Unit 2, Review for Quiz #1: Hydrocarbons

1. What is the simplest organic molecule?

a) CH_4 c) HCN
b) CO_2 d) $HC \equiv CH$

2. Which of the following molecules would be classified as organic?

I) $CaCO_3$
II) C_2H_6
III) $Mg(SCN)_2$
IV) CH_3COOH

a) I, II and III only c) II and IV only
b) I and III only d) IV only

3. What was the first organic molecule to be synthesized chemically?

a) urea c) glucose
b) acetic acid d) ethanol

4. What makes carbon such a unique element?

a) carbon atoms can form four covalent bonds
b) carbon atoms can bond with other carbon atoms to form long chains and rings
c) carbon atoms can form single, double and triple bonds with each other and many other elements
d) all of the above

5. Friedrich Wohler was significant in the history of organic chemistry because:

a) he synthesized the first organic compound from non-living materials
b) the proved that organic food is better for you
c) he was the first person to explain why carbon forms 4 bonds, not two as predicted
d) he was the first person to determine the actual structure of benzene

6. Which of the following statements is true?

a) natural foods are chemical free
b) organic foods contain no harmful chemicals
c) organic chemicals are safe to use and ingest
d) none of the above statements is true

7. The hybridization of carbon atoms in alkanes is:

a) sp c) s^2p^2
b) sp^2 d) sp^3

8. A molecule with the molecular formula C_3H_8 is a(n):

a) alkyne c) alkene
b) alkane d) cycloalkane

9. A molecule with the molecular formula C_5H_{10} could be:

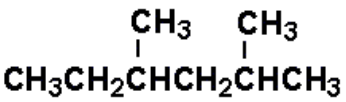
a) cyclopentane c) 2-methyl-1-butene
b) 2-pentene d) all of the above

10. The molecule $CH \equiv CH$ has the common name acetylene. What is its IUPAC name?

a) dimethylene c) propylene
b) ethyne d) dicarbon hydride

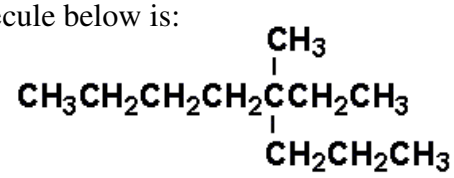
11. The correct IUPAC name for the molecule below is:

a) 1,1,3-trimethylpentane
b) 1-ethyl-1,3-dimethylbutane
c) 2,4-dimethylhexane
d) 3,5-dimethylhexane



12. The correct IUPAC name for the molecule below is:

a) 5-methyl-5-propylheptane
b) 4-ethyl-4-methyloctane
c) 3-methyl-3-propyloctane
d) 3-methyl-3-propylheptane



13. The molecular formula for an alkene with 60 hydrogen atoms would be:

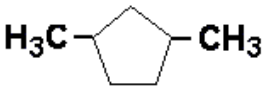
a) $C_{29}H_{60}$
b) $C_{30}H_{60}$
c) $C_{31}H_{60}$
d) $C_{30}H_{62}$

14. Which of the following straight chain molecules is mono-unsaturated?

a) C_5H_{10}
b) C_6H_{14}
c) C_8H_{12}
d) C_6H_6

15. The correct IUPAC name for the molecule below is:

a) 1,4-dimethylcyclopentane
b) 1,3-dimethylcyclopentane
c) 2,5-dimethylcyclopentane
d) 2,3-dimethylcyclopentane



