midterm II Marks (10)	Overall CO-1 %	Overall Level for CO-1
1	Aaradhaya Khandelwal	9	9	90	3
2	Aashita Jain	10	9	95	3
3	ABHAY PRATAP SINGH SAMBYAL				
4	Abhay Singh Rathore	8	1	25	1
5	Abhilasha Chakraberty	10	0.5	44	2
6	Abhinav Anand	8	8	90	3
7	Abhishree Mundra	10	4	74	3
8	Adesh Shrivastav	8		100	3
9	Adit Jain	7	3	78	3
10	Aditya Kumar	7		70	3
11	Aditya Mishra	10	6	85	3
12	Aditya Nair	9	6	88	3
13	Amrit Agarwal	9	8	85	3
14	Akshat Gupta	9	9.5	93	3

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15	Aman Choubey	9	9	90	3
16	Aman Goyal	8	3	70	3
17	Aman Kumar Singh	9	6	70	3
18	Amar Singh	6	4	79	3
19	Amit Mishra	8	8	70	3
20	Anchal Jain	9	9	85	3
21	Anjali Garg	9	9	90	3
22	Ankit Kumar	9		90	3
23	Anshul Sharma	8	5	77	3
24	Anshul Sharma	8	2	90	3
25	Anshuman Singh	8	3	78	3
26	Anubhav Anand	8	30	75	3
27	Anupam Anand	9	36	220	3
28	Anurag Kumar	7	6	75	3
29	Anush Jain	8	3	60	3
30	Anvi Sahu	8	4	74	3
31	Arpit Gupta	9	5	72	3
32	Aryan Nama	9	9	90	3
33	Aryan Rana	8	3	60	3
34	ASHISH KUMAR PRAJAPATI	9	8	80	3
35	Ashutosh Upadhyay	10	44	95	3
36	Astha Sharma	10	10	100	3
37	Atharav Porwal	9	8	90	3
38	Avinash Dubey	10	5	77	3
39	Ayush Baluni	10	7	94	3
40	Ayush Jain	10	3	75	3
41	Ayush Singhal	9	4	70	3

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42	Ayushi Gupta	9	44	90	3
43	Bharti Gupta	9	4	79	3
44	Bhavit Chaudhary	9	41	95	3
45	Bhavya Agarwal	9	8	85	3
46	Bhavya Lohami	10	2	70	3
47	Chaitanya Khurana	10	6	88	3
48	Chandan Jangir	10	8	90	3
49	CHANDAN JANGIR		3	75	3
50	Chetan Sharma	10	9	90	3
51	Daksh Kardam	10	6.5	91	3
52	Deepak Dayma	10	1.5	88	3
53	Deepak Kumar			100	3
54	Deepak Kumar Tiwari	9	1.5	75	3
55	Dev Soni	8	1	70	3
56	Devendra Singh Rao	8	24	85	3
57	Devesh Sharma	8	3	78	3
58	Dhruv Gaur	10	5	82	3
59	Divyansh Agarwal	8	3	88	3
60	Divyanshi Choudhary	9	5	72	3
61	Divyanshu Tailor	9	3.5	89	3
62	Esha Kapoor	10	8	85	3
63	Fardeen Alam	9	7	85	3
64	Farhan Khan	9	5	77	3
65	Gagan Sharma	9	4.5	83	3
66	Gauransh Sharma	8		90	3
67	Gaurav Agrawal	9	5	82	3
68	Gaurav Parihar	9	7.5	83	3

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69	Gautam Sharma	**10**	**4**	**95**	**3**
70	Gourav Joshi	**10**		**100**	**3**
71	Gunank Bansal	**10**	**4**	**84**	**3**
72	KHUSHI AGARWAL	**7**	**5**	**92**	**3**
No. of Students attained level 3=		**69**		**% of Students Attained Level 3=**	**97%**
No. of Students attained level 2=		01		**% of Students Attained Level 2=**	**2%**
No. of Students attained level 1=		00		**% of Students Attained Level 1=**	**-**
Target Achieved= YES				**Gap=**	**0.07**
Mark X for absent- (Take avg. of all present)= NA					

