

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIFTH SEMESTER EXAMINATION, DECEMBER 2013

THIRD YEAR

INDUSTRIAL CHEMISTRY (Honours)

Date : 16/12/2013

Time : 11 am – 1 pm

Paper : V

Full Marks : 50

[Use a separate Answer Book for each Unit]

Group – A

Unit - I

1. Give definitions / reasons / explanation / answer in brief (any six): [6×1]
 - a) Octane number of a gasoline
 - b) Cetane number of a diesel oil
 - c) Doctor's Test
 - d) Cloud point and Pour Point
 - e) Cubical Thermal expansion (CTE)
 - f) Power alcohol
 - g) Viscosity breaking
 - h) API gravity
 - i) What is straight run gasoline
 - j) Dewaxing

2. Answer any three of the following : [3×3]
 - a) What is reforming of Gasoline? How does reforming increase octane number? Give any two reforming reactions. [1+1+1]
 - b) What is meant by desulfurisation of crude oil? How is sulfur removed from crude oil? What are meant by the terms Sweet and Sour Petrol. Give claus reactions of Sulfur Recovery. [2+1]
 - c) What is TEL? Why TEL is used in Internal Combustion engine? Why a small quantity of ethyl bromide is added to petrol along with TEL. Give reason. [1½+1½]
 - d) Name the major Petrochemical companies in India. Draw a Pie diagram showing oil reserves in the world. [1½+1½]
 - e) How are the following thermal properties of Petroleum Calculated?
 - i) Latent Heat of vaporization
 - ii) Specific Heat
 - iii) Flash point [1+1+1]
 - f) Write short notes on (any two) : [1½+1½]
 - i) Viscosity Index
 - ii) Detonation characteristics
 - iii) Vacuum Distillation
 - iv) Atmospheric Distillation

3. Answer any three of the following : [3×5]
 - a) Outline the steps involved in the distillation of a Crude Oil. List in order of increasing boiling ranges of the fractions obtained in fractional distillation of crude oil. Mention their major uses in Industry. [2+2+1]

- b) what is meant by Cracking of Petroleum? Describe in brief the processes of— (i) liquid phase thermal cracking, (ii) vapour phase thermal cracking, (iii) catalytic cracking. What are the advantages of catalytic cracking over thermal cracking? [1+1+1+1+1]
- c) What are the various types of catalysts used in Petroleum Industry? What are the characteristics of a good catalyst? Why is a reaction speeded up in presence of a catalyst? Mention two applications of catalysts in petro-chemical industry. [1½+1½+1+1]
- d) The exhaust gas from a hydrocarbon fuel oil fired furnace. Shows 10.2% CO₂, 7.9% O₂ and 81.9% N₂ by orsat analysis. Calculate— (i) % excess air used, and (ii) Kg of dry air supplied per kg of oil burnt in the engine. [5]
- e) i) How does dehydroisomerization differ from dehydrocyclisation
 ii) Why does the Petro-air mixture expand on ignition?
 iii) Why does volatility decreases with increasing number of carbon atoms in different fractions of petroleum?
 iv) Why are no aromatic compounds found in the gases of gasoline fractions.
 v) Is catalytic reforming an exothermic or endothermic process? [1+1+1+1+1]
- f) Write short notes (**any two**) : [5]
 i) Annealing point
 ii) De sulphurization
 iii) kinematic viscosity
 iv) knocking of engine

Unit - II

Answer **any four** of the following :

4. Describe with a neat sketch Biazzini process of continuous Nitration of glycerine. [5]
5. Define DVS (Dehydrating Value of Sulphuric acid)
 Toluene is nitrated to mononitrotoluene. At the end of reaction, the composition of the mixed acid is :
 H₂SO₄ – 32%, HNO₃ – 53%, Nitrobody – 5%, Water – 10%
 Calculate DVS (Assume theoretical value of R) [5]
6. Describe with neat sketch the design of a typical batch sulphonating Reactor illustrating types of agitator, capacity of vessel and materials of construction. [5]
7. a) 1000 kg of Naphthalene is sulfonated to 1 – Naphthalene sulphonic acid with 20% oleum as sulphonating agent. Calculate the theoretical quantity of 100% sulphuric acid required for the process.
 b) 500 Kg of Lauryl Alcohol is sulphonated with chlorosulphonic acid calculate how much Hydrochloric Acid gas is liberated. [2½+2½]
8. Describe how to synthesize (**any two**) : [2.5×2]
 a) trinitroanniline
 b) trinitroglycerine
 c) hexchlorobenzene
9. Write short notes (**any two**) : [2.5×2]
 a) Friedel-Crafts Reaction
 b) RDX
 c) Sodium dodecyl sulphonate

