RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2014

THIRD YEAR

Date : 18/12/2014 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 11 am – 1 pm **Paper :** V (Gr. A) Full Marks : 50

[Use a separate Answer book for each unit]

Unit - I

1. Give definitions and explain in brief (**any six**) : [6×1]
   a) API gravity
   b) Diesel Index
   c) Ignition temperature
   d) Viscosity Index
   e) Dewaxing
   f) Compression ratio of an Internal Combustion Engine.
   g) Straight run gasoline
   h) flash point
   i) Octane number
   j) Cetane number

2. Write short notes on (**any three**) : [3×3]
   a) i) What is meant by Sweet & sour crude?
      ii) How is desulfurisation made? [1+2]
   b) i) Why desalting operation of crude oil is necessary?
      ii) Describe in brief the desalting process with a rough sketch of the unit. [1+2]
   c) How are thermal properties of Petroleum calculated (**any two**) :
      i) Thermal Conductivity
      ii) Latent heat of vaporization
      iii) Specific heat [1½+1½]
   d) i) What is reforming of Petrol?
      ii) Give any two reforming reactions with chemical equation. [1+2]
   e) Explain the following terms :
      i) LPG as a fuel
      ii) What is meant by knocking? Arrange n-octane, napthelene & isooctane in increasing order of their knocking tendency. [1½+1½]

3. Answer **any three** : [3×5]
   a) Outline the steps involved in the distillation of crude oil. List in order of increasing boiling ranges of the fractions obtained in fractional distillation of crude oil. Mention uses (at least one) of each fraction. [2+2+1]
   b) What is meant by cracking of Petroleum? What is the difference between liquid phase thermal cracking and vapour phase thermal cracking?
      What is the advantage of catalytic cracking over thermal cracking. Name the methods of catalytic cracking which are normally used. [1+2+2]
   c) What are the various types of catalysts used in Petroleum Industry? What are the functions of (i) Active catalytic agent (ii) Promoter (iii) Carrier associated with a catalyst. [2+3]

d) A fuel containing : 90% C and 6% H by mass, has burnt in 90% of air of that required for complete combustion. Find out the percentage composition of dry products of combustion by mass, if H is burnt completely and no carbon is left behind. [5]

e) What is meant by refining of Gasoline? What are processing units used in refineries including auxilary units. [2+3]

f) In the context of shortage of crude oil reserve in our country. Could you suggest the names of any other alternative fuels which can be used for industrial as well as domestic purpose? [5]

Unit - II

(*Answer **any four** questions*) [4×5]

4. Write chemical equations for synthesis of— (i) RDX (ii) Dioctyl Sulfosuccinate. State one use of each.
   1000Kg Toluene is nitrated to S-Trinitrotoluene (TNT) composition of mixed acid after the conversion is : Fuming HNO_3 – 970, 98% H_2SO_4 – 1485, Nitrobody – 30, water – 100, Calculate DVS assuming R = 2·5 (as set in process) [1+1+3]

5. Describe with Flow diagram for the manufacture of Vinyl Chloride by catalytic Halogenation of acetylene. How can you prepare Iodoform from acetone? [4+1]

6. Distinguish between Sulfonation and Sulfation with example (one each)
   1000Kg Keryl Benzene  $C_{14}H_{27}$ is directly Sulfonated with liquid SO_3 (100% Pure) in a glass lined reactor. Calculate quantity of SO_3 required if the yield is 98% based on SO_3 feed. [2+3]

7. Write with flow diagram the Biazzi Process of continuous nitration of glycerine to Trinitroglycerine. Mention one use of the chemical other than explosive. [4+1]

8. Complete the following reactions :
   a) i) Dimethyl Ether + Sulfurtrioxide ⟶
      ii) Acetylene + Nitric acid ⟶
   b) Shampoo base, Sodium Lauryl Sulfate is made from Lauryl alcohol ($C_{12}H_{25}OH$) and chlrosulfonic acid ($ClSO_3H$)
      For 100 Kg Lauryl alcohol, calculate the quantity of 95% pure chlorosulfonic acid required, assuming 100% yield based on cholorosulfonic acid. [2+3]

9. Name one important agent, each for Nitration, Halogenation (Bromination), and Sulfonation Process. For Fabrication of equipment for sulfonation exercise your choice in increasing order out of the following in respect of corrosion resistance. (i) cast iron, (ii) Duriron, (iii) Enamelled cast iron What is equivalent H_2SO_4 strength of 20% oleum? [2+1+2]

10. Give outline of synthesis of Picric acid. Keeping in mind its explosive nature, what are the safety measure generally taken. What is the use of this material in laboratory? [5]

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