CO2: 1FY2-03: Attainment Table (Cumulative I midterm and II Midterm)

S. No.	Student	CO-2 Midterm II Marks (20)	CO-2 Midterm I Marks (20)	Overall CO-2 %	Overall Level for CO-2
1	Aaradhaya Khandelwal	12	19	92	3
2	Aashita Jain	17.5	20	100	3
3	ABHAY PRATAP SINGH SAMBYAL				
4	Abhay Singh Rathore	4	14	40	2
5	Abhilasha Chakraberty	2	19	78	3
6	Abhinav Anand	12	14	45	2
7	Abhishree Mundra	4	19	53	2

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8	Adesh Shrivastav	2	13	48	2
9	Adit Jain	6	14	60	3
10	Aditya Kumar	5	14	80	3
11	Aditya Mishra	18	17	80	3
12	Aditya Nair	12	14	74	3
13	Amrit Agarwal	15.5	18	83	3
14	Akshat Gupta	7.5	16	65	3
15	Aman Choubey	10	15	75	3
16	Aman Goyal	10	15	75	3
17	Aman Kumar Singh	7.5	16	63	3
18	Amar Singh	9	11	78	3
19	Amit Mishra	20	15	78	3
20	Anchal Jain	16	16	80	3
21	Anjali Garg	16	19	95	3
22	Ankit Kumar		15	55	2
23	Anshul Sharma	7	8	40	2
24	Anshul Sharma		7	26	1
25	Anshuman Singh	5	17	73	3
26	Anubhav Anand	12	16	80	3
27	Anupam Anand		18	108	3
28	Anurag Kumar	12.5	11	43	2
29	Anush Jain	6	14	67	3
30	Anvi Sahu	12.5	10	35	1
31	Arpit Gupta	4	18	93	3
32	Aryan Nama	19	19	70	3
33	Aryan Rana	9	15	78	3
34	ASHISH KUMAR PRAJAPATI	16	18	88	3

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35	Ashutosh Upadhyay	17	19	98	3
36	Astha Sharma	20	19	63	3
37	Atharav Porwal	6	15	70	3
38	Avinash Dubey	13	19	78	3
39	Ayush Baluni	12	19	68	3
40	Ayush Jain	8	18	73	3
41	Ayush Singhal	11	18	88	3
42	Ayushi Gupta	17	19	80	3
43	Bharti Gupta	13	8	58	2
44	Bhavit Chaudhary	15	18	53	2
45	Bhavya Agarwal	3	19	58	2
46	Bhavya Lohami	2	19	78	3
47	Chaitanya Khurana	12	19	79	3
48	Chandan Jangir	12.5	19	58	2
49	CHANDAN JANGIR	4		88	3
50	Chetan Sharma	17.5	16	59	2
51	Daksh Kardam	7.5	19	58	2
52	Deepak Dayma	4	20	100	3
53	Deepak Kumar				
54	Deepak Kumar Tiwari	4	16	50	2
55	Dev Soni	2	14	88	3
56	Devendra Singh Rao	21	17	62	3
57	Devesh Sharma	7.5	17	74	3
58	Dhruv Gaur	12.5	19	80	3
59	Divyansh Agarwal	13	16	118	3
60	Divyanshi Choudhary	15.5	19	79	3
61	Divyanshu Tailor	12.5	13	78	3

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62	Esha Kapoor	**18**	**17**	**68**	**3**
63	Fardeen Alam	**10**	**16**	**80**	**3**
64	Farhan Khan	**5**	**15**	**55**	**2**
65	Gagan Sharma	**7**	**17**	**85**	**3**
66	Gauransh Sharma		**14**	**62**	**3**
67	Gaurav Agrawal	**10.5**	**15**	**78**	**3**
68	Gaurav Parihar	**16**	**18**	**60**	**3**
69	Gautam Sharma	**6**	**19**	**95**	**3**
70	Gourav Joshi		**19**	**65**	**3**
71	Gunank Bansal	**11**	**18**	**75**	**3**
72	KHUSHI AGARWAL	**12**	**7**	**35**	**1**
No. of Students attained level 3=		**52**		**% of Students Attained Level 3=**	**73%**
No. of Students attained level 2=		15		**% of Students Attained Level 2=**	**17%**
No. of Students attained level 1=		4		**% of Students Attained Level 1=**	**4%**
Target Achieved= YES				**Gap=**	**0.53**
Mark X for absent- (Take avg. of all present)= NA					

