JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

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Year & Sem – B.Tech I year I Sem
Subject –Engg.Chemistry
Unit – IV
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 | | | |

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| **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 | | | |
| | 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, /Dulongs formula, proximate & ultimate Analysis. | 19 | | | |
| | Numerical problems based on combustion of fuel. | 20 | | | |

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| **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 | | | |

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| **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 | | | Engg. Chemistry (New Age International) |
| | Borosilicate glass, glass wool, safety glass. | 28 | | | Engg. Chemistry (New Age International) |
| | 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 | | | |

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| **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 | | | |

# Types of Glass

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- Hard Glass
- Soft Glass

- Safety Glass
- Boro silicate Glass
- Glass Wool

# SODA LIME GLASS (Soft Glass)

This is also known as the soda-glass or soft-glass. It is mainly a mixture of sodium silicate and calcium silicate.

**Properties:**

**Following are the properties of soda-lime glass:**

(i) It is available in clean and clear state.

(ii) It is cheap.

(iii) It is easily fusible at comparatively low temperatures.

(iv) It is possible to blow or to weld articles made from this glass with the help of simple sources of heat.

**Uses:**

- It is used in the manufacture of glass tubes and other laboratory apparatus, plate glass, window glass, etc.

# Potash-Lime Glass (Hard Glass)

This is also known as the Bohemian-glass or hard-glass. It is mainly a mixture of potassium silicate and calcium silicate.

**Properties:**

**Following are the properties of potash-lime glass:**

(i) It fuses at high temperatures.

(ii) It is not easily affected by water and other solvents.

(iii) It does not melt so easily.

**Uses:**

- This glass is used in the manufacture of glass articles which have to withstand high temperatures such as combustion tubes, etc.

# BOROSILICATE GLASS(PYREX GLASS)

Most of us are more familiar with this type of glass in the form of ovenware and other heat-resisting ware, better known under the trade name Pyrex. Borosilicate glass is made mainly of 70% to 80% silica and 7% to 13% boric oxide with smaller amounts of the alkalis (sodium and potassium oxides) and aluminium oxide.

**Properties:**

**Following are the properties of borosilicate glass:**

(i) It has a relatively low alkali content and consequently has good chemical durability and thermal shock resistance.

(ii) It has high softening point.

(iii) It does not break when temperature changes quickly.

**Uses:**

This glass is widely used in the chemical industry, for laboratory apparatus, for ampoules and other pharmaceutical containers, for various high intensity lighting applications and as glass fibres used in the reinforced plastics to make protective helmets, boats, piping, car chassis, ropes, car exhausts and many other items and also in textile industry.

# LAMINATED GLASS (SAFETY GLASS)

Laminated glass is a safety and security glass that is made by sandwiching a laminated sheet between two pieces of glass. The laminated sheet is usually polyvinyl butryl (PVB) sheet. The PVB sheet in the middle of the glass helps in sticking the glass pieces to it when the glass is broken. The laminated glass is designed to prevent it from shattering into pieces and thus ensures safety.

**property**

- Laminated glass remains intact when broken, protecting people from injury. Laminated glass is very safe in overhead glazing
- The PVB interlayer material has viscoelastic property which in turn helps in the reduction of sound acoustic insulation
- Laminated glass reduces transmission of UV rays and hence protects the furniture from fading
- It is durable and maintains color and strength for a much longer time
- The installation of laminated glass is similar to any other type of glass

**uses**

Laminated glass is widely used in building and housing products

- It is used in automotive and transport industries
- Laminated glass is mostly used in building facades and car windscreens
- It plays a major role in overhead glazing like skylights, glass ceilings and roofs
- Laminated glass can also be used in greenhouse

# GLASS WOOL

**Glass wool** is an insulating material made from fibres of glass arranged using a binder into a texture similar to wool

## Process :

Natural sand and recycled glass are mixed and heated to 1,450 °C, to produce glass. The fiberglass is usually produced by a method similar to making cotton candy by forcing it through a fine mesh by centripetal force cooling on contact with the air. Cohesion and mechanical strength are obtained by the presence of a binder that “cements” the fibers together. A drop of binder is placed at each fiber intersection. The fiber mat is then heated to around 200 °C to polymerize the resin and is calendered to give it strength and stability. Finally, the wool mat is cut and packed in rolls or panels, palletized, and stored for use.

## USES:

Glass wool is a thermal insulation material consisting of intertwined and flexible glass fibers, which causes it to "package" air, resulting in a low density that can be varied through compression and binder content (as noted above, these air cells are the actual insulator). Glass wool can be a loose-fill material, blown into attics, or together with an active binder, sprayed on the underside of structures, sheets, and panels that can be used to insulate flat surfaces such as cavity wall insulation, ceiling tiles, curtain walls, and ducting. It is also used to insulate piping and for soundproofing.

# Suggested links from NPTEL

https://en.wikipedia.org/wiki/Glass

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Thank you!