Name _____ Section _____ Date _____

Chapter 20: Review Worksheet

1. When a carbon atom is bonded to four other carbon atoms, what geometric arrangement occurs around the carbon atom? Why?

2. Write the names and structural formulas of the first ten straight-chain alkanes without looking in your textbook. By what group of atoms does each successive member of this family differ from the previous member?

3. How is the number of multiple substituents of the same type indicated in the systematic name of a hydrocarbon?

4. How is the root name of an alkane modified to indicate that a given hydrocarbon contains a double or triple bond?

5. How is the location of a double or triple bond in the longest continuous chain of an unsaturated hydrocarbon indicated?

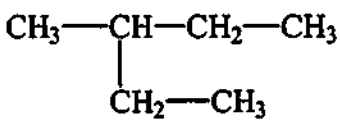
6. What does a triple bond represent? How many pairs of electrons are shared between the atoms in a triple bond? Draw the Lewis structure of a molecule with a triple bond.

7. Draw structural formulas showing all possible molecules containing six carbon atoms and having one triple bond. Name each of these.

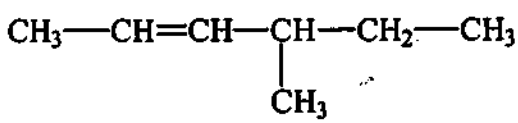
8. Sketch the general formula for the following functional groups without looking in your text: alcohols (primary, secondary, and tertiary), ethers, aldehydes, ketones, carboxylic acids, esters, and amines.

9. Name the following molecules:

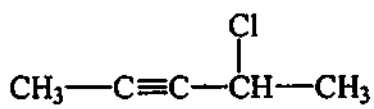
   a.



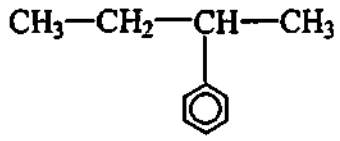
   b.



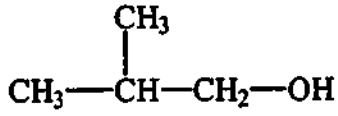
   c.



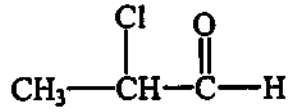
d.



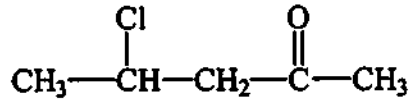
e.



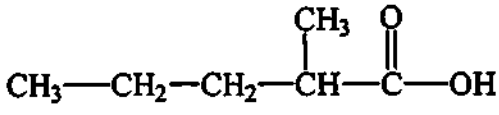
f.



g.



h.



10. Sketch the following molecules:
    a. 2-methylbutane
    b. 3-methyl-2-pentene
    c. 3,3-dichloropropyne
    d. 1,3,5-trichlorobenzene
    e. 2-methyl-2-propanol
    f. 3-methylbutanal
    g. 2,5,6-trichloro-3-heptanone
    h. 3-iodopropanoic acid

$$\frac{100}{66.7} = 2^{t/15}$$

$$\log\left(\frac{100}{66.7}\right) = \frac{t}{15}\log 2$$

$$t = 8.8 \text{ yrs}$$

5. The chemical properties of isotopes (radioactive or not) of a given element are the same. This is because the chemical properties are governed by the electrons not the nucleus (although mass effects can be important for light elements). An example of the importance of this fact for radiotracers is I-131. Iodine is taken in by the thyroid gland, and I-131 is used to monitor this uptake. If I-131 was chemically different from the more common I-127, it might not be taken in by the thyroid gland and would not be a useful radiotracer.

Chapter 20: Review Worksheet

1. The geometric arrangement is a tetrahedral. This allows the four electron pairs coming off the carbon atom to be as far apart from each other as possible.

2. The extended formulas are shown in Table 20.1 in the text. Each successive member differs from the previous member by a $-CH_2-$ unit.

