



Sanjay Ghodawat University, Kolhapur

EXM/P/09/00

2018-19

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

Year and Program: MSc Chem.

School of Science

Department of Chemistry

Course Code: CHS 608

Course Title: Catalysis,
Polymers & Petrochemicals

Semester – Even (IV)

Day and Date: Tuesday
28 May 2019

End Semester Examination

Time: 3 hrs, Max Marks: 100

2.30 to 3.00 PM.

PRN:

Seat No:

Section A Marks out of 20:

Jr. Supervisor
Signature

Student Signature

Section A

- Instructions:** 1) All Questions are compulsory.
2) For MCQs mark/tic (\checkmark) for correct answer. No marks for multiple tics (\checkmark).
3) Section A should be submitted to Jr Supervisor immediately after first 30 Min.

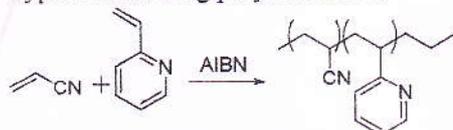
Q.1 Multiple choice questions.

| | Marks | level | CO |
|--|-------|-------|----|
| | 20 | | |
| 1 Choose right statement about catalyst | 01 | L1 | 1 |
| A) Substance enhances the rate of reaction by take part in reaction | | | |
| B) Substance enhances the rate of reaction by take part in reaction and without appearing in the product | | | |
| C) Substance which enhance the rate of reaction without taking part into the reaction. | | | |
| D) None of above | | | |
| 2 Process in which catalyst has a different phase to a reaction mixture, this process is known as | 01 | L2 | 1 |
| A) homogeneous catalysis | | | |
| B) heterogeneous catalysis | | | |
| C) hypergeneous catalyst | | | |
| D) hypogenous catalyst | | | |
| 3 Which gas used in TPD for detection of acidic sites | 01 | L1 | 1 |
| A) CO ₂ | | | |
| B) SO ₂ | | | |
| C) N ₂ | | | |
| D) NH ₃ | | | |
| 4 In the hydrogenation of alkenes using Wilkinson's catalyst, the active catalyst is RhCl(PPh ₃) ₂ or RhCl(PPh ₃) ₂ (solvent)). The first step in the catalytic cycle is | 01 | L1 | 2 |
| A) alkene coordination | | | |
| B) oxidative addition of H ₂ | | | |
| C) loss of PPh ₃ | | | |
| D) loss of Cl ⁻ | | | |
| 5 Ziegler-Natta catalysis is associated with | 01 | L2 | 2 |
| A) alkene hydrogenation | | | |

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- B) alkene polymerization
C) hydroformylation of alkenes
D) alkyne metathesis
- 6 Typical Grubbs' catalysts contain 01 L1 2
A) Ru; a carbene ligand
B) Rh; a carbene ligand
C) Ru; an alkene ligand
D) Mo; a carbene ligand
- 7 Which polymers occur naturally? 01 L1 3
A) Starch and Nylon
B) Starch and Cellulose
C) Proteins and Nylon
D) Proteins and PVC
- 8 Which one of the following polymers is prepared by condensation polymerization? 01 L2 3
A) Teflon
B) Rubber
C) Styrene
D) Nylon-6,6
- 9 $[\text{NH}(\text{CH}_2)\text{NHCO}(\text{CH}_2)_4\text{CO}]_n$ is a 01 L2 3
A) Addition polymer
B) Thermosetting polymer
C) Homopolymer
D) Co-polymer
- 10 Which of the following statements is false? 01 L1 3
A) The repeat unit in natural rubber is isoprene.
B) Both starch and cellulose are polymers of glucose.
C) Artificial silk is derived from cellulose.
D) Nylon-66 is an example of elastomer.
- 11 Type of following polymerization 01 L1 3



- A) Free radical polymerization
B) Co-polymerization
C) Free radical Copolymerization
D) None of above
- 12 The characteristics of condensation polymerization are given below- 01 L2 3
I. Only $-\text{C}-\text{C}-$ linkages present in the polymer structure
II. Use of bifunctional or polyfunctional monomers
III. Elimination of a small byproduct molecule
Which of the following is true?
A) I, II, III
B) II and III
C) I and II
D) Only III

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|----|---|-------------|------|
| 13 | Which of the following kind of polymers are known for their high crystallinity? A) Isotactic B) Syndiotactic C) Atactic D) None of the mentioned | 01 | L1 3 |
| 14 | Mercaptans are low boiling A) Sulphur compounds B) Oxygen compound C) Nitrogen compounds D) Organometallic compounds | 01 | L1 4 |
| 15 | Which of the following petroleum products has lowest flash point? A) Gasoline B) Kerosene C) HSD oil D) Fuel oil | 01 | L1 4 |
| 16 | LPG at normal atmospheric temperature and pressure is a A) Liquid which is heavier than water B) Gas which is heavier than air C) Gas which is lighter than air D) Liquid which is lighter than water | 01 | L2 4 |
| 17 | Octane No is important test for A) LPG B) Kerosene C) Gasoline D) Light diesel oil | 01 | L2 4 |
| 18 | Crude petroleum distillation is carried out at pressure A) Slightly below atmospheric pressure B) Slightly above atmospheric pressure C) Above 5 atm D) Above 15 atm | 01 | L2 4 |
| 19 | Acidic gases like CO ₂ can be removed from petroleum by A) Adsorption by zeolite B) Fractional Distillation C) Chemical conversion D) None of above | 01 | L2 4 |
| 20 | The process of cracking of heavy residues under severe thermal conditions is called as A) Fluid cracking B) Thermal cracking C) Catalytic cracking D) All of the above | 01 | L2 4 |

