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AS–1405

B.Sc. Part—II (Semester—III) Examination

PETROCHEMICAL SCIENCE

Time : Three Hours] [Maximum Marks : 80

N.B. :— (1) Question No. **1** is compulsory and carries **8** marks.
(2) Remaining **SIX** questions carry **12** marks each.
(3) Give chemical equations and draw diagrams wherever necessary.
(4) Use of calculator is permitted.

1. (a) Fill in the blanks with appropriate words :
(i) _____ type of petroleum coke is commonly used for electrode manufacture.
(ii) In catalytic cracking lighter molecules more commonly undergo _____ reaction.
(iii) In catalytic reforming _____ material is commonly used as feedstock.
(iv) In extractive distillation for recovery of butadiene _____ solvent is commonly adopted. 2

(b) Choose correct alternative :
(i) In petrochemical complex steam cracking process is commonly used to produce :
(a) Olefinic hydrocarbon (b) Paraffinic hydrocarbon
(c) Gasoline (d) Gas oil
(ii) The operating pressure commonly adopted in delayed coking is :
(a) 2 to 3 Atmosphere (b) 5 to 6 Atmosphere
(c) 10 to 15 Atmosphere (d) 10 to 50 Atmosphere
(iii) The desirable reaction in catalytic reforming is :
(a) Cracking (b) De-alkylation
(c) Hydrogenation (d) Dehydrogenation
(iv) The main reaction in steam cracking is :
(a) Dehydrogenation (b) Hydrogenation
(c) Isomerisation (d) Cyclisation 2

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(c) Answer the following questions in **one** sentence each :

(i) What are the various type of units available in visbreaking ?

(ii) On which principle delayed coking is based ?

(iii) Define % conversion in catalytic cracking.

(iv) In India which petroleum base technique is commonly adopted for butadiene production ? 4

2. Discuss the time-temperature relationship in thermal cracking. Also discuss how API gravity of feed affect the product pattern in thermal cracking at constant temperature and pressure. 12

OR

3. (p) Why steam to hydrocarbon ratio in thermal cracking have fixed range ? Hence discuss the role of steam in thermal cracking. 5

(q) What are the limitations of catalytic process ? Even though thermal cracking is not adopted for gasoline synthesis . 7

4. Discuss the process flow for visbreaking unit in detail with operating conditions adopted. 12

OR

5. What are the various process parameters which decide the product pattern in steam cracking ? Discuss each in brief. 12

6. (a) Write the comparison between thermal cracking and catalytic cracking. 6

(b) What are the various feedstock commonly adopted for catalytic cracking ? Which one is most preferable ? Why ? 6

OR

7. (p) What is the role of mechanism in chemical reactions ? 2

(q) What is carbonium ion ? Give the chemistry of each step involved in carbonium ion mechanism. 10

8. (a) What do you mean by space velocity ? Define the term Liquid Hour Space Velocity (LHSV) and Weight Hour Space Velocity (WHSV). Which term is commonly adopted in catalytic cracking ? Why ? 6

(b) What are the various operating parameters which affect the product pattern in catalytic cracking ? Discuss any two in brief. 6

OR

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9. Draw and discuss the process flow for catalytic cracking including :

   (i) Reactor-riser

   (ii) Regenerator-flue gas separator

   (iii) Fractionation and recycle unit. 12

10. Which route is commonly adopted for production of butadiene in developed countries ? Discuss the same route in brief with chemistry involved and type of catalyst used. 12

OR

11. (p) Discuss the extractive distillation for recovery of butadiene from respective feedstock in brief with basic principle involved. 8

   (q) Write the various uses of butadiene. 4

12. (a) What are the various types of catalyst commonly adopted for catalytic reforming process ? 3

   (b) How to maintain the activity of catalyst in this process ? 4

   (c) Which technique is commonly adopted to maintain the severity of operation in catalytic reforming process ? 5

OR

13. What is azeotropic distillation ? Discuss the utility of azeotropic distillation for separation of toluene in brief. 12

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