RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2016

THIRD YEAR [BATCH 2014-17]

Date : 14/12/2016 **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

(*Answer any six questions*) [6×5]

1. a) Define crude oil.
   b) Give composition by weight of chemical elements present in crude oil.
   c) Write names of sulphur compounds present in crude oil [1+2+2]

2. Explain the following terms (*any five*): [1x5]
   a) API gravity
   b) Aniline point
   c) Smoke point
   d) Octane number
   e) Diesel index
   f) Doctor test

3. With respect to reforming operation used in refinery answer the following:
   a) feedstock used;
   b) reaction involved;
   c) catalyst used [1+3+1]

4. a) What do you mean by 'Bifunctional catalyst'? Indicate its use in refinery.
   b) In FCC reacter unit write the following process conditions are generally used
      (i) Temperature;
      (ii) Pressure;
      (iii) Catalyst to oil ratio
   c) In FCC unit how is the heat of reaction provided? [1+3+1]

5. a) What is the purpose of an alkylation process used in refinery?
   b) What are the catalyst used in alkylation process?
   c) Write a note on isomerization process used in refinery. [1+1+3]

6. a) Write the purpose and catalyst used for desulphurization process.
   b) Write the advantages of hydrocracking over the catalytic cracking.
   c) What is petroleum coke? Write the use of petroleum coke. [2+2+1]

7. a) Write the basic differences between the thermal cracking and catalytic cracking process.
   b) What is viscosity index? How viscosity and viscosity index are interrelated? Write down the formula for calculating V.I. of an oil. [3+2]

8. a) Draw neat sketches of distillation column for crude oil (a) atomospheric column and (b) vacuum column, mentioned the products obtained and the temperature ranges.
   b) Write the purpose of desalting operation for crude oil. [4+1]

9. a) What are the tests are necessary for
   (i) gasoline
   (ii) diesel
   b) Why commercial grade of gasoline, diesel and kerosene are coloured?
   c) Why TEL is not used as octane booster in gasoline? [3+1+1]

UNIT-II

(*Answer any four questions*) [4×5]

10. a) What do you mean DVS?
    b) What is oleum?
    c) Calculate equivalent H_2SO_4 in 100% oleum. [2+1+2]

11. a) Write the names of nitrating agents used in industries.
    b) In a nitrator, dry toluene is reacted with mixed acid (mixture of conc. H_2SO_4 and HNO_3) to produce mononitrotoluene. At the end of the reaction the mixed acid has the following composition

    HNO_3 = 25%; H_2SO_4 = 55%;
    H_2O = 15%; Nitrobody = 5%

    Calculate the DVS of the mixed acid. [2+3]

12. Discuss the photocatalytic synthesis of chloromethanes (mono; di; tri and tetra chloromethane) in detail. [5]

13. a) Explain under what condition the liquid and gas phase nitration reaction occurs for straight chain aliphatic compounds.
    b) Write the nitration products obtained for n-pentane. [2½+2½]

14. a) A certain compound x of weight 10 gms gives 5 gms of nitrated product with a yield of 100%. If 25.9 gms of x is taken and the yield is 98%, calculate the amount of nitrated products that is obtained.
    b) 1000 kg of benzene is fed into a batch nitrator and is nitrated to mono-nitrobenzene (MBN). After the reaction is over, the MBN is removed by steam distillation. The composition of the mixed acid is —

Fuming HNO_3	=	970 Kg
98% H_2SO_4	=	1485 Kg
Nitrobody	=	30 Kg
H_2O	=	100 Kg
Total	=	2585 Kg

    i) Calculate the DVS of the mixed acid assuming R = 0·9.
    ii) Calculate the % composition of the spent acid left in the reactor after MNB is distilled out. [2+3]

15. Discuss the Biazzi process for nitration of glycerin in detail. [5]

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