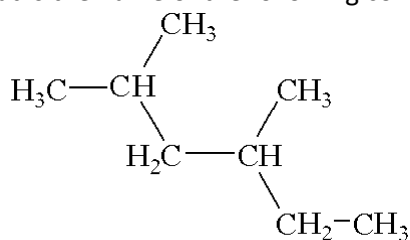


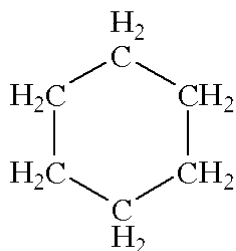
**1BFinal RP**

- Structural isomers are compounds that have
  - the same elemental composition, but the atoms are linked in different ways.
  - have identical structures, but contain different isotopes of the same elements.
  - the same physical properties, but different chemical properties.
  - two or more resonance structures.
- Optical isomers have
  - double bonded carbon atoms with either *cis* or *trans* functional groups.
  - nonsuperimposable mirror images.
  - only  $sp^2$  or  $sp$  hybridized central atoms.
  - identical structures, but different physical properties (such as melting and boiling points).
- Which one of the following statements concerning isomers is INCORRECT?
  - Pairs of nonsuperimposable molecules are called enantiomers.
  - Two types of stereoisomers exist: geometric isomers and structural isomers.
  - Optical isomers rotate polarized light in opposite directions.
  - Structural isomers have the same composition, but the atoms are linked in different ways.
- For which one of the following molecules do geometric isomers exist?
  - $\text{BrHC}=\text{CHCl}$
  - $\text{H}_2\text{C}=\text{CCl}_2$
  - $\text{ClH}_2\text{C}-\text{CH}_2\text{Br}$
  - $\text{H}_3\text{C}-\text{CH}_2\text{Cl}$
- Which of the following molecules may be a cycloalkene?
  - $\text{C}_5\text{H}_{10}$
  - $\text{C}_4\text{H}_8$
  - $\text{C}_6\text{H}_{10}$
  - $\text{C}_5\text{H}_{12}$

6. What is the name of the following compound?



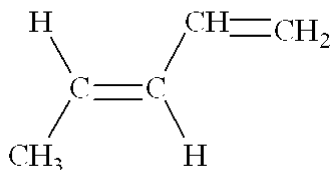
- 3-methyl-4-propylbutane
  - 2,4-dimethyloctane
  - 1,1,3-trimethylpentane
  - 2,4-dimethylhexane
7. What is the name of the following compound?



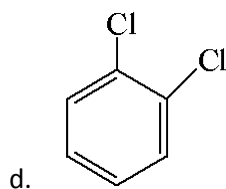
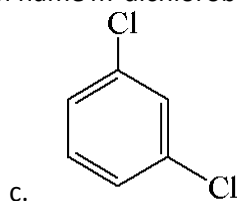
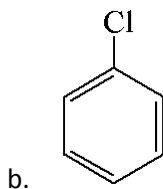
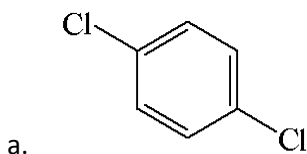
- hexane
- cyclobenzene
- cyclohexane
- cyclohexene

8. Which one of the following hydrocarbons has *cis* and *trans* isomers?  
 a. 2-ethylbutane    b. 2-methylpropene    c. 2-butene    d. 1-pentene

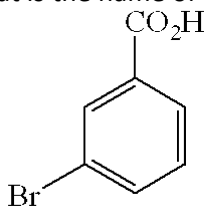
9. What is the name of the following compound?



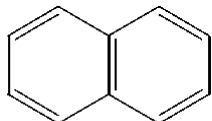
- a. *cis*-4-methyl-1,3-butadiene                      c. *cis*-4-methyl-1,3-butene  
 b. *trans*-1,3-pentadiene                              d. *trans*-acetylene
10. What is the balanced chemical equation for the combustion of 2-methyl-1-butene?  
 a.  $C_4H_8(g) + 6 O_2(g) \rightarrow 4 CO_2(g) + 4 H_2O(l)$   
 b.  $2 C_5H_{10}(g) + 15 O_2(g) \rightarrow 10 CO_2(g) + 10 H_2O(l)$   
 c.  $C_5H_{12}(g) + 13 O_2(g) \rightarrow 5 CO_2(g) + 6 H_2O(l)$   
 d.  $C_6H_{12}(g) + 9 O_2(g) \rightarrow 6 CO_2(g) + 6 H_2O(l)$
11. What is the product of the addition of HCl to ethylene?  
 a. chloroethylene                                      c. chloroethane  
 b. 1,1,2,2-tetrachloroethylene                      d. 1,2-dichloroethane
12. Identify the product(s) of the hydrogenation of *cis*-2-hexene.  
 a. carbon dioxide and water                              c. 2-hydroxyhexane  
 b. 2,3-dihydroxyhexane                                  d. hexane
13. How many structures (i.e., unique isomers) exist for dichlorobenzene?  
 a. 6                                      b. 4                                      c. 2                                      d. 3
14. Which of the structures below has the common name *m*-dichlorobenzene (where *m*- is meta)?