16. Which of the following compounds are saturated?

I) cyclobutane
II) cyclohexene
III) butene
IV) octane

a) I and II only
b) III and IV only
c) II and III only
d) I and IV only

17. Which of the following formulas represents an alkene?

a) $CH_3CH_2CH_3$
b) $CH_3CH_2CHCH_2$
c) CH_3CH_3
d) $CH_3CH_2CH_2CH_3$

18. The general molecular formula for acyclic alkenes is:

a) C_nH_{2n+2}
b) C_nH_{2n-2}
c) C_nH_{2n}
d) C_nH_{n+2}

19. Which of the following compounds are structural isomers of each other?

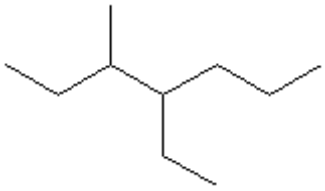
I) 2-hexene
II) cyclohexane
III) 2,3-dimethyl-2-butene
IV) propylcyclopropane

a) I and II
b) II and IV
c) III and IV
d) I, II, III and IV

20. Which of the following is a structural isomer of pentane?

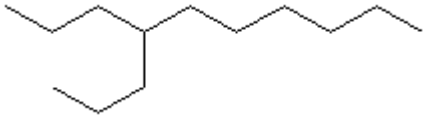
a) 2-methylpentane
b) 2-methylbutane
c) 2-methylpropane
d) 2-pentene

21. The IUPAC name for the molecule to the right is:



a) 4-ethyl-3-methylheptane
b) 3-ethyl-4-methylhexane
c) 4-ethyl-5-methylheptane
d) 4-ethyl-5-methylhexane

22. The IUPAC name for the molecule to the right is:

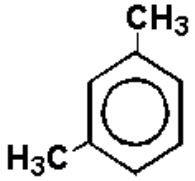


a) 3-ethyldecane
b) 4-ethylnonane
c) 4-propyldecane
d) 3-propylnonane

23. The correct name for 2-ethylpentane is:

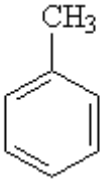
a) 3-methylpentane
b) isopropylbutane
c) 3-methylhexane
d) 2-ethylpentane is correct

24. What is the molecular formula of the molecule shown to the right:



a) C_8H_{10}
b) C_6H_6
b) C_6H_8
d) C_8H_{12}

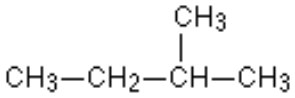
25. The molecule to the right would be classified as:

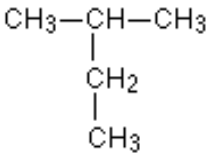


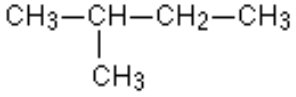
I) aliphatic
II) hydrocarbon
III) aromatic
IV) unsaturated

a) I and II only
b) II and III only
c) I, II and IV
d) II, III and IV

26. Which of the following statements is/are true about the molecules shown below?





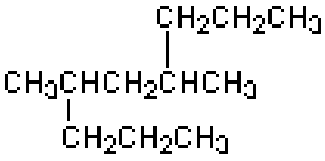


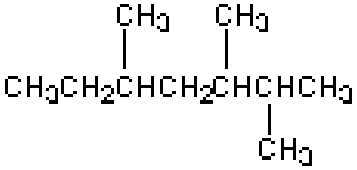
I) these molecules are aliphatic
II) these molecules are structural isomers of one another
III) these molecules are saturated
IV) these structural formulas all represent the same molecule

a) I and II only
b) II and III only
c) I, II and IV only
d) I, III and IV only

27. What is the relationship between the following two molecules?

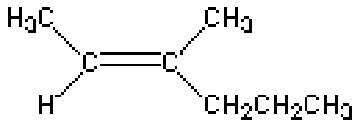
a) the molecules are identical
b) the molecules are structural isomers
c) the molecules are cis-trans isomers
d) the molecules are unrelated

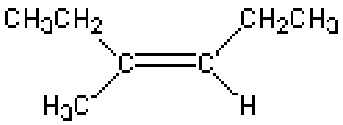




28. What is the relationship between the following two molecules?

a) the molecules are identical
b) they are structural isomers of one another
c) they are cis-trans isomers of one another
d) the molecules are unrelated





29. Which of the following molecules will exhibit cis/trans isomerism?

a) 2-methyl-2-hexane
b) 2-methyl-3-hexene
c) 3-hexyne
d) both "b" and "c"

