

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2017

THIRD YEAR [BATCH 2015-18]

INDUSTRIAL CHEMISTRY [Honours]

Date : 13/12/2017

Time : 11 am – 1 pm

Paper : V[Gr-A]

Full Marks : 50

[Use a separate Answer Book for each Unit]

Unit – I

(Answer any six questions)

[6×5]

1. a) Define : Crude Oil. Explain how does it occur in mines along with natural gas and salt water under rock cap. [1]
b) Explain the terms : Sweet crude and Sour crude. Name two important places in India where ONGC is operating to produce crude oil. [1+1]
c) Classify crude petroleum into 3 categories based on Nature of Hydrocarbons which predominates over other. [2]
2. Explain in brief the following terms : [1×5]
Octane Number, API gravity, Hydrodesulfurisation, Diesel Index, Low sulfur Heavy Stock
3. Describe with a neat sketch the process of distillation of crude oil both in Atmospheric Pressure and Vacuum indicating Boiling Ranges of different streams from LPG to Vacuum Residue. [5]
4. State why delayed cokers are operated in modern refineries.
A Reformer operating with a feed stock, converts C6/C7 range paraffins to aromatics. Assume Feed Stock is n-Heptane with API Gravity 73.53 and assume 100% conversion to Toluene with API Gravity 30.39 calculate the volumetric and weight basis yield (volume or weight of product/volume or weight of Feed both liquid). [2+3]
5. Which of the following boiling curves will have the highest slope—
TBP, ASTM, EFV? Explain your answer. What are the usual operating temperature and pressure of a FCC? Name the catalyst employed. [3+2]
6. What are Lubricating oils? State how the crude stocks of Lub oils are refined by Furfural extraction producing extract and Raffinate fractions. State how Raw Kerosene is refined by Liquid SO₂ extraction process into superior kerosene oil. What do you mean by smoke point of a Fuel Oil? State smoke point of Kerosene oil. [1+2+2]
7. Explain in brief the following facts : [1×5]
 - a) Aniline Point Test is related to Aromatic content of a petroleum distillate.
 - b) Water content of an ATE is a crucial test for use as fuel in a Jet Plane.
 - c) Dewaxing of Lubricating Oils.
 - d) Raw Naphtha is used as Feed Stock to produce H₂ for NH₃ synthesis in Fertiliser Plants.
 - e) TEL (Tetraethyl Lead) is added to enhance octane rating of motor gasoline — How?
8. How do you evaluate the following properties of a Petroleum oil [1×5]
 - a) Thermal Conductivity
 - b) Specific Heat
 - c) Ramsbottom Carbon Residue in Fuel oils
 - d) Latent heat of Vaporization
 - e) True Boiling Point of a Crude Oil

9. A FCC unit requires either supply or removal of Heat evolved during cracking. How do you design a suitable Heat Exchanger?

A refinery stream is hydrocracked suppose the hydrocarbon is C_{35} fraction having structure equivalent to a Naphthalene Ring with Paraffinic side chain.

The product of cracking may be considered as having carbon number 10·5 approximately.

Calculate the amount of $H_2(g)$ consumed per kg of Feed so cracked.

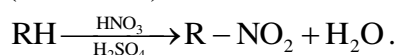
[2+3]

Unit – II

(Answer any four questions)

[4×5]

10. State the usual composition of mixed acid used in Nitration Process. Name two explosive Nitro compounds used in Nitration Process. Name two explosive Nitro compounds used in Military (wartime) operation. What is RDX? Write Mechanism of Nitration showing how NO_2^+ (Nitronium) Ion substitutes H atom from parent molecules having the reaction below :



[1+2+2]

11. What are “DUS” and “Nitric Ratio”? Explain how the process of Nitration of Toluene into Mononitrotoluene using a mixed Acid consisting of 70% conc. H_2SO_4 and 30% Fuming HNO_3 is dependent on Nitric Ratio and DVS. Highlight continuous process of nitration of glycerine into TNG — used in making blasting gelatine.

[2·5×2]

12. What is halogenation? Why iodination is difficult compared to Fluorination/Chlorination? Write block diagram of the process of manufacture of Vinyl chloride Monomer from Petrochemical Feed stock gas.

[2+3]

13. What is synthetic anionic detergent? Give two examples: one for washing, other as Shampoo base. Describe with help of block diagram how Alkyl Aryl Benzene suflonate (Called Acid Slurry) is manufactured using SO_3 gas as sulfonating Agent. Give example of a reaction using $Na_2S_2O_5$ ($NaHSO_3$) as sulfonating agent.

[1+3+1]

14. Discuss how can you prepare the following industrial chemicals (any two) :

[2×2·5]

- a) Bleaching Powder
- b) Sodium Lauryl sulfate
- c) Saccharine or Sugar Free or artificial Sugar (other than Saccharine)
- d) TNT

15. 100Kg Lauryl Alcohol ($C_{12}H_{25}OH$) of purity 96% is sulfated to sodium Lauryl Alcohol Sulfate by using oleum as sulfonating agent. The yield from the sulfonating process is 90% and that from Neutralisation to sodium salt using caustic soda is 95%. Calculate overall yield of Sodium Lauryl sulfate (Shampoo base) [Na = 23, S = 32, C = 12, O = 16]

[5]

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