

CHAPTER 12

Unsaturated Hydrocarbons

EXAM QUESTIONS

Multiple Choice

1. Name a difference between a saturated and an unsaturated hydrocarbon.
- Saturated hydrocarbons are composed of only carbon and hydrogen, and unsaturated hydrocarbons include other atoms than just carbon and hydrogen.
 - Saturated hydrocarbons do not contain multiple bonds between carbons, but unsaturated hydrocarbons do contain multiple bonds.
 - Unsaturated hydrocarbons are flammable but saturated hydrocarbons are not.
 - Saturated hydrocarbons are essentially insoluble. Unsaturated hydrocarbons are soluble.

Answer: B

2. Which characteristic relates to alkenes, but not the other hydrocarbon families?
- saturation
 - halogen substitution
 - double bonds
 - triple bonds

Answer: C

3. What number would be used to indicate the double bond position in the IUPAC name for $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3$?
- 1
 - 2
 - 3
 - 4

Answer: B

4. In the IUPAC name for the following compound, the -Br group is located at what position? $\text{CH}_3\text{CHBrCH}=\text{CH}_2$.
- 1
 - 2
 - 3
 - 4

Answer: C

5. The IUPAC name of $\text{CH}_3\text{CH}_2\overset{\text{CH}_2}{\underset{\parallel}{\text{C}}}\text{CH}-\text{CH}_2\text{CH}_3$ is
- 3-ethyl-1-butene
 - 2-ethyl-2-butene
 - 3-ethyl-3-butene
 - 2-ethyl-1-butene

Answer: D

6. The IUPAC name of $\text{CH}_3-\overset{\text{CH}_3}{\underset{|}{\text{C}}}=\text{CH}-\text{CH}=\text{CH}_2$ is
- 2-methyl-1,4-pentadiene
 - 2-methyl-2,4-dipentene
 - 4-methyl-1,3-pentadiene
 - 4-methyl-2,4-pentadiene

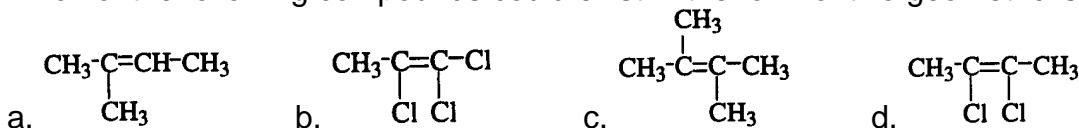
Answer: C

7. A correct IUPAC name for  is

- a. 5-bromo-1,3-cyclohexadiene c. 2-bromo-1,4-cyclohexadiene
b. 2-bromo-1,3-cyclohexadiene d. 3-bromo-1,5-cyclohexadiene

Answer: A

8. Which of the following compounds could exist in the form of two geometric isomers?



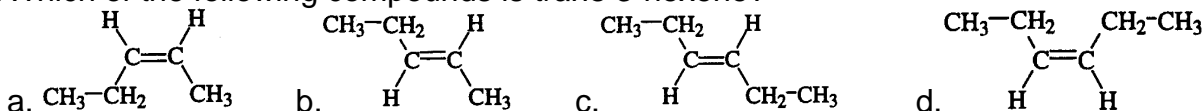
Answer: D

9. Which of the following can exhibit geometric isomerism?

- a. 1-propene c. 2,3-dimethyl-2-butene
b. 1,2,2-tribromoethene d. 1-bromo-1-propene

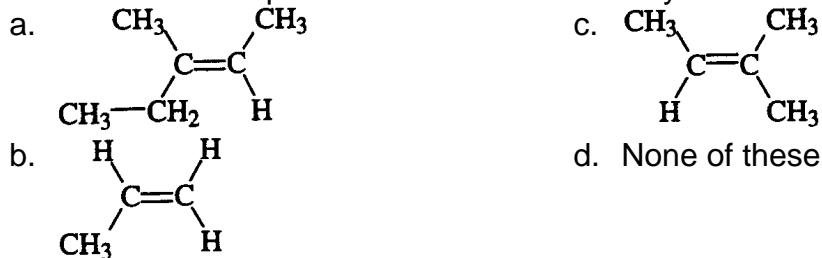
Answer: D

10. Which of the following compounds is *trans*-3-hexene?



Answer: C

11. Which of the compounds below could correctly be called a *cis* compound?



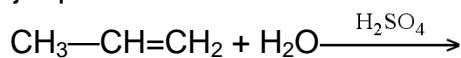
Answer: A

12. Which of the following represents an addition reaction?

- a. $HX + C_4H_8 \rightarrow C_4H_9X$ c. $C_4H_8 \rightarrow C_4H_6 + H_2$
b. $X_2 + C_3H_6 \rightarrow C_3H_5X + HX$ d. more than one response is correct

Answer: A

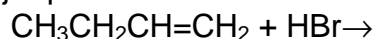
13. Select the major product that would result from the reaction:



- a. $CH_3CH(OH)CH_3$ c. $CH_3CH_2CH_3$
b. $CH_3CH_2CH_2OH$ d. $CH_3CH_2CH_2SO_4$

Answer: A

14. Select the major product that would result from the reaction:



- a. $\text{CH}_3(\text{CHBr})_2\text{CH}_3$ c. $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$
b. $\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ d. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}_2$

Answer: C

15. The conversion of cyclohexene to cyclohexane requires the reagent(s)

- a. HCl b. H_2O and H_2SO_4 c. H_2 and H_2SO_4 d. H_2 and Pt

Answer: D

16. Which is the formula for an alkene?

- a. CH_3CHCH_2 c. $\text{CH}_3\text{CH}_3\text{CH}_2$
b. $\text{CH}_3\text{CH}_2\text{CH}_2$ d. There is more than one correct response.

Answer: A

17. Which is the formula for an alkyne?

- a. $\text{CH}_3\text{CH}_2\text{CCH}_2$ c. $\text{CH}_3\text{CH}_2\text{CCH}$
b. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ d. $\text{CH}_3\text{CH}_2\text{CCH}_2$

Answer: C

18. Which is a difference between butane and butene?

- a. butane burns and butene does not c. they are isomers
b. the presence of a double bond d. the presence of a triple bond

Answer: B

19. Which is a difference between butene and cyclobutene?

- a. They are isomers.
b. Cyclobutene has 2 double bonds, butene does not.
c. The location of the double bond is terminal in cyclobutene, but between interior carbons in butene.
d. Cyclobutene is missing more hydrogens than is butene.

Answer: D

20. Which is a difference between butyne and cyclobutyne?

- a. Cyclobutyne does not exist.
b. Butyne's multiple bond is interior, cyclobutyne is not between interior carbons.
c. Cyclobutyne burns much hotter than butyne because of the greater unsaturation.
d. Both b and c are differences between the molecules.

Answer: A

21. The correct IUPAC name for the compound $\text{CH}_2-\text{C}\equiv\text{C}-\text{CH}_2-\text{CH}_2-\text{Br}$ is

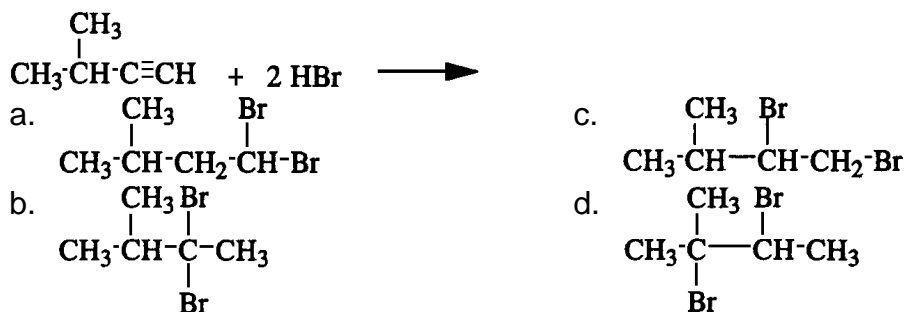
- a. 4-bromopentyne c. 1-bromo-3-pentyne
b. 1-bromo-2-pentyne d. 5-bromo-2-pentyne

Answer: D

22. The addition of two moles of hydrogen to an alkyne produces an
 a. alkane b. alkene c. aromatic d. alkyl halide

Answer: B

23. Select the product of the following reaction:



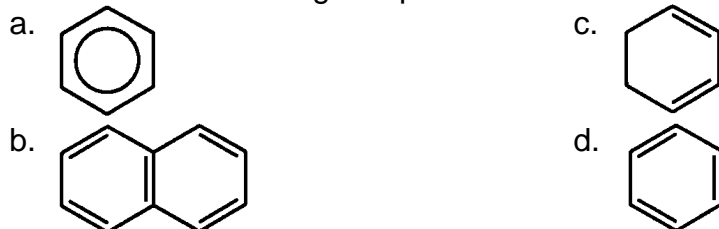
Answer: B

24. What is the characteristic of aromatic compounds that is responsible for them being named aromatic compounds?

- a. The compounds have a pleasant smell.
 b. These compounds contain a benzene ring or structural relative.
 c. A requirement is to contain a hydrocarbon chain that is either saturated or unsaturated and at least 3 carbons long.
 d. There is more than one correct response.

