



JECRC Foundation



**JAIPUR ENGINEERING COLLEGE
AND RESEARCH CENTRE**

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Sem – B.Tech I year I Sem

Subject –Engg.Chemistry

Unit – II

Presented by – Ms.Rekha Vijay

Designation - Asst.Professor

Department - Chemistry

VISION OF INSTITUTE

To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

MISSION OF INSTITUTE

- ❖ Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- ❖ Identify, based on informed perception of Indian, regional and global needs, the areas of focus and provide platform to gain knowledge and solutions.
- ❖ Offer opportunities for interaction between academia and industry.
- ❖ Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge in a range of profession.

Engineering Chemistry: Course Outcomes

Students will be able to:

CO1: Explain the impurities of water (mainly hardness) and boiler troubles.

CO2: Describe processing technologies of fuel with numerical aspects of combustion of fuel.

CO3: Describe the engineering material (cement, glass and lubricant) with respect to their manufacturing, composition, classification & properties.

CO4: Explain corrosion with its controlling measures, organic reaction mechanism and synthesis of drugs (Aspirin & Paracetamol) with their properties and uses.

JECRC
Department of Applied Sciences
Lecture Plan (Session- 2020-2021)

Course Name: Engineering Chemistry

Year/Semester: 1st Year/ Semester- I

Course code: 1FY2-03

No. of Lecture Req. /(Avl.): /(40/44)

Semester starting: 21 Sept. 2020

Semester Ending: 24 Dec. 2020

Unit No./ Total Lect. Req.	Topics	Lect. No.	Date of Delivery	Book Referred	Pg. No.
Unit-I 10	Introduction to syllabus, Common natural impurities, hardness, Degree of hardness,	1			
	Units of hardness, Determination of hardness by complexometric (EDTA method).	2			
	Municipal water supply, Requisite of drinking water, purification of water, Sedimentation,	3			
	Filtration, disinfection, Breakpoint chlorination.	4			
	Boiler troubles: Scale and Sludge formation, Internal treatment Methods	5			
	Priming and Foaming, Boiler corrosion and caustic embrittlement	6			
	Water softening: Lime-Soda process	7			
	Water softening: Zeolite (Permutit) process, Demineralization process.	8			
	Numerical problems based on Hardness, EDTA,	9			
	Numerical problems based on Lime-Soda and Zeolite process.	10			

Unit-II

10

2.Organic Fuels: Solids fuels: Coal, Classification of Coal, Proximate analyses of coal and its significance	11		
Ultimate analyses of coal and its significance,	12		
Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter.	13		
Metallurgical coke, Carbonization processes; Otto-Hoffmann byproduct oven method.	14		
Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking	15		Engg. Chemistry (New Age International)
Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number	16		
Gaseous fuels; Advantages, manufacturing, composition and Calorific value of coal gas and oil gas	17		
Determination of calorific value of gaseous fuels by Junker's calorimeter, Numerical problems based on Junkers calorimeter	18		
Numerical problems based on determination of calorific value bomb calorimeter, /Dulong's formula, proximate & ultimate Analysis.	19		
Numerical problems based on combustion of fuel.	20		

Unit-III

3

3.Corrosion and its control: Definition and significance of corrosion, Mechanism of chemical (dry) corrosion	21			
Mechanism of electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion.	22			
Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.	23			

Unit-IV

10

4.Engineering Materials: Portland Cement; Definition, Manufacturing by Rotary kiln.	24		
Chemistry of setting and hardening of cement. Role of Gypsum.	25		
Glass: Definition, Manufacturing by tank furnace, significance of Annealing	26		
Types and properties of soft glass, hard glass	27		
Borosilicate glass, glass wool, safety glass.	28		
Lubricants: Classification	29		
Lubricants: Mechanism	30		
Properties; Viscosity and viscosity index	31		
Flash and fire point, cloud and pour point.	32		
Emulsification and steam emulsion number.	33		

Unit-V

7

5. Organic reaction mechanism and introduction of drugs: Organic reaction mechanism: Substitution; SN1, SN2.	34			
Electrophilic aromatic substitution in benzene, free radical halogenations of alkanes,	35			
Elimination: elimination in alkyl halides, dehydration of alcohols,	36			
Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones	37			
Rearrangement: Carbocation and free radical rearrangements	38			
Drugs : Introduction, Synthesis, properties and uses of Aspirin	39			
Drugs : Introduction, Synthesis, properties and uses of Paracetamol, Revision	40			

Lecture-15 (Unit-II FUEL)

- **Advantage & Disadvantage of liquid fuel**
- **Mining**
- **Refining**

Liquid Fuels

INTRODUCTION :

Liquid fuels are widely used for industrial and domestic purpose. Almost all IC engines run on liquid fuels. liquid fuels are also used in heat generation in ovens and furnaces. The largest source of liquid fuels is petroleum. It is also called mineral oil. petroleum product are obtained from the refining of crude oil.

