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| **Name:**<br>**Enrolment No:** | UPES |

# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

## End Semester Examination, August 2020

**Programme Name: B.Tech(CE+RP)** **Semester : VIII**
**Course Name : Petrochemical Process Technology** **Time : 03 hrs**
**Course Code : CHEG 432** **Max. Marks : 100**
**Nos. of page(s) : 3**
**Instructions :**

**SECTION A** **10 X 1.5 = 15 Marks**

Just enter only the answer to fill into the blanks

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | ------ process is used for the separation of olefin from paraffin. | **1.5** | **CO1** |
| Q 2 | Mass of naphtha required is ---------- than methanol to form same mass of olefins. | **1.5** | **CO1** |
| Q 3 | Increase in initiator concentration in free radical addition polymerization, results in ---------- in the degree of polymerization. | **1.5** | **CO2** |
| Q 4 | Stereo-regular polymers are obtained by ----------addition polymerization. | **1.5** | **CO2** |
| Q 5 | Shell and tube heat exchanger used as reactor for urea production, in which the compressed $NH_3$ and $CO_2$ enters the ----- side of the heat exchanger. | **1.5** | **CO3** |
| Q 6 | 1-butene is separated from 2-butene and isobutene by ----------. | **1.5** | **CO3** |
| Q 7 | --------- is one of the monomer for the manufacture of epoxy resin. | **1.5** | **CO4** |
| Q 8 | Butyl rubber is produced by copolymerizing isobutylene with small amount of ---------. | **1.5** | **CO4** |
| Q 9 | In Nelson Diaphragm cell process, NaOH produced is contaminated by ---------. | **1.5** | **CO5** |
| Q 10 | Fuel oil fetches price which is --------- than price of crude oil. | **1.5** | **CO5** |

**SECTION B** **10 X 1.5 = 15 Marks**

Choose the correct answer

| | | | |
|---|---|---|---|
| Q 11 | Which one of the following is the first generation petrochemical?<br>(a) Styrene (b) 1,3-Butadiene (c) Acrylonitrile (d) Low Density Polyethylene | **1.5** | **CO1** |
| Q 12 | According to 2017 data, what is the percentage of petroleum consumed for petrochemical production? | **1.5** | **CO1** |

| | | | |
|---|---|---|---|
| | (a) 1% . (b) 90% (c) 50% (d) 14% | | |
| Q 13 | For a given hydrocarbon, its relative reaction rates of decompositions ($r_1/r_2$) is<br>(a) $A_1/A_2\ e^{(E2-E1)/RT}$ (b) $A_1/A_2\ e^{(E1-E2)/RT}$<br>(c) $A_2/A_1\ e^{(E1-E2)/RT}$ (d) $A_2/A_1\ e^{(E1-E2)/RT}$ | **1.5** | **CO2** |
| Q 14 | Among the propagation reactions of free radical formed in steam cracking, which is the most favored under high temperatures?<br>(a) Isomerization (b) Decomposition<br>(c) Substitution (d) Addition | **1.5** | **CO2** |
| Q 15 | Among the following $C_8$ aromatic pairs which is not possible to be separated by fractional distillation.<br>(a) o-xylene and p-xylene (b) o-xylene and m-xylene<br>(c) m-xylene and p-xylene (d) ethyl benzene and o-xylene | **1.5** | **CO3** |
| Q 16 | Name the process by which di-olefins are selectively hydrogenated to mono olefins by liquid phase catalytic hydrogenation in LAB production?<br>(a) DeFine (b) Detal<br>(c) Pacol (d) Detal-Plus | **1.5** | **CO3** |
| Q 17 | Polycarbonate is produced by<br>(a) Solution polymerization (b) Bulk polymerization<br>(b) Emulsion polymerization (d) Interfacial polymerization | **1.5** | **CO4** |
| Q 18 | Which of the following is an engineering resin?<br>(a) Polypropylene (b) Polyethylene<br>(c) Nylon – 6 (d) Polystyrene | **1.5** | **CO4** |
| Q 19 | Methyl ethyl ketone is derived from<br>(a) n-butylene (b) isobutylene<br>(c) ethylene (d) propylene | **1.5** | **CO5** |
| Q 20 | Oxidation of sulphur dioxide to sulphur trioxide is catalyzed by<br>(a) Pt-Rh (b) Ni (c) $V_2O_5$ (d) Pt-Re | **1.5** | **CO5** |
| | **SECTION-C** **10 X 1.5 = 15 Marks**<br>Identify the following statements as TRUE or FALSE | | |
| Q 21 | Upgradation of steam cracking furnace is an important development in petrochemical industries. | **1.5** | **CO1** |
| Q 22 | UOP started the world first plant for the manufacture of ammonia. | **1.5** | **CO1** |
| Q 23 | Henningen and Bundgard-Nielson Model of catalytic reforming does not take into account the differences in the behavior of five and six membered cycloalkanes. | **1.5** | **CO2** |
| Q 24 | In steam cracking, ease of C-C cleavage increases as one move towards the center of the hydrocarbon. | **1.5** | **CO2** |

