

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIFTH SEMESTER EXAMINATION, DECEMBER 2012

THIRD YEAR

INDUSTRIAL CHEMISTRY (Honours)

Date : 17/12/2012

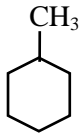
Time : 11 am – 1 pm

Paper : V

Full Marks : 50

[Use separate Answer Book for each group]

Group - A

1. Give definition / reasons / explanation / answer in brief (**any six**) [6×1]
- API Gravity
 - What is aniline point?
 - What is grease?
 - What is UoP K factor?
 - What is LPG? Write its main constituents?
 - Doctor List
 - Octane number
 - TBN
 - What is asphaltene
 - What does visbreaking mean?
2. Answer **any three** : [3×3]
- Name the various fractions obtained in fractional distillation of crude oil. Give composition by weight of chemical elements present in crude petroleum..
 - What are the process condition used in reforming straight run gasoline to higher octane gasoline?
 - Why do crude distillation columns do not use any reboiler?
 - Write the objectives of cracking of heavy petroleum fractions.
 - State which one of the following hydrocarbons you will choose for a diesel engine or a gasoline engine
- $$\text{H}_3\text{C}-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_2-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-\text{CH}_3$$
 - $\eta\text{C}_{16}\text{H}_{34}$
 - 
- f) How the following thermal properties of petroleum calculated,
- Latent heat of vaporization
 - Thermal conductivity
 - Specific heat.
3. Answer **any three** : [3×5]
- What are the primary (straight run) products from the atmospheric distillation column? List in order of increasing boiling ranges, indicate approximate boiling ranges and major uses.
 - What are the various types of catalysts used in Petroleum Industry? Give two examples. What are the major constituents involved in the preparation of a typical catalyst.
 - The weight composition of fuel oil is 86% carbon and 14% hydrogen. It is burned with air (mixture of N₂ and O₂ and enriched with O₂)

The orsat analysis of the fuel gas produced is

CO₂ — 14%

O₂ — 4%

N₂ — 82%

Determine— i) Percent excess oxygen used,

ii) Composition of air used

Also calculate the final composition of the fuel gas if the normal air is used for burning purpose.

- d) What is viscosity index? How viscosity and viscosity index are interrelated? Write down the formula for calculating viscosity index of an oil and how to increase the viscosity index of an oil.
- e) Specific heat of a petroleum fraction is often calculated by the following empirical correlation :

$$C = \frac{1}{\sqrt{d}}(0.402 + 0.00081t) \text{ where } C \text{ is in K cal/Kg, } d \text{ is sp. gravity and } T \text{ is the temperature in } ^\circ\text{C}.$$

Calculate the heat required to increase the temperature of fuel oil with specific gravity 0.93 from 30°C to 150°C.

- f) Ethylene is a major petrochemical. What are the major processes used for the manufacture of ethylene? What are the major products made from ethylene?

Group - B

4. Answer **any four**:

[4×5]

- a) Describe in brief, with a block flow diagram, the Biazzi process for producing nitroglycerine. Give the reaction condition and basic reactions.
- b) Distinguish between 'sulfonation' and 'sulfation' of organic compounds with example. Narrate in brief the production of Acid Slurry (LABS) starting from C-14 Alkylate as followed in RIL's patalganga plant.
- c) What materials of construction may be used for batch/kettle reactors for—
- i) Sulfonation by conventional sulfuric acid and oleum.
- ii) Nitration of aromatics like benzene.
- d) What is the overall reaction for the production of Iodoform by iodization of alkaline ethanol solution? What fraction of Iodine is converted to Iodoform?
- e) 100Kg of benzene is being nitrated by a HNO₃. H₂SO₄ mixtures. How much heat will have to be removed if heat of dilution of sulfuric acid is not taken into account. Assume heats of formation of—
- | | |
|--------------|------------------|
| Benzene | 19.82 Kcal/mol |
| Nitrobenzene | 2.98 Kcal/mol |
| Nitric acid | – 41.35 Kcal/mol |
| Water | – 68.31 Kcal/mol |
- f) Describe in brief any process for the production of vinyl chloride with respect to its starting materials, reactions, process conditions and a block flow diagram.