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CO3: 1FY2-03: Attainment Table

Cumulative I midterm and II Midterm

S. No.	Student	CO-3 Midterm I Marks (10)	CO-3 Midterm II Marks (20)	Overall CO-3 %	Overall Level for CO-3
1	Aaradhaya Khandelwal	9	8	40	2
2	Aashita Jain	9	18	90	3
3	ABHAY PRATAP SINGH SAMBYAL				
4	Abhay Singh Rathore	7	10	50	2
5	Abhilasha Chakraberty	9	5	48	2
6	Abhinav Anand	6	6	60	3
7	Abhishree Mundra	8	7	48	2
8	Adesh Shrivastav	5	3	48	2
9	Adit Jain	8	3	33	1
10	Aditya Kumar	6	1	43	2
11	Aditya Mishra	10		60	3
12	Aditya Nair	5		100	3
13	Amrit Agarwal	6	16	65	3
14	Akshat Gupta	7	3	38	1
15	Aman Choubey	6	11	63	3
16	Aman Goyal	7		60	3
17	Aman Kumar Singh	7	1	38	1
18	Amar Singh	4	7	53	2
19	Amit Mishra	6	10	45	2
20	Anchal Jain	5	9	53	2

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21	Anjali Garg	9	9	48	2
22	Ankit Kumar	4		90	3
23	Anshul Sharma	7	7	38	1
24	Anshul Sharma	7	18	80	3
25	Anshuman Singh	6	4	45	2
26	Anubhav Anand	7	11	58	2
27	Anupam Anand	7		70	3
28	Anurag Kumar	5	5	48	2
29	Anush Jain	8	4	35	1
30	Anvi Sahu	7	5	53	2
31	Arpit Gupta	7	7	53	2
32	Aryan Nama	8	10	60	3
33	Aryan Rana	6	2	45	2
34	ASHISH KUMAR PRAJAPATI	8	5	43	2
35	Ashutosh Upadhyay	9	9	63	3
36	Astha Sharma	10	9	68	3
37	Atharav Porwal	6	8	70	3
38	Avinash Dubey	9	17	73	3
39	Ayush Baluni	8	15	83	3
40	Ayush Jain	8	8	60	3
41	Ayush Singhal	7	7	58	2
42	Ayushi Gupta	9	9	58	2
43	Bharti Gupta	6	8	65	3
44	Bhavit Chaudhary	8	9	53	2
45	Bhavya Agarwal	9	9	63	3
46	Bhavya Lohami	9	3	53	2
47	Chaitanya Khurana	9	2	50	2

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48	Chandan Jangir	9	6	60	3
49	CHANDAN JANGIR		3	53	2
50	Chetan Sharma	7	9	45	2
51	Daksh Kardam	8	5	48	2
52	Deepak Dayma	9	6	55	2
53	Deepak Kumar				
54	Deepak Kumar Tiwari	7	6	30	1
55	Dev Soni	6	1	38	1
56	Devendra Singh Rao	8	5	43	2
57	Devesh Sharma	7	4	50	2
58	Dhruv Gaur	10	2	40	2
59	Divyansh Agarwal	6	5	63	3
60	Divyanshi Choudhary	8	7	48	2
61	Divyanshu Tailor	6	5	53	2
62	Esha Kapoor	7	8	50	2
63	Fardeen Alam	7	14	70	3
64	Farhan Khan	5		70	3
65	Gagan Sharma	7	5	38	1
66	Gauransh Sharma	9		70	3
67	Gaurav Agrawal	7	2	50	2
68	Gaurav Parihar	7	5	48	2
69	Gautam Sharma	9	2	40	2
70	Gourav Joshi	10		90	3
71	Gunank Bansal	6	5	63	3
72	KHUSHI AGARWAL	8	10	55	2
No. of Students attained level 3=		**27**		**% of Students Attained Level 3=**	**38%**

