

# Chapter - Polymers



## Topic-1: Classification of Polymers



### 10 Subjective Problems

1. Write the matched set (of three) for each entry in column A: **[Multiple Concepts, 1984 - 1 × 5 = Mark]**

A	B	C
(i) Asbestos	(a) molecular sieve	(1) air pollutant
(ii) Fluorocarbons	(b) paramagnetic	(2) carcinogen
(iii) Lithium metal	(c) refrigeration	(3) fluorescent paint
(iv) Nitric oxide	(d) reducing agent	(4) electron donor
(v) Zeolites	(e) semi-conductor	(5) ion exchanger
(vi) Zinc oxide	(f) silicates of	(6) propellant

(Ca + Mg)



## Topic-2: Preparation, Properties and Uses of Polymers



### 1 MCQs with One Correct Answer

1. On complete hydrogenation, natural rubber produces  
(a) ethylene-propylene copolymer **[Adv. 2016]**  
(b) vulcanised rubber  
(c) polypropylene  
(d) polybutylene
2. Among cellulose, poly (vinyl chloride), nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest is **[2009S]**  
(a) Nylon (b) Poly (vinyl chloride)  
(c) Cellulose (d) Natural rubber



### 2 Integer Value Answer

3. The total number of lone-pairs of electrons in melamine is **[2013]**



### 4 Fill in the Blanks

4. Sulphur acts as ..... agent in vulcanization of rubber. **[1989 - 1 Mark]**

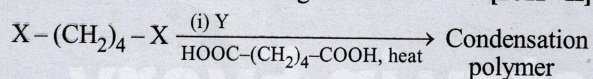


### 6 MCQs with One or More than One Correct Answer

5. Among the following, the correct statement(s) about polymers is(are) **[Adv. 2022]**  
(a) The polymerization of chloroprene gives natural rubber.  
(b) Teflon is prepared from tetrafluoroethene by heating it with persulphate catalyst at high pressures.  
(c) PVC are thermoplastic polymers.  
(d) Ethene at 350-570 K temperature and 1000-2000 atm pressure in the presence of a peroxide initiator yields high density polythene.
6. Choose the correct option(s) from the following.  
(a) Nylon-6 has amide linkages **[Adv. 2019]**  
(b) Cellulose has only  $\alpha$ -D-glucose units that are joined by glycosidic linkages  
(c) Teflon is prepared by heating tetrafluoroethene in presence of a persulphate catalyst at high pressure  
(d) Natural rubber is polyisoprene containing trans alkene units



7. The correct functional group X and the reagent/reaction conditions Y in the following scheme are [2011 - II]



- (a)  $X = \text{COOCH}_3$ ,  $Y = \text{H}_2/\text{Ni/heat}$   
 (b)  $X = \text{CONH}_2$ ,  $Y = \text{H}_2/\text{Ni/heat}$   
 (c)  $X = \text{CONH}_2$ ,  $Y = \text{Br}_2/\text{NaOH}$   
 (d)  $X = \text{CN}$ ,  $Y = \text{H}_2/\text{Ni/heat}$



### 7 Match the Following

8. Match the chemical substances in **Column I** with type of polymers/type of bonds in **Column II**. [2007]

### Column I

- (A) Cellulose  
 (B) Nylon-6, 6  
 (C) Protein  
 (D) Sucrose

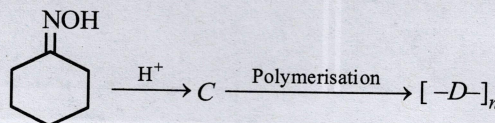
### Column II

- (p) Natural polymer  
 (q) Synthetic polymer  
 (r) Amide linkage  
 (s) Glycoside linkage



### 10 Subjective Problems

9. Give the structures of the products in each of the following reactions. [2000 - 2 Marks]



## Answer Key

### Topic-2 : Preparation, Properties and Uses of Polymers

1. (a)    2. (d)    3. (6)    4. cross-linking;    5. (b, c)    6. (a, c)    7. (a, b, c, d)  
 8. (A) : (p) and (s); (B) : (q) and (r); (C) : (p) and (r); (D) : (s)



# Hints & Solutions

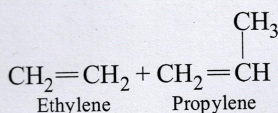
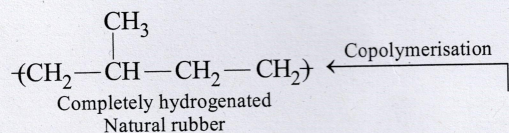
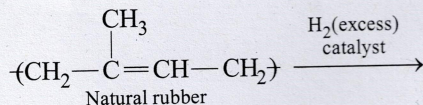
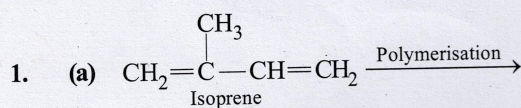


## Topic-1: Classification of Polymers

- (i)-(f)-6; (ii)-(c)-2; (iii)-(d)-4; (iv)-(b)-1; (v)-(a)-5; (vi)-(e)-3.
  - (i) Asbestos was used as an insulator I solid propellant rocket motors.
  - (ii) Fluorocarbons were used as refrigerant which are carcinogens.
  - (iii) Lithium metal an easily donate electron and therefore, can be used as a reducing agent.
  - (iv) Nitric oxide is paramagnetic and an air pollutant.
  - (v) Zeolites have high porosity due to the presence of cavities of molecular dimensions. They are used as ion exchange for softening of water.
  - (vi) Zinc oxide is used as a semi-conductor. They have property of fluorescence.

