



JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Sem. – B. Tech I year, Sem.-I

Subject –Engineering Chemistry

Unit – V

Presented by – Dr. Seema Joshi

Designation - 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.

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		Engg. Chemistry (New Age International)	2-12
	Units of hardness, Determination of hardness by complexometric (EDTA method).	2		Engg. Chemistry (Jain & Jain)	
	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

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2.Organic Fuels: Solids fuels: Coal, Classification of Coal, Proximate analysis of coal and its significance	11		Engg. Chemistry (Jain & Jain)	116 -117
Ultimate analysis of coal and its significance,	12		Engg. Chemistry (Jain & Jain)	117 -118
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			
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

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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

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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-39(Unit-V) Drugs

CONTENTS:

- Introduction,
- Synthesis,
- Properties and
- Uses of Aspirin



What is a Drug ?

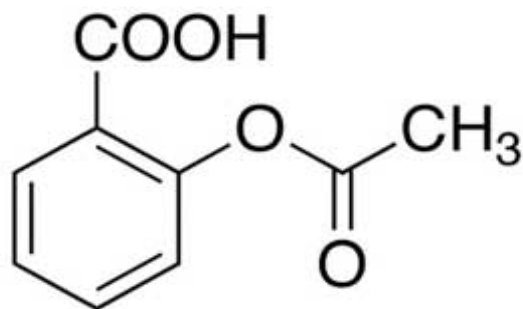
A drug is any substance (with the exception of food and water) which, when taken into the body, alters the body's function either physically and/or psychologically. Drugs may be legal (e.g. alcohol, caffeine and tobacco) or illegal (e.g. cannabis, ecstasy, cocaine and heroin). Drugs are a way of modifying the chemistry of the body. They can be used to treat diseases and infections, correct imbalances in electrolytes and fluids, or alter mental status. Drugs are used both for medical purposes and for recreation. In both cases, no drug is perfect. A perfect drug would be 100% effective while causing no side effects. Drugs offer many benefits, but there are always trade-offs and risks to consider. Aspirin, Paracetamol are among the many examples.

Aspirin: Introduction

Aspirin also known as acetylsalicylic acid is a medication used to treat pain fever or inflammation. A specific inflammatory condition in which Aspirin is used includes rheumatic fever, pericarditis .It is one of the oldest drugs and most consumed drugs.

Structure of Aspirin

Functional groups in Aspirin: It contains one benzene ring with a carboxyl group as well as an acetyl group. That's why it is acidic in nature.



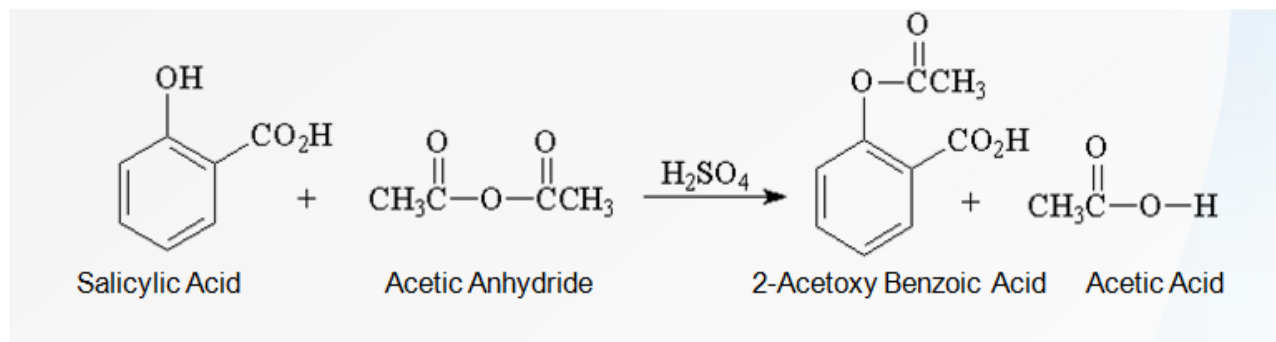
Synthesis

The synthesis of Aspirin is an esterification reaction. In this salicylic acid is treated with acetic anhydride which is an acid derivative in presence of sulphuric acid which causes a chemical reaction that turns salicylic acid's hydroxyl group into an ester group. Products are Aspirin and acetic acid. Acetic acid is considered as a by-product for this reaction.

Procedure:

Salicylic acid solid is mixed with acetic anhydride which is a liquid with a catalytic amount of sulfuric acid H_2SO_4 . It is heated for 10 minutes at 90°C . It is then cool down to room temperature and water is added (Crystallization solvent). Water also destroys excess acetic anhydride. Crystals are not filtered off and washed with water. Aspirin is then collected and purified by recrystallization. After recrystallization its melting point is measured.

Synthesis : Reaction



Side effects of Aspirin

- Swelling, or pain lasting longer than 10 days;
- Hearing problems,
- Ringing in ears
- Less serious side effects may include: upset stomach, heartburn, and headache.

Properties & Uses of Aspirin

Aspirin is indicated for the relief of minor aches and mild-to-moderate pain in the conditions such as arthritis and related conditions. Also used in myocardial infarction prophylaxis.

- Analgesic (painkiller)
- Antipyretic (fever reducer)
- Anti inflammatory (inhibition of the synthesis of prostaglandins).

Physical Properties of Aspirin

- Physical State: crystalline
- Appearance: white
- Odor: odorless
- Nature: Aromatic and acidic
- pH: 3.5
- Melting Point: 136°C
- Boiling Point: 140°C
- Solubility: in organic solvents.
- Specific Gravity/Density: 1.350
- Molecular Formula: $C_6H_4(OCOCH_3)COOH$
- Molecular Weight: 180.16

Question Bank

Q1. What do you mean by drugs ?

Q2. Write down types of Organic reactions which are taking place during synthesis of aspirin.

Q3. How many types of drugs are there ?

Q4. Write properties and uses of Aspirin.

Q5. Describe preparation properties and uses of Aspirin in detail.

Q6. Describe properties and uses of Aspirin.

Q7. Why is the aspirin washed with cold water?

Q8. Write complete mechanism of synthesis of Aspirin.

Q 9. Write down physical properties of Aspirin.

Q10. Write down all the reactants used in synthesis of Aspirin.

Suggested links from NPTEL & other Platforms:

- https://nptel.ac.in/content/storage2/courses/downloads/102106070/Assignment-2_noc18_bt28_58.pdf
- https://nptel.ac.in/content/storage2/courses/downloads/102106070/Assignment-2_noc18_bt28_58.pdf



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*Thank
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