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No. of Students attained level 2=	36	**% of Students Attained Level 2=**	**40%**
No. of Students attained level 1=	8	**% of Students Attained Level 1=**	**9%**
Target Achieved= NO		**Gap=**	**1.5**
Mark X for absent- (Take avg. of all present)= NA			

CO4: 1FY2-03: Attainment Table

Cumulative I midterm and II Midterm					
S. No.	**Student**	**CO-4 Midterm II Marks (10)**	**CO-4 Midterm I Marks (10)**	**Overall CO-4 %**	**Overall Level for CO-4**
1	Aaradhaya Khandelwal	**9**		**90**	**3**
2	Aashita Jain	**9**		**90**	**3**
3	ABHAY PRATAP SINGH SAMBYAL				
4	Abhay Singh Rathore	**9**	**5**	**90**	**3**
5	Abhilasha Chakraberty	**7**		**80**	**3**
6	Abhinav Anand	**7**	**9**	**65**	**3**
7	Abhishree Mundra	**8**	**6**	**80**	**3**
8	Adesh Shrivastav	**4**		**60**	**3**

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9	Adit Jain	4	8	40	2
10	Aditya Kumar	5		65	3
11	Aditya Mishra	10	8	60	3
12	Aditya Nair	4	2	40	2
13	Amrit Agarwal	7		70	3
14	Akshat Gupta	6		60	3
15	Aman Choubey	6		60	3
16	Aman Goyal	5		50	2
17	Aman Kumar Singh	6		60	3
18	Amar Singh	7		80	3
19	Amit Mishra	9	9	80	3
20	Anchal Jain	6	7	70	3
21	Anjali Garg	8	8	80	3
22	Ankit Kumar	6		65	3
23	Anshul Sharma	7	7	70	3
24	Anshul Sharma	7		40	2
25	Anshuman Singh	7	1	70	3
26	Anubhav Anand	6		60	3
27	Anupam Anand	8		80	3
28	Anurag Kumar	7		40	2
29	Anush Jain	7	1	65	3
30	Anvi Sahu	7	6	60	3
31	Arpit Gupta	8	5	90	3
32	Aryan Nama	8	10	85	3
33	Aryan Rana	6	9	65	3
34	ASHISH KUMAR PRAJAPATI	7	7	75	3
35	Ashutosh Upadhyay	9	8	90	3

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36	Astha Sharma	9	9	90	3
37	Atharav Porwal	6		60	3
38	Avinash Dubey	9		90	3
39	Ayush Baluni	8		75	3
40	Ayush Jain	8	7	60	3
41	Ayush Singhal	8	4	85	3
42	Ayushi Gupta	9	9	85	3
43	Bharti Gupta	7	8	70	3
44	Bhavit Chaudhary	5	7	70	3
45	Bhavya Agarwal	7	9	70	3
46	Bhavya Lohami	8		60	3
47	Chaitanya Khurana	10	4	70	3
48	Chandan Jangir	9	4	55	2
49	CHANDAN JANGIR		2	90	3
50	Chetan Sharma	5	9	75	3
51	Daksh Kardam	8	10	80	3
52	Deepak Dayma	9	8	90	3
53	Deepak Kumar				
54	Deepak Kumar Tiwari	7	8	70	3
55	Dev Soni	7		55	2
56	Devendra Singh Rao	9	4	70	3
57	Devesh Sharma	7	5	65	3
58	Dhruv Gaur	9	6	90	3
59	Divyansh Agarwal	6	9	60	3
60	Divyanshi Choudhary	9		90	3
61	Divyanshu Tailor	4	9	70	3
62	Esha Kapoor	8	10	80	3

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63	Fardeen Alam	**6**		**60**	**3**
64	Farhan Khan	**6**		**55**	**2**
65	Gagan Sharma	**6**	**5**	**60**	**3**
66	Gauransh Sharma	**6**		**40**	**2**
67	Gaurav Agrawal	**7**	**2**	**80**	**3**
68	Gaurav Parihar	**8**	**9**	**80**	**3**
69	Gautam Sharma	**9**	**8**	**90**	**3**
70	Gourav Joshi	**9**		**65**	**3**
71	Gunank Bansal	**7**	**4**	**55**	**2**
72	KHUSHI AGARWAL	**6**	**4**	**60**	**3**
No. of Students attained level 3=		**61**		**% of Students Attained Level 3=**	**86%**
No. of Students attained level 2=		2		**% of Students Attained Level 2=**	**11%**
No. of Students attained level 1=		NIL		**% of Students Attained Level 1=**	**NIL**
Target Achieved=		**YES**		**Gap=**	**0.3**
Mark X for absent- (Take avg. of all present)= NA					