Advantage & Disadvantage

Advantage:

- Handling of liquid fuel is easy and they require less storage space
- Liquid fuels can be fired easily and maximum temperature is attained in time as compared to solid fuels.
- The solid fuels containing higher of moisture burn with great difficulty.
- The solid fuels leave a large quantity of ash after burning and then disposal of ash becomes a problem. Where as the liquid fuels as very little ash after burning.
- The combustion of liquid fuel is uniform therefor the change in load can be easily met by controlling the flow of fluid.

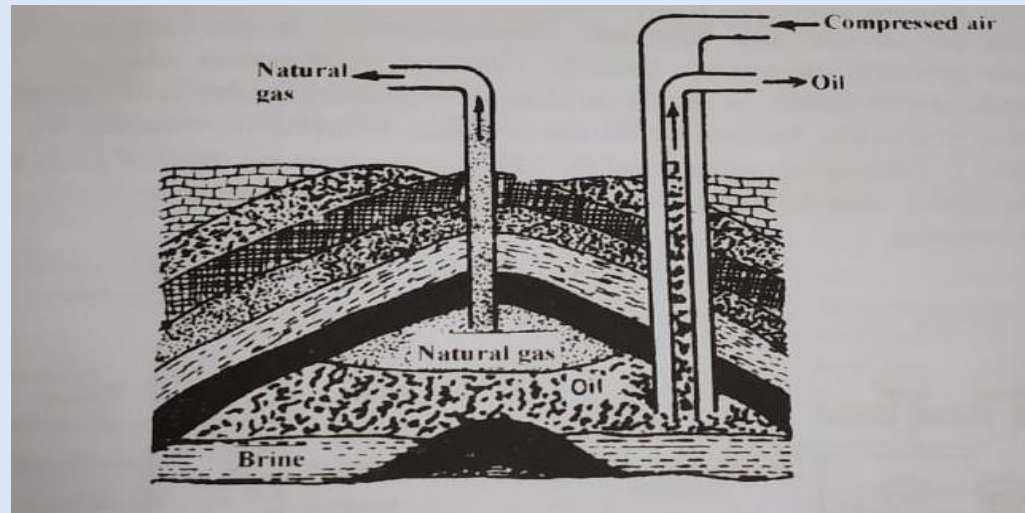
Disadvantage:

- They are costly as compared to solid fuels
- They require special type of burners
- In cold climate the oil stored in tanks is to be heated in order to avoid the stoppage of flow

Mining

Petroleum is found deep below the earth crust The oil is generally found floating upon layer of salt and solution and has a layer of gas on of it

Oil is brought to the surface by drilling holes in the earth's crust and sinking pipes into the oil bearing surface Due to hydrostatic pressure of natural gas oil usually rushes out through these holes and it is pumped up by the help of air lift pumps when the pressure of natural gas subsides The air lift pumps consist of two coaxial pipes lowered to the il reservoir Compressed air is forced through the outer pipes where oil from the innerpipe flows out



Refining

- Petroleum is found in deep in earth crust The term petroleum means 'rock oil or mineral oil. It is a dark green brown, viscous oil Petroleum is a complete mixture of paraffinolefinic and aromatic hydrocarbon with small quantities of organic compounds containing oxygen, nitrogen and sulfur All metals are found in petroleum common metals are Si Fe. Al. Ca. Mg. Ni
- The average composition of petroleum is as follows
- C = 80 - 87%. H = 11 - 15%. S = 0.1 - 3.5%. O = 0.1 - 0.9%
- **Refining of Crude Petroleum**
- Crude oil reaching the surface as such is of little importance and it is a viscous crude oil is usually contains mixture of solid. liquid and gaseous hydrocarbons. containing sand and water After removal of dirt water and natural gas, the crude oil is separated into fractions by distillation and the fractions obtained are subjected to simple purification process or conversion processes to get different useful petroleum products All processes are referred to as refining of petroleum and the plant where these processes take place are called refineries Following steps are included in refining steps