30. How many **actual** double bonds does the benzene ring possess?

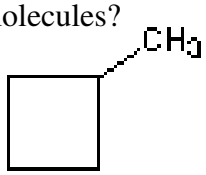
a) 1 double bond
b) 3 double bonds
c) 2 double bonds
d) none, all bonds are equivalent to 1 ½ bonds

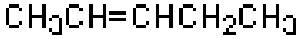
31. Para-dimethylbenzene is another name for:

a) 1,2-dimethylbenzene
b) 1,3-dimethylbenzene
c) 1,4-dimethylbenzene
d) 1,3-dimethylcyclohexene

32. What is the relationship between the following two molecules?

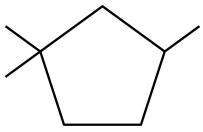
a) the molecules are identical
b) the molecules are structural isomers
c) the molecules are cis-trans isomers
d) the molecules are unrelated





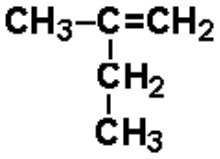
33. The correct IUPAC name for the molecule below is:

a) 3-methylcyclopentane
b) 3- trimethyl cyclopentane
c) 1,1,3-trimethylcyclopentane
d) 1,1,3-trimethylcyclopentene



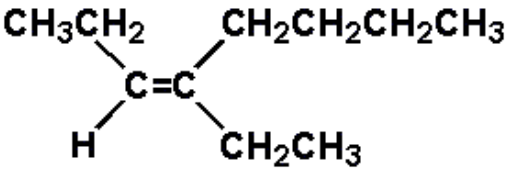
34. The correct name for this compound is:

a) 2-methyl-1-butene
b) 2-ethyl-1-propene
c) 2-ethyl-1-pentane
d) 3-methyl-2-butene



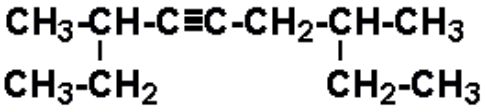
35. Select the best name for this molecule:

a) cis - 4-ethyl-3-octene
b) trans - 4-ethyl-3-octene
c) trans - 5-ethyl-5-octene
d) cis - 5-ethyl-5-octene



36. What is the IUPAC name of the following compound?

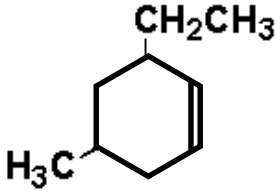
a) 2,6-diethyl-4-heptyne
b) 2,6-diethyl-3-heptyne
c) 2,6-diethyl-3-nonyne
d) 3,7-dimethyl-4-nonyne



37. Which of the following is a structural isomer of cis-3-hexene?

a) 2-methylpentane
b) cyclohexane
c) 3-methylpentane
d) 2,3-dimethylbutane

38. Name the following compound:



a) 3-ethyl-5-methyl-1-cyclohexene
b) 6-ethyl-3-methylcyclohexene
c) 3-ethyl-5-methylcyclohexene
d) 6-ethyl-4-methyl-1-cyclohexene

39. Which of the following statements are true about **ALL** aliphatic organic compounds?
   I) they contain only hydrogen and carbon
   II) they contain no ring structures of any kind
   III) they do not contain any benzene rings
   IV) they contain no double or triple bonds

a) I, II and III only
b) I and II only
c) I and III only
d) I, II, III and IV

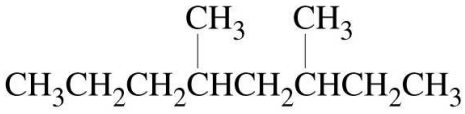
40. Which of the following statements is/are true about benzene?
   I) it is a planar molecule
   II) it forms resonance structures
   III) it is an aliphatic hydrocarbon
   IV) its molecular formula is C_6H_{12}

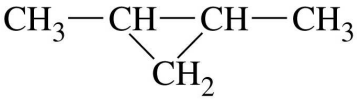
a) I and II only
b) II and III only
c) I, II and III only
d) I, II, III and IV