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Attainment of CO (MIDTERM-I & II Midterm Cumulative) Component				
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**
Targets	**1.00**	**2.00**	**3.00**	**2.00**
MID I Attainments	**1.00**	**1.91**	**2.90**	**1.92**
Attainments Mid II	**0.93**	**1.47**	**1.50**	**1.70**
Attainments Cumulative	**0.97**	**1.69**	**2.20**	**1.81**
Gap	**0.03**	**0.31**	**0.80**	**0.19**

Gaps in CO from (MIDTERM-I & II Midterm Cumulative) Component:

1. Max. gap for CO-3 (0.81)

Action to be taken:

1. Assignment based on CO-3 will be given to student and questions for CO-3 will be given for practice in tutorial.

	Attainment of PO through CO (MIDTERM-I & II cumulative) Component											
2FY2-03	**PO**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO10**	**PO1 1**	**PO12**
Targets	**2.00**	**2.00**	-	-	-	-	-	-	-	-	-	-
Achieved	**1.19**	**1.33**	-	-	-	-	-	-	-	-	-	-
Gap	**0.81**	**0.67**	-	-	-	-	-	-	-	-	-	-

Gaps in PO through CO from MIDTERM-I &II cumulative component:

1. Lack of understanding of basic concepts of chemistry.

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Action to be taken:

1. To improve knowledge of basic chemistry more practical based lecture will be planned.

Cumulative Attainment of Internal Assessment									
S.no	**Name of Student**	**Mid I**	**Level**	**Mid II**	**Level**	**Assignment+class test %**	**Level**	**Overall %**	**Overall level**
		% CO	**60**	**% CO**	**60**	**% CO**	**60**	**% CO**	**60**
1	Aaradhaya Khandelwal	91	3	63	3	92	3	82	3
2	Aashita Jain	95	3	92	3	93	3	93	3
3	ABHAY PRATAP SINGH SAMBYAL			93	3			31	1
4	Abhay Singh Rathore	78	3	36	1	80	3	65	2
5	Abhilasha Chakraberty	89	3	55	2	73	3	72	3
6	Abhinav Anand	70	3	77	3	85	3	77	3
7	Abhishree Mundra	89	3	58	2	68	3	72	3
8	Adesh Shrivastav	59	2	70	3	70	3	66	3
9	Adit Jain	65	3	54	2	75	3	65	3
10	Aditya Kumar	63	3	53	2	78	3	65	3
11	Aditya Mishra	96	3	84	3	72	3	84	3
12	Aditya Nair	63	3	88	3	55	2	69	3
13	Amrit Agarwal	78	3	66	3	91	3	78	3

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14	Akshat Gupta	75	3	71	3	68	3	71	3
15	Aman Choubey	71	3	69	3	79	3	73	3
16	Aman Goyal	69	3	66	3	76	3	70	3
17	Aman Kumar Singh	75	3	58	2	75	3	69	3
18	Amar Singh	56	2	63	3	75	3	65	3
19	Amit Mishra	76	3	68	3	76	3	73	3
20	Anchal Jain	70	3	74	3	91	3	78	3
21	Anjali Garg	89	3	72	3	90	3	84	3
22	Ankit Kumar	66	3	89	3	74	3	76	3
23	Anshul Sharma	65	3	59	2	68	3	64	3
24	Anshul Sharma	64	3	70	3	36	1	57	2
25	Anshuman Singh	74	3	47	2	73	3	65	3
26	Anubhav Anand	73	3	69	3	64	3	69	3
27	Anupam Anand	83	3	108	3	72	3	88	3
28	Anurag Kumar	61	3	78	3	60	3	66	3
29	Anush Jain	75	3	44	2	67	3	62	3
30	Anvi Sahu	68	3	64	3	73	3	68	3
31	Arpit Gupta	83	3	55	2	81	3	73	3
32	Aryan Nama	86	3	83	3	90	3	86	3
33	Aryan Rana	69	3	65	3	78	3	71	3
34	ASHISH KUMAR PRAJAPATI	83	3	66	3	86	3	78	3
35	Ashutosh Upadhyay	94	3	80	3	86	3	87	3
36	Astha Sharma	96	3	89	3	91	3	92	3
37	Atharav Porwal	71	3	78	3	84	3	78	3

