

## PETROCHEMICAL TECHNOLOGY (CHE3232)

Time Allotted : 2½ hrs

Full Marks : 60

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 4 (four) from Group B to E, taking one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

### Group – A

1. Answer any twelve:

12 × 1 = 12

*Choose the correct alternative for the following*

- (i) Crude oil contains  
 (a) 83 – 87% carbon (b) 10 – 30% carbon  
 (c) 50% carbon (d) 100% carbon
- (ii) The catalyst used in catalytic reforming unit is  
 (a) Alumina (b) Vanadium Pentoxide  
 (c) Platinum (d) Zinc oxide
- (iii) The percentage conversion of CO to additional H<sub>2</sub> in high temperature shift reactor is  
 (a) 20 – 30% (b) 15 – 50%  
 (c) 65 – 80% (d) 10 – 100%
- (iv) Dowtherm is used during ethylene oxide production  
 (a) To maintain the reactor pressure  
 (b) To maintain the reactor temperature  
 (c) To maintain the higher conversion  
 (d) All of these
- (v) Refrigerated brine solution is used in the production of  
 (a) Ethylene oxide (b) Isopropanol  
 (c) Propylene oxide (d) Ethylene dichloride

(vi) Match the following

|                          |                    |
|--------------------------|--------------------|
| A. Autothermal reforming | (i) LAB            |
| B. Alkylation            | (ii) P - Xylene    |
| C. Parex process         | (iii) Olefins      |
| D. Dehydrogenation       | (iv) Synthesis gas |

(a) A (iv), B (i), C (ii), D (iii)

(b) A (i), B (iv), C (ii), D (iii)

(c) A (iv), B (i), C (iii), D (ii)

(d) A (iii), B (i), C (ii), D (iv)

- (vii) Stabilizing agent used in detergent is  
 (a) Sodium phosphate (b) Silicon  
 (c) Fluorescence dye (d) Bleaching powder
- (viii) Liquid hourly space velocity is expressed as  
 (a)  $LHSV = \frac{\text{Hourly volume charge rate of naptha}}{\text{Volume of catalyst in the reactor}}$   
 (b)  $LHSV = \frac{\text{Hourly volume charge rate of catalyst}}{\text{Volume of feed in the reactor}}$   
 (c)  $LHSV = \frac{\text{Weight charge rate of naptha}}{\text{Weight of catalyst in the reactor}}$   
 (d)  $LHSV = \frac{\text{Weight charge rate of naptha}}{\text{Volume of catalyst in the reactor}}$
- (ix) The raw materials of Nylon66 production are  
 (a) Adipic acid and hexamethylene diamine  
 (b) Caprolactum and adipic acid  
 (c) Napthalene and hexamethylene diamine  
 (d) Syngas and propylene
- (x) Which type of reactor is used during low density polyethylene production?  
 (a) Stirred tank reactor (b) Tubular reactor  
 (c) Fluidised bed reactor (d) Packed bed reactor

*Fill in the blanks with the correct word*

- (xi) Lighter oil has \_\_\_\_\_ API.
- (xii) In the high temperature shift reactor the \_\_\_\_\_ catalyst is used.
- (xiii) The catalyst used in the alkylation unit of LAB production is \_\_\_\_\_.
- (xiv) The raw material of styrene production is \_\_\_\_\_.
- (xv) Natural rubber is chemically known as \_\_\_\_\_.

### Group - B

2. (a) Discuss the classification of petroleum product. [[C01](Analyse/HOCQ)]  
 (b) What are the composition of crude oil? [[C01](Remember/LOCQ)]  
 (c) Name any two Indian petrochemical industry. [[C01](Apply/IOCQ)]  
 (d) Define API gravity. [[C01](Remember/LOCQ)]  
**6 + 2 + 2 + 2 = 12**
3. (a) Briefly discuss the natural gas processing unit with help of a neat block diagram. [[C01](Remember/LOCQ)]  
 (b) Discuss the major engineering problems associated with methanol production from synthesis gas. [[C01](Apply/IOCQ)]  
**8 + 4 = 12**

### Group - C

4. (a) Briefly discuss the manufacturing process of ethylene oxide production with the help of a neat flow sheet. [[CO2](Analyse/HOCQ)]  
(b) Why second compressor is used before the stripper column? [[CO2](Apply/LOCQ)]  
**8 + 4 = 12**
5. (a) Briefly discuss the manufacturing process of acrylonitrile production from propylene with the help of a neat flow sheet. [[CO2](Analyse/IOCQ)]  
(b) Why oxalic acid is added in the acrylonitrile purification unit? [[CO2](Understand/IOCQ)]  
(c) Write the reaction occurred in acrylonitrile production unit. [[CO2](Remember/LOCQ)]  
**8 + 2 + 2 = 12**

### Group - D

6. (a) Discuss the role of process variables in the catalytic reforming of naphtha. [[CO3](Analyse/HOCQ)]  
(b) Mention desirable and non – desirable reactions of catalytic reforming of naphtha. [[CO3](Remember/LOCQ)]  
(c) Name any two solvent used in BTX recovery unit. [[CO3](Apply/IOCQ)]  
**5 + 5 + 2 = 12**
7. (a) Write the reactions occurred during phthalic anhydride production. [[CO3](Remember/LOCQ)]  
(b) Draw the flow sheet of phthalic anhydride manufacturing process? [[CO3](Understand/LOCQ)]  
(c) Discuss the major engineering problems associated with this production. [[CO3](Apply/IOCQ)]  
**3 + 6 + 3 = 12**

### Group - E

8. (a) Briefly discuss the manufacturing process of phenol formaldehyde resin with the help of a neat flow sheet. [[CO4](Analyse/HOCQ)]  
(b) Write a short note on comparative studies on plastic, fibre and elastomer. [[CO4](Remember/LOCQ)]  
**8 + 4 = 12**
9. (a) With a schematic diagram, discuss polystyrene (PS) production process. [[CO4](Remember/LOCQ)]  
(b) Write down the applications of LLDPE, HDPE, PVC, PS and Phenol formaldehyde resin. [[CO4](Analyze/IOCQ)]  
**7 + 5 = 12**

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| Cognition Level         | LOCQ  | IOCQ  | HOCQ  |
|-------------------------|-------|-------|-------|
| Percentage distribution | 44.79 | 27.08 | 28.13 |