| | | | |
|---|---|---|---|
| Q 25 | Molten salt is used as heat transfer fluid in transferring the heat of reaction from the reactor in phthalic anhydride production. | **1.5** | **CO3** |
| Q 26 | Smaller steam reformers use rectangular furnace and larger steam reformers use cylindrical furnace. | **1.5** | **CO3** |
| Q 27 | Emulsion SBR is produced by free radical addition polymerization. | **1.5** | **CO4** |
| Q 28 | Phenol : Formaldehyde ratio is 1:2 in the manufacture of Novolac . | **1.5** | **CO4** |
| Q 29 | One of the source of HCl gas required for producing hydrochloric acid is as a byproduct in the manufacture of vinyl chloride. | **1.5** | **CO5** |
| Q 30 | Vinyl acetate is derived from propylene. | **1.5** | **CO5** |
| | **SECTION D 8 X 5 = 40 Marks**<br>Give Short answers | | |
| Q 31 | Give any two important criteria in choosing the feedstock for the manufacture of first generation petrochemicals. | **5** | **CO1** |
| Q 32 | How does anionic addition polymerization yield polymer of high and uniform molecular weight? | **5** | **CO2** |
| Q 33 | Calculate the mole fraction of the unreacted monomer styrene left after 30 minutes during its anionic addition polymerization with n-butyl lithium as initiator of initial concentration 0.002 moles liter$^{-1}$ and propagation rate constant is 5.7 liter mole$^{-1}$ min$^{-1}$. | **5** | **CO2** |
| Q 34 | How to decrease the carbon formation in steam reforming which deactivates the catalyst? | **5** | **CO3** |
| Q 35 | Name a process each and reactants involved for the manufacture of acetic acid and methyl methacrylate. | **5** | **CO3** |
| Q 36 | What is the innovation in the Asahi/Chi Mei Process of manufacture of polycarbonate. | **5** | **CO4** |
| Q 37 | How does Dual process of manufacture of soda ash mitigate the problem of global warming? | **5** | **CO5** |
| Q 38 | Give any four drivers for integration of petroleum refinery with petrochemicals operations. | **5** | **CO5** |
| | **SECTION E 1 X 15 = 15 Marks**<br>Give Detailed Answer | | |
| Q 39 | (a) Name the five steps involved in the steam reforming and one objective of each of them.<br>(b) Give the manufacturing steps of any one method of manufacturing styrene-butadiene rubber.<br>(Or)<br>(a) Give the steps involved in the catalytic reforming of naphtha.<br>(b) Describe the manufacturing steps of acrylic fiber. | **8**<br>**7**<br><br>**8**<br>**7** | **CO3**<br>**CO4**<br><br>**CO3**<br>**CO4** |