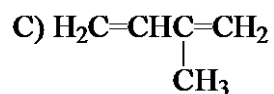
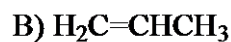
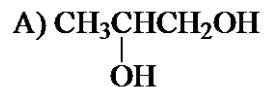
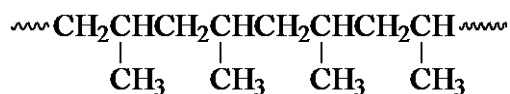


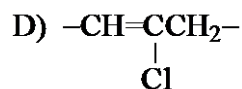
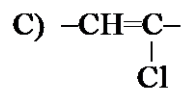
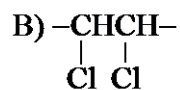
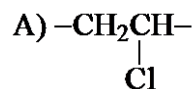
ACS Review Synthetic Polymers

1. Which of the following is the monomer that gives the polymer shown below?



- A. A
B. B
C. C
D. D

2. Which of the following is the repeating unit in polyvinyl chloride (PVC)?



- A. A
B. B
C. C
D. D

3. Which of the following are addition polymers?

I. polypropylene II. Teflon III. Nylon

- A. only I
B. only II

- C. only III
- D. both I and II

4. Which of the following are condensation polymers?

I. polypropylene II. Teflon III. Nylon

- A. only I
- B. only II
- C. only III
- D. both II and III

5. Which one of the following monomers undergoes cationic polymerization most readily?

- A. $\text{H}_2\text{C}=\text{CH}_2$
- B. $\text{H}_2\text{C}=\text{CHCH}_3$
- C. $\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2$
- D. $\text{H}_2\text{C}=\text{CHCN}$

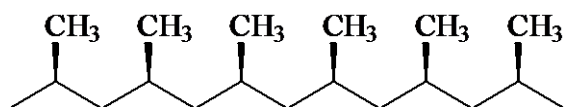
6. Which one of the following monomers undergoes anionic polymerization most readily?

- A. $\text{H}_2\text{C}=\text{CH}_2$
- B. $\text{H}_2\text{C}=\text{CHCH}_3$
- C. $\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2$
- D. $\text{H}_2\text{C}=\text{CHCN}$

7. Which of the following monomers can form a stereoregular polymer?

- A. $\text{H}_2\text{C}=\text{CH}_2$
- B. $\text{F}_2\text{C}=\text{CF}_2$
- C. $\text{H}_2\text{C}=\text{CHCH}_3$
- D. $\text{H}_2\text{C}=\text{CCl}_2$

8. Which one of the following best describes the polymer chain shown below?

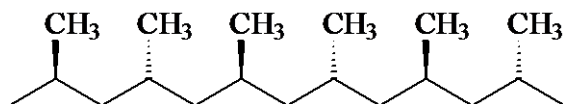


- A. atactic polypropylene
- B. isotactic polypropylene
- C. syndiotactic polypropylene
- D. cross-linked polypropylene

9. Which one of the following is used to make Teflon?

- A. fluoroethene
- B. 1,1,4,4-tetrafluorobutadiene
- C. 1,2-difluoroethene
- D. tetrafluoroethylene

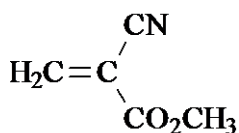
10. Which one of the following best describes the polymer chain shown below?



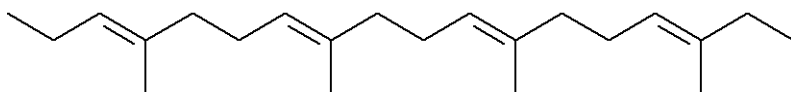
- A. atactic polypropylene
- B. isotactic polypropylene
- C. syndiotactic polypropylene

D. cross-linked polypropylene

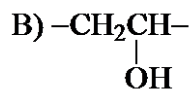
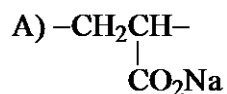
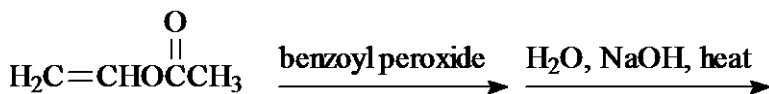
11. The monomer used to make superglue is shown below. Which one of the following methods of polymerization is most suitable for this type of monomer?