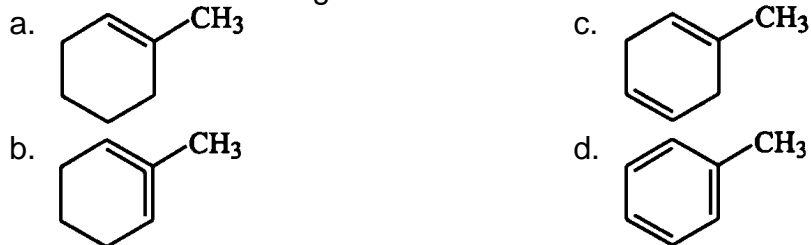
Answer: B

25. Which of the following compounds is **not** considered to be aromatic?



Answer: C

26. Which of the following structures violates the octet rule?

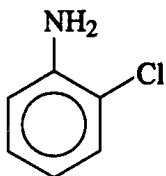


Answer: B

27. The benzene ring as a branch is called

- a. hexyl b. benzyl c. phenol d. phenyl

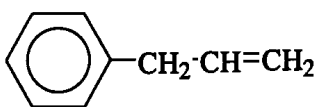
Answer: D



28. A correct name for

- a. 2-chlorophenol c. 2-chloroaniline
b. 2-chlorotoluene d. 1-chloroaniline

Answer: C



29. What is the correct name for

- a. 3-phenyl-1-propene c. 1-phenyl-2-propene
b. 1-phenyl-1-propene d. 3-phenyl-2-propene

Answer: A

30. Another acceptable name for 1-ethyl-3-methylbenzene is

- a. *m*-ethylmethyltoluene c. *p*-ethylmethyltoluene
b. *o*-ethylmethyltoluene d. *m*-ethyltoluene

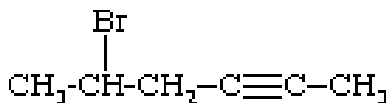
Answer: D

31. Which is a characteristic of alkenes and alkynes, but not a characteristic of alkanes.

- a. Alkynes are not flammable, the others are flammable.
b. Alkenes all have a scent similar to the aromatic compounds, but the alkanes and alkenes have a scent that is extremely sharp.
c. Alkanes have only single bonds between carbons.
d. There is more than one correct response.

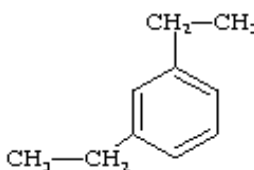
Answer: C

32. Name the following compound



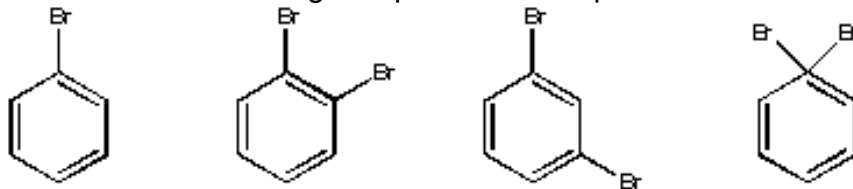
- a. 5-bromo-2-hexyne b. bromo-4-hexyne
c. 1-bromo-1-methyl-3-pentyne d. none of these are correct

Answer: A

33. Name the following aromatic compound 
- a. 1,5-diethylbenzene c. o-diethylbenzene
b. p-diethylbenzene d. 1,3-diethylbenzene

Answer: D

34. Which of the following compounds is not possible:



- 1 2 3 4
- a. 1 b. 3 c. 2 d. 4

Answer: D

35. The reaction of hydrogen fluoride with ethene would be an example of:
- a. hydration c. hydrohalogenation
b. halogenation d. fluorination

Answer: C

36. Which of the following could exhibit cis/trans isomerism
- a. propene c. 1-butene
b. 1,2-dichloropropene d. 2-butene

Answer: D

37. What type of hybridization is associated with alkyne bonding?
- a. sp b. sp² c. sp³ d. sp⁴

Answer: A

True/False

1. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2$ is the formula for a saturated hydrocarbon.
Answer: F
2. The general formula for an alkene is C_nH_{2n} .
Answer: T
3. Alkenes must have at least two carbon atoms.
Answer: T
4. Alkenes can only have one double bond.
Answer: F
5. The addition of bromine to an alkene results in an alkane because one bond of the multiple bond is broken.
Answer: T
6. A characteristic of alkynes is a region of strong polarity caused by the multiple bond.
Answer: F
7. One of the halogenation reactions occurs when a halogen, a member of group VIIA, reacts with alkene.
Answer: T
8. Cyclic compounds do not undergo halogenation reactions.
Answer: F
9. The general formula for an alkyne is C_nH_{2n} .
Answer: F
10. Markovnikov's rule indicates that in the addition of H-X to an alkene, the hydrogen becomes attached to the carbon atom that is already bonded to more hydrogens.
Answer: T
11. An alkene with one multiple bond can be converted to an alkane by hydration.
Answer: T
12. Polymers are compounds that are composed of repeating units chemically bound to each other.
Answer: T
13. The physical properties of alkynes are very different from those of alkenes.
Answer: F
14. 2-butyne can exist as *cis*- and *trans*- isomers.
Answer: F
15. The same substances which add to double bonds can add to triple bonds.

Answer: T

16. Two moles of hydrogen gas would be required to convert one mole of 2-butyne into butane.

Answer: T

17. Benzene is an alkene with more than one multiple bond.

Answer: T

18. Phenyl is the name given to the ion produced when benzene loses one hydrogen, making it a substituent.

Answer: T

19. Aromatic compounds dissolve well in a nonpolar solvent.

Answer: T

20. The alkynes belong to an extensive family of compounds that have a large biological significance, especially when discussing digestion.

Answer: F