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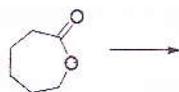
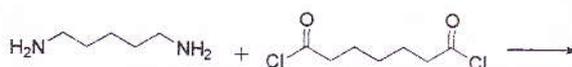
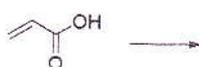
Section B

| | | Marks | level | CO |
|------------|---|-----------|-------|----|
| Q.2 | Attempt the following (any Two) | 12 | | |
| a) | Explain the following term | 06 | L2 | 1 |
| | 1. Adsorption isotherm | | | |
| | 2. Physisorption and chemisorption | | | |
| | 3. ZSM-5 | | | |
| b) | State the basic steps in surface area analysis. Explain the BET principle for surface area measurement of heterogeneous catalyst. | 06 | L2 | 1 |
| c) | Write the characterization techniques that you will use to find the following characteristics of the heterogeneous catalyst (V_2O_5/Al_2O_3): | 06 | L2 | 1 |
| | (i) Reducibility (Oxidation state) | | | |
| | (ii) Meso pore size distribution | | | |
| | (iii) Acidic strength of catalyst | | | |
| | (iv) Surface topography of catalyst | | | |
| | (v) Surface area | | | |
| | (vi) Phase distribution | | | |
| Q.3 | Attempt the following (any Two) | 12 | | |
| a) | What is the importance of Heck coupling and related cross coupling reactions. Similarly explain the catalytic cycle of Heck reaction. | 06 | L2 | 2 |
| b) | Explain the asymmetric synthesis by catalysis. | 06 | L2 | 2 |
| c) | Compare the followings with example | 06 | L3 | 2 |
| | a. Insertion process and migration process | | | |
| | b. Oxidative addition and reductive elimination | | | |

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- Q.4 a) Attempt the following (any Two)** **12**
- | | | | | |
|------|--|----|----|---|
| i) | Give an account of classification of polymers with examples. | 06 | L3 | 3 |
| ii) | Write a note on ring opening, step growth and chain polymerization. | 06 | L3 | 3 |
| iii) | Draw the repeat unit of the polymer that would be obtained in the polymerization of the following monomers. Also write names of the following polymers and classify them whether they are condensation or addition polymers, formed by chain or step or ring opening polymerization. | 06 | L3 | 3 |



- b) Attempt the following (any Four)** **16**
- | | | | | |
|------|--|----|----|---|
| i) | Explain the function of inhibitor in the polymer synthesis. | 04 | L4 | 3 |
| ii) | Give the synthesis of polyurethane and urea-formaldehyde resin with its applications and properties. | 04 | L4 | 3 |
| iii) | Write a note on rubber (including natural and synthetic rubber synthesis). | 04 | L4 | 3 |
| iv) | Give any one synthesis method for following polymers Polycarbonate Phenol formaldehyde Polyamide PVC | 04 | L5 | 3 |
| v) | Write mechanistic feature of Ziegler-Natta polymerization. | 04 | L5 | 3 |

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| | | EXM/P/09/00 | | |
|---------------|--|-------------|----|---|
| Q.5 a) | Attempt the following (any Two) | 16 | L4 | |
| | | | L5 | |
| i) | Give an account of composition of crude oil and natural gas. | 08 | L4 | 4 |
| ii) | Explain the following term about crude oil: | 08 | L4 | |
| | Refining | | | |
| | Reforming | | | |
| | Cracking | | | |
| | Fractionation | | | |
| iii) | Give the synthesis reaction and application of following from methane: | 08 | L5 | |
| | Methanol | | | |
| | Chloromethanes (dicloromethanes) | | | |
| | Hydrogen Cyanide | | | |
| | Carbon disulfide | | | |
| b) | Attempt the following (any Three) | 12 | L4 | |
| | | | L6 | |
| i) | Explain the term ignition point and flash points with its significance. | 04 | L4 | 4 |
| ii) | Explain the term octane number and C-tane number with its significance. | 04 | L4 | 4 |
| iii) | Write a note on origin of coal and its carbonization. | 04 | L6 | 4 |
| iv) | What is meant by thermal cracking and catalytic cracking of petroleum? Explain the effect of temperature and pressure on it. | 04 | L6 | 4 |

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