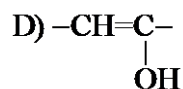
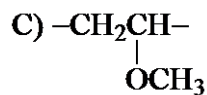


- A. free-radical chain-growth
B. cationic chain-growth
C. anionic chain-growth
D. acid-catalyzed step-growth
12. Which type of polymerization process uses benzoyl peroxide (or other peroxides) as an initiator?
- A. free-radical chain-growth
B. cationic chain-growth
C. anionic chain-growth
D. acid-catalyzed step-growth
13. Which one of the following is the monomer that gives the polymer shown below?



- A. $\text{H}_2\text{C}=\text{CHCH}_3$
B. $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$
C. $\text{H}_2\text{C}=\text{CHCH}=\text{CHCH}_3$
D. $\begin{array}{c} \text{H}_2\text{C}=\text{CHC}=\text{CH}_2 \\ | \\ \text{CH}_3 \end{array}$
14. What modification occurs when a small amount of *p*-divinylbenzene is added to the polymerization reaction of styrene to polystyrene? (Recall: the vinyl group is $-\text{CH}=\text{CH}_2$.)
- A. cross-linking of the polystyrene
B. isotactic stereochemistry of the polystyrene
C. syndiotactic stereochemistry of the polystyrene
D. "softening" of the polystyrene by a plasticizer
15. Identify the repeating unit in the polymer formed from the following reaction sequence.





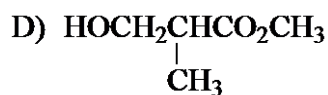
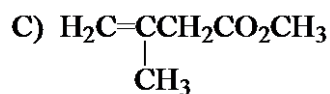
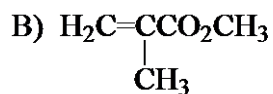
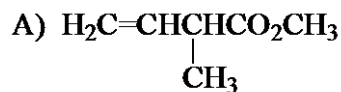
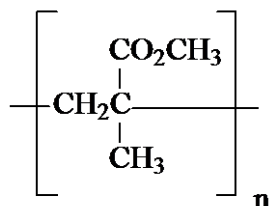
- A. A
 B. B
 C. C
 D. D

16. The acid-catalyzed dimerization of isobutylene gives a mixture of two isomeric alkenes (A and B). Hydrogenation of this mixture gives a single C_8H_{18} hydrocarbon. What is the hydrocarbon?



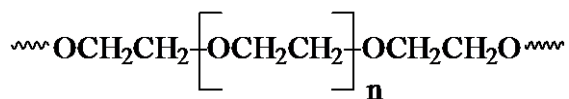
- A. 2,2,4-trimethylpentane
 B. 2,3,4-trimethylpentane
 C. 2,4-dimethylhexane
 D. 2,5-dimethylhexane

17. The repeating unit of poly (methyl methacrylate) is shown below. Which one of the following is the monomer used to make poly (methyl methacrylate)?




- A. A
 B. B
 C. C
 D. D


18. Which one of the following monomers is used to make the polymer carbowax, shown below?



A) $\text{H}_2\text{C}=\text{CHOH}$

B) $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$

C) 

D) 

- A. A
B. B
C. C
D. D

19. Which one of the following initiators can be used for anionic chain-growth polymerization?

- A. benzoyl peroxide
B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Li}$
C. BF_3
D. $\text{Al}(\text{CH}_2\text{CH}_3)_3, \text{TiCl}_4$

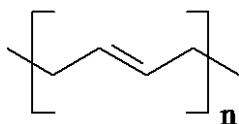
20. Which one of the following initiators can be used for free radical chain-growth polymerization?

- A. benzoyl peroxide
B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Li}$
C. BF_3
D. $\text{Al}(\text{CH}_2\text{CH}_3)_3, \text{TiCl}_4$

21. Which one of the following initiators is used to make isotactic polypropylene?

- A. benzoyl peroxide
B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Li}$
C. BF_3
D. $\text{Al}(\text{CH}_2\text{CH}_3)_3, \text{TiCl}_4$

22. The repeating unit of a polymer is shown below. This polymer is formed by:

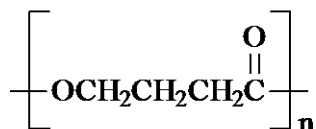


- A. addition of ethylene
B. addition of *trans*-2-butene
C. 1,2 addition of butadiene
D. 1,4 addition of butadiene