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38	Avinash Dubey	94	3	70	3	83	3	82	3
39	Ayush Baluni	89	3	86	3	78	3	84	3
40	Ayush Jain	88	3	69	3	72	3	76	3
41	Ayush Singhal	83	3	65	3	80	3	76	3
42	Ayushi Gupta	91	3	80	3	89	3	87	3
43	Bharti Gupta	65	3	77	3	84	3	75	3
44	Bhavit Chaudhary	78	3	69	3	87	3	78	3
45	Bhavya Agarwal	86	3	68	3	85	3	80	3
46	Bhavya Lohami	91	3	63	3	82	3	79	3
47	Chaitanya Khurana	96	3	69	3	86	3	84	3
48	Chandan Jangir	94	3	75	3	80	3	83	3
49	CHANDAN JANGIR			60	3			20	1
50	Chetan Sharma	75	3	78	3	76	3	76	3
51	Daksh Kardam	89	3	68	3	91	3	83	3
52	Deepak Dayma	95	3	70	3	83	3	83	3
53	Deepak Kumar			95	3			32	1
54	Deepak Kumar Tiwari	78	3	51	2	66	3	65	3
55	Dev Soni	70	3	57	2	88	3	72	3
56	Devendra Singh Rao	84	3	68	3	72	3	75	3
57	Devesh Sharma	76	3	65	3	60	3	67	3
58	Dhruv Gaur	96	3	65	3	71	3	77	3
59	Divyansh Agarwal	70	3	80	3	73	3	74	3
60	Divyanshi Choudhary	89	3	74	3	83	3	82	3
61	Divyanshu Tailor	64	3	78	3	84	3	75	3

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62	Esha Kapoor	84	3	71	3	83	3	79	3
63	Fardeen Alam	75	3	76	3	78	3	76	3
64	Farhan Khan	69	3	72	3	71	3	71	3
65	Gagan Sharma	76	3	58	2	72	3	69	3
66	Gauransh Sharma	75	3	76	3			50	2
67	Gaurav Agrawal	76	3	58	2	74	3	69	3
68	Gaurav Parihar	83	3	72	3	61	3	72	3
69	Gautam Sharma	94	3	69	3	85	3	83	3
70	Gourav Joshi	96	3	94	3	39	1	76	2
71	Gunank Bansal	80	3	89	3	86	3	85	3
72	KHUSHI AGARWAL	61	3	69	3	82	3	71	3

No. of Students attained level 3=	**61**	**% of Students Attained Level 3=**	**88%**
No. of Students attained level 2=	4	**% of Students Attained Level 2=**	**6%**
No. of Students attained level 1=	4	**% of Students Attained Level 1=**	**6%**
Target Achieved	**YES**	**Gap=**	**0.24**

1FY2-03- Engineering Chemistry_ Overall Attainment For internal Assessment

Overall Attainment For internal Assessment				
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**
Targets	**1.00**	**2.00**	**3.00**	**2.00**

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Till Mid -II	**0.97**	**1.69**	**2.20**	**1.81**
Attainments D2	**1.00**	**1.99**	**3.00**	**1.94**
Attainments Cumulative	**0.97**	**1.81**	**2.55**	**1.86**
Gap	**0.03**	**0.19**	**0.45**	**0.14**

Gaps in PO through CO from cumulative internal Assesment component:

1. CO-3 gap is highest, due to not attempting CO-3 related questions in internal assessment.

Action to be taken:

1. OBT and assignment based on CO-3 will be prepared and plasticized by students in class.

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