3. The total number of substituents is indicated by a prefix before the name of the substituent [di- (2); tri- (3); tetra- (4); etc.].

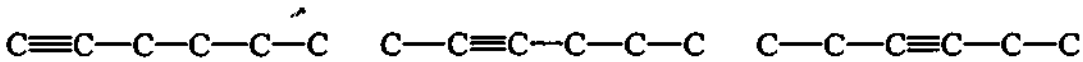
4. To indicate a double bond, the ending of the longest chain containing the double bond is changed to –ene; to indicate a triple bond, the ending of the longest chain containing the triple bond is changed to –yne.

5. The location of the double or triple bond is indicated by giving the number of the lowest number carbon atom involved in the double or triple bond.

6. A triple bond represents three pairs of electrons shared between atoms. An example of a molecule with a triple bond is C_2H_2. The Lewis structure is

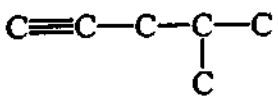
   H: C:::C:H or HC≡CH

7. Shown are carbon skeletons

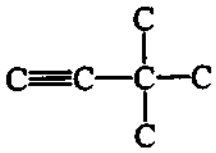


1-hexene 2-hexene 3-hexene

3-methyl-1-pentyne 4-methyl-2-pentyne

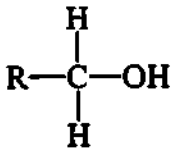


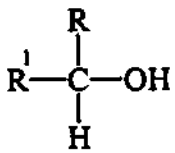
4-methyl-1-pentyne

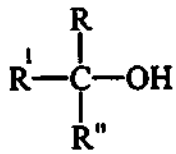


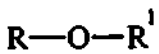
3,3-dimethyl-1-butyne

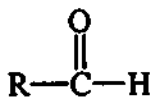
8.

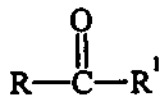
alcohols:  primary

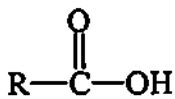
 secondary

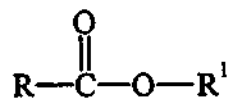
 tertiary

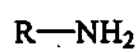
ethers: 

aldehydes: 

ketones: 

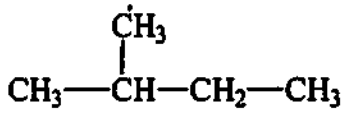
carboxylic acids: 

esters: 

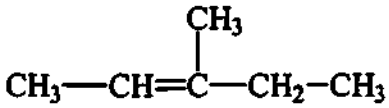
amines: 

9. a. 3-methyl pentane
   b. 4-methyl-2-hexene
   c. 4-chloro-2-pentyne
   d. 2-phenylbutane
   e. 2-methyl-1-propanol
   f. 2-chloropropanal
   g. 4-chloro-2-pentanone
   h. 2-methylpentanoic acid

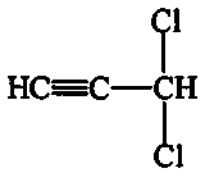
10. a.



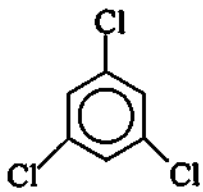
b.



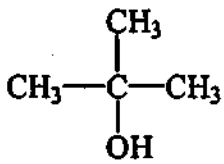
c.



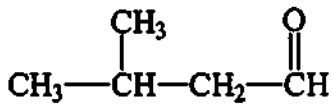
d.



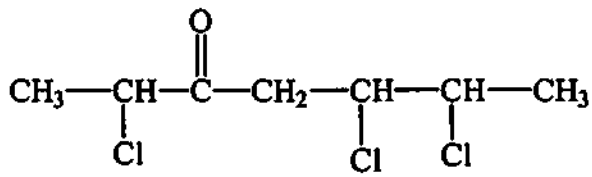
e.



f.



g.



h.