23. Vulcanization is the process of cross-linking polymer chains in rubber using:

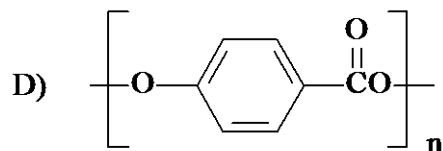
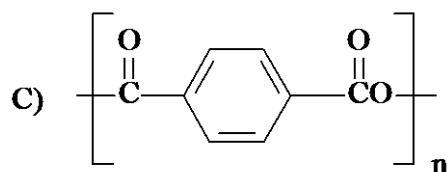
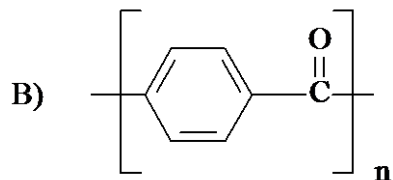
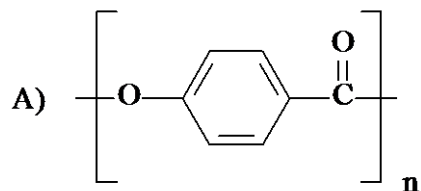
- A. sulfur
- B. formaldehyde
- C. benzoyl peroxide
- D. ethylene glycol

24. What monomer(s) would be used to make the polyester shown below?



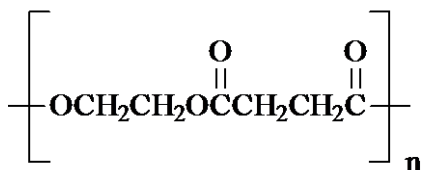
- A. butanedioic acid
- B. 4-hydroxybutanal
- C. 4-hydroxybutanoic acid
- D. butanedioic acid and 1,4-butanediol

25. Which one of the following is the repeating unit of the polymer formed in the polymerization of *para*-hydroxybenzoic acid?



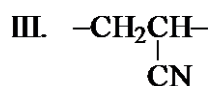
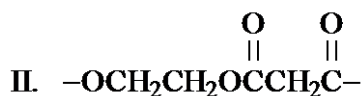
- A. A
- B. B
- C. C
- D. D

26. Identify the monomer(s) needed to make the following polyester.



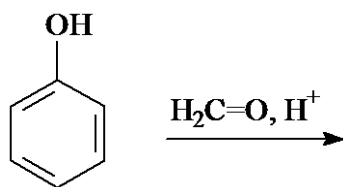
- A. 3-hydroxybutanoic acid
- B. butanedioic acid
- C. butanedioic acid and 1,2-ethanediol
- D. butanedioic acid and ethanol

27. Which of the following are repeating units of step-growth polymers?



- A. only I
- B. only II
- C. only III
- D. I and II

28. Bakelite is formed by the acid-catalyzed polymerization of phenol with formaldehyde. What is(are) the product(s) of the first step in this polymerization, shown below? (Note: in the answers below the hydroxymethyl group is $-\text{CH}_2\text{OH}$.)

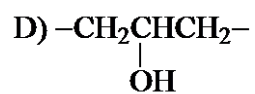
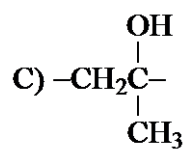
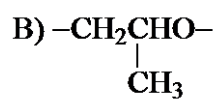
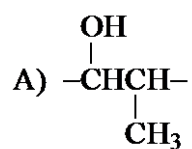
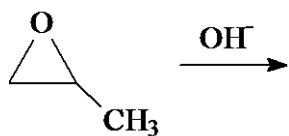


- A. *ortho* and *para*-hydroxybenzaldehyde
- B. *meta*-hydroxybenzaldehyde
- C. *ortho* and *para*-(hydroxymethyl)phenol
- D. *meta*-(hydroxymethyl)phenol

29. What is the purpose of plasticizers?

- A. harden plastics
- B. soften plastics
- C. initiate polymerizations
- D. cross-link polymer chains

30. Which of the following is the repeating unit of the polymer formed in the polymerization reaction shown below?



- A. A
 B. B
 C. C
 D. D

31. Polymers which soften on heating and harden when cooled are:

- A. cross-linked polymers.
 B. copolymers.
 C. thermosetting polymers.
 D. thermoplastics.

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1. B
2. A
3. D
4. C
5. C
6. D
7. C
8. B
9. D
10. C
11. C
12. A
13. D
14. A
15. B
16. A
17. B
18. D
19. B
20. A
21. D
22. D
23. A
24. C
25. A
26. C
27. D
28. C
29. B
30. B
31. D