AS–1380

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

PETROCHEMICAL SCIENCE

Time : Three Hours] [Maximum Marks : 80

N.B. :— (1) Question No. **1** is compulsory.

(2) Discuss the reaction mechanism wherever necessary.

(3) Diagrams and chemical equations should be given wherever necessary.

(4) Illustrate your answers with neat sketches wherever necessary.

(5) Use pen of blue/black ink/refill only for writing the answer book.

1. (A) Fill in the blanks :— $4\times\frac{1}{2}=2$

(i) Almost 90% of the total world production of organic chemicals are product of ____ industry.

(ii) Methanol has a tendency to form _____ with toluene.

(iii) In steam reforming process, steam hydrocarbon ratio strictly depends upon the _____ of the feed stock.

(iv) Modern processes for generating synthesis gas from naphtha require to remove _____ from feedstock.

(B) Choice the correct alternative :— $4\times\frac{1}{2}=2$

(i) The main source of important feedstock for petrochemicals today is _____.

(a) Coal (b) Molasses

(c) Crude oil (d) Biomass

(ii) P-xylene and M-xylene can be separated by _____.

(a) Distillation (b) Fractional crystallization

(c) Drying (d) Extraction

(iii) The use of secondary reformer is to convert about 10% _____ still unrelated in the primary reformer.

(a) Ethane (b) Methane

(c) Propane (d) Olefins

(iv) The advantage of oxo-synthesis is in getting higher primary alcohol from _____.

(a) Acetylenes (b) Olefins

(c) Naphthalenes (d) Paraffins.

(C) Answer the following questions in **ONE** sentence each :— 4×1=4

(i) Which petrochemical industry is regarded as actually the first integrated petrochemical complex in India ?

(ii) In which case compression and liquefaction technique is suitable ?

(iii) What is the use of secondary reformer in natural gas steam reforming process ?

(iv) What is the advantage of oxo-synthesis process ?

2. (A) What was clearly mentioned in the Prof. G.P. Kane committee report ? 2

(B) "The main source of important feedstock for petrochemicals today are crude oil and natural gas." Explain with schematic representation showing the basic petrochemicals available from these sources. 10

OR

3. (P) What is the outcome of choosing active catalysts in fertilizer industry ? 2

(Q) "The growth of petrochemicals and the discoveries made in the polymer field are inter-related, the advances made in the one field open-up new vistas in the other." Explain with the suitable examples. 10

4. (A) What are the most common impurities present in petroleum gases ? 2

(B) Which properties the most desirable liquid desiccants used for commercial dehydration process should posses ? 4

(C) Generally the feedstocks for petrochemicals are classified on the basis of existing form. Discuss this classification with suitable examples. 6

OR

5. (P) Name the various mechanical impurities present in petroleum gases. Also mention their sources. 3

(Q) Mention the important properties that solid desiccants used for natural gas dehydration should possess. 4

(R) Name the various solvents that can be used for H_2S removal from sour gases. Also mention their relative capacity to remove H_2S from the sour gases. 5

6. Styrene is obtained as byproduct during cracking of naphtha for ethylene and it constitutes about 4-6%. Discuss the separation of styrene from this fraction by extractive distillation in detail with neat sketch of flow diagram. 12

OR

7. Any thermally cracked or catalytically reformed stocks contain at least 18% of toluene. This toluene is separated by azeotropic distillation. Discuss this process in detail with neat sketch of flow diagram. 12

8. (A) Why the end use of synthesis gas must be well known before hand ? 2

(B) Why threshold concentration of 0.1 ppm weight of sulfur should not exceed in the feedstock for steam reforming process ? 3

(C) Discuss the reactivity of hydrocarbons in steam reforming process in detail. 7

OR

9. (P) Why it is necessary that certain degree of conversion at temperature below 650—700°C is essential for natural gas reforming ? 2

(Q) Why high temperature and high ratio of steam to carbon is required in natural gas steam reforming process ? 3

(R) "Increase in molecular weight of feedstock, increases the reactivity rapidly." Explain in detail with reference to steam reforming. 7

10. (A) Name the various technologies for coal gasification processes along with the recent developments in these processes. 6

(B) Coal gasification process is based on the reaction of coal in the form of coke with steam and oxygen (air). Mention the reactions involved in this process along with their heat requirements. 6

OR

11. Discuss the natural gas steam reforming process in detail with neat sketch of flow diagram and process parameters involved. 12

12. (A) What are the various uses of synthesis gas ? 4

(B) Name the various chemicals based on the carbon monoxide alongwith the chemical reactions involved. 8

OR

13. (P) Syngas appears to have bright future in the production of both bulk and fine chemicals. Name some of the syngas based technologies. 4

(Q) Discuss recent developments in methanol production and also mention its applications. 8