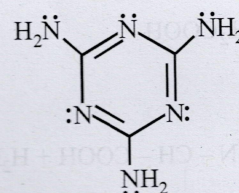


## Topic-2: Preparation, Properties and Uses of Polymers



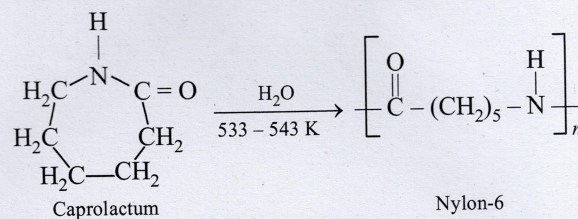
- (d) Nylon and cellulose, both have intermolecular hydrogen bonding, polyvinyl chloride has dipole-dipole interaction, while natural rubber has van der Waal forces which are weakest.

- (6) Structure of melamine is as follows :

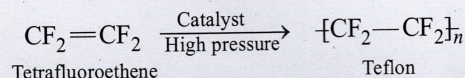


Total no. of lone pairs of electron is '6'.

- cross-linking;
  - (b, c)
  - (a) The polymerization of neoprene gives natural rubber.
  - (d) Ethene in these conditions yield low density polythene.
  - (a, c)
  - (a) Nylon-6. It is obtained by heating caprolactam with water at high temperature and have amide linkage.



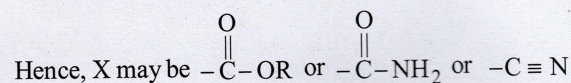
- (b) Cellulose has only  $\beta$ -D-glucose units that are joined by glycosidic linkages between C-1 of one glucose unit and C-4 of the next glucose unit.
- (c) Teflon is prepared by heating tetrafluoroethene in presence of a persulphate catalyst at high pressure.



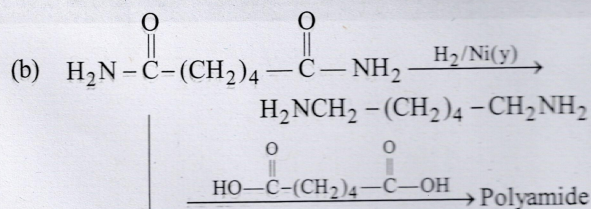
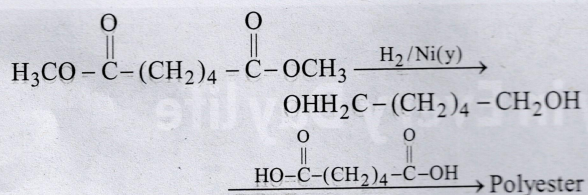
- (d) Natural rubber is a linear polymer of isoprene (2-methyl-1, 3-butadiene) containing *cis* alkene units. It is also called *cis*-1, 4-polyisoprene.

- (a,b,c,d)

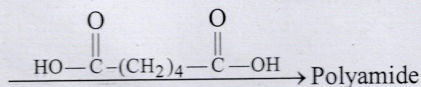
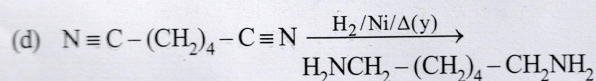
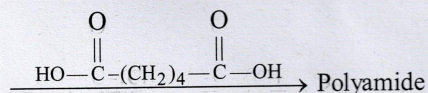
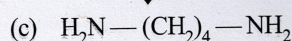
Condensation polymers are formed by condensation of a diol or diamine with a dicarboxylic acid.







$\text{Br}_2/\text{OH}^-$ ,  $\Delta$  (y)  
Hofmann bromamide  
reaction



8. (A): (p) and (s)

Cellulose is a natural polymer and has a  $\text{C}_1-\text{C}_4$   $\beta$ -glycosidic linkage.

(B): (q) and (r)

Nylon-6, 6 is a synthetic polymer of hexamethylenediamine and adipic acid and has amide linkages.

(C): (p) and (r)

Proteins are natural polymers of  $\alpha$  amino acids joined by amide linkages (peptide bonds).

(D): (s)

Sucrose is a disaccharide of  $\alpha$ -D glucose and  $\beta$ -D-fructose and has an  $\alpha, \beta$ -glycosidic linkage.