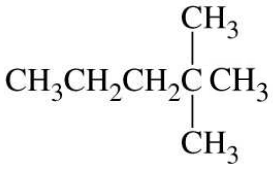
Part II: Use condensed structural formulas or stick diagrams to draw the following molecules:
a) para-dimethylbenzene
b) meta-diethylbenzene
c) 3-ethyl-2,2-dimethylheptane
d) 4-ethyl-2,2-dimethylhexane
e) 2,2,3-trimethylbutane
f) 4-isopropyl-4-methylheptane
g) 4-ethyl-4-methyl-2-hexene
h) 3-methyl-2,4,6-octatriene
i) 1-ethyl-3-methylcyclopentane
j) 3-ethyl-4,4-dimethylcyclohexene

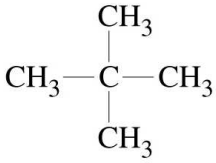
Part III:

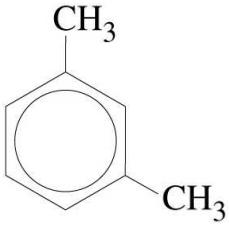
a) Name the following molecules using the IUPAC system.
b) Where possible, also name any aromatic hydrocarbons with the "ortho, meta, para" name.
c) Write the molecular formula for each molecule.
d) Identify any structural isomers among the molecules.

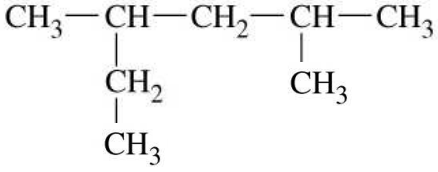


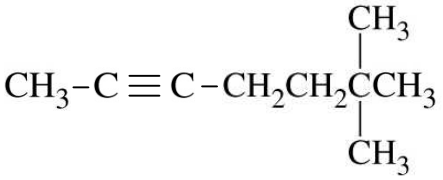


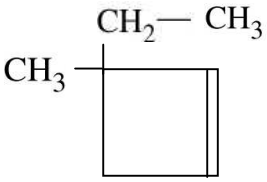


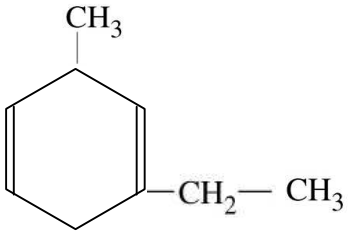


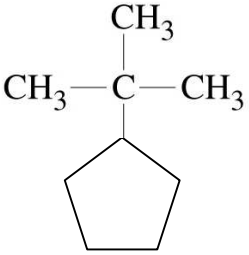


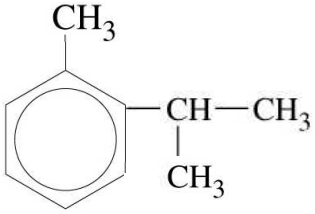


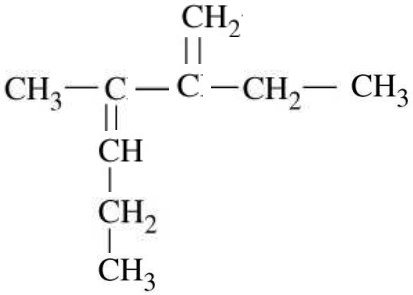




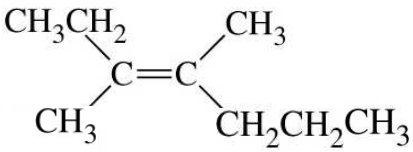


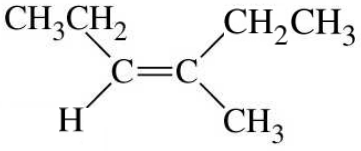






Name these geometric isomers:





Part IV: Draw structural diagrams for eight structural isomers of pentene. Name each molecule.