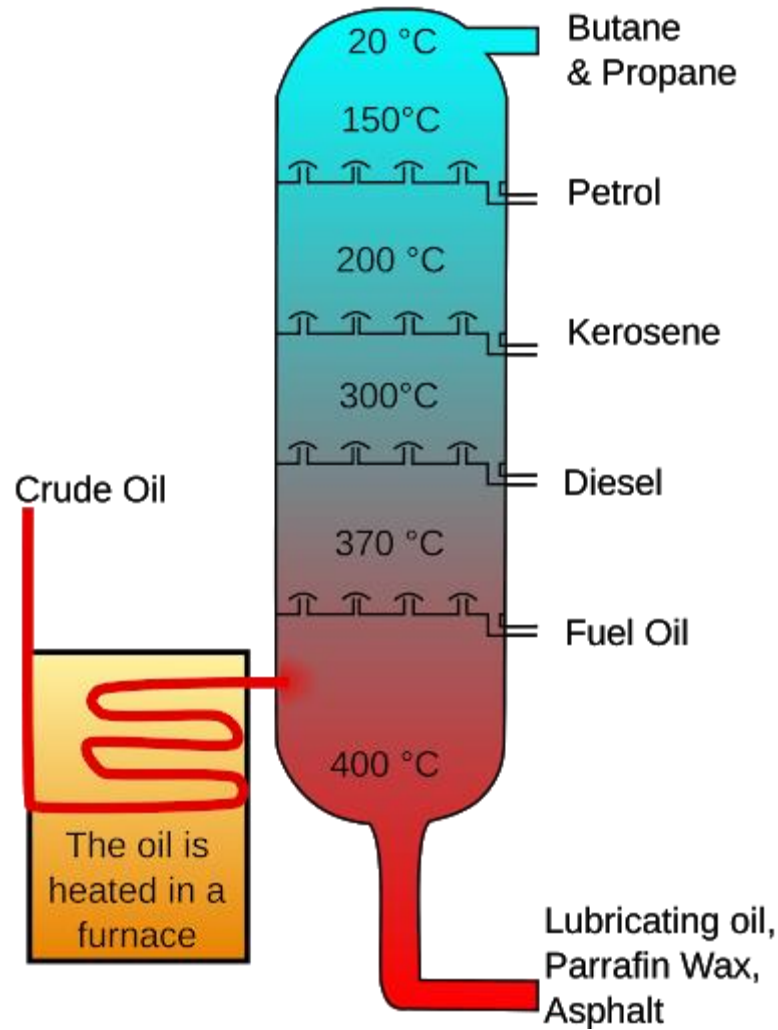
-

(1) **Demulsification or Cottrell's Process:** The yellow dark brown coloured crude oil comes out from the well. Crude oil is mixed with water forming an emulsion. The water is separated from the oil by allowing the crude oil to flow between two highly charged electrodes. The water droplets coalesce to form drops which separate out from the oil. This process is known as Cottrell's Process.

(2) **Removal of Harmful Chlorine and Sulphur Compounds:** Removal of NaCl and $MgCl_2$ can corrode the refining equipment. These can be removed by washing with water. The harmful sulphur compounds are removed as copper sulphides by treating the crude oil with copper oxide. Copper sulphide is removed in solid form by filtration.

(3) Fractional Distillation: The crude oil subjected to distillation to about 400.C in pipe still whereby all volatile constituents are evaporated. The hot vapours are then passed through a tall cylindrical tower, known as fractionating column containing a number of horizontal stainless steel trays at short distances. These trays are provided with individual chimneys are covered with loose cap. The temperature in the fractionating tower decreases gradually on moving upwards. Fractional condensation takes place as a different heights of column, as the vapours rise up. Fractions of higher boiling temperature condenses first, while fractions of the lower boiling temperature condenses later.this distillation is a continuous process. The residue from the bottom of the fractionating tower is vacuum distilled to remove various fractions.

Fractional Distillation



Suggested links from NPTEL

<https://nptel.ac.in/courses/103/102/103102022/>



JECRC Foundation



**JAIPUR ENGINEERING COLLEGE
AND RESEARCH CENTRE**

*Thank
you!*