15. What is the name of the following benzene derivative?

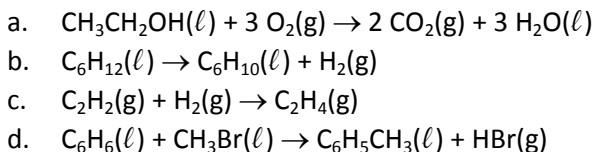


- a. 5-bromoaniline  
 b. 3-bromobenzoic acid  
 c. 1-acetate-3-bromobenzene  
 d. 5-bromobenzoic acid
16. What is the name of the following benzene derivative?



- a. naphthalene      b. aniline      c. toluene      d. 1,2-dibenzene
17. Which of the following statements concerning hydrocarbons is/are CORRECT?
- Coal is a source of many aromatic hydrocarbons.
  - The primary components of petroleum (prior to refining) are alkenes and alkynes.
  - Reactions of hydrocarbons with oxygen generally yield carbon dioxide and water.
- a. 1 only      c. 3 only      d. 1 and 3      e. 1, 2, and 3  
 b. 2 only

18. Which of the following chemical equations depicts an alkylation reaction?



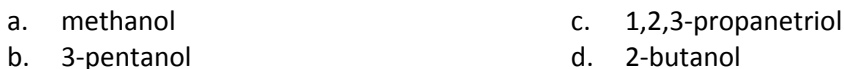
19. Formulas for derivatives of hydrocarbons may be written as R-X, where R is a hydrocarbon lacking a hydrogen atom and X is a functional group. Which of the following formulas represents an ether?



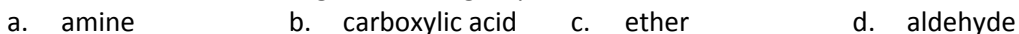
20. Which functional group does **not** contain a double bond to an oxygen atom?



21. Which of the following alcohols is likely to be least soluble in water?



22. Which one of the following functional groups is a base?

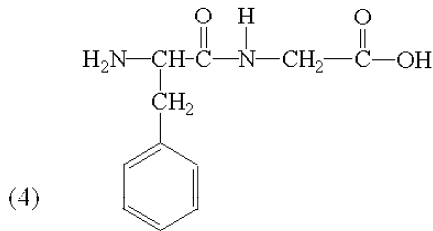
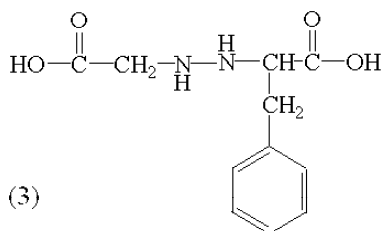
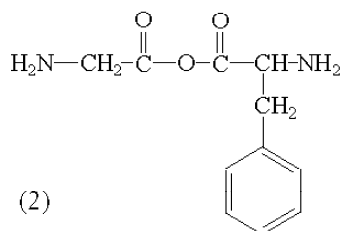
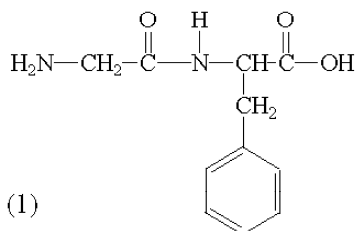
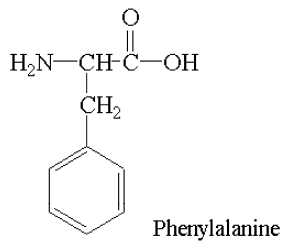
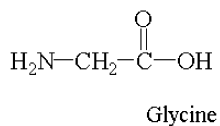


23. The functional group  $\text{RCO}_2\text{R}'$  is characteristic of a(n) \_\_\_\_\_.



24. The carbonyl group occurs in molecules with all of the following functional groups EXCEPT \_\_\_\_.
- a. ethers                      b. amides                      c. ketones                      d. esters
25. Which of the following compounds might be used to oxidize an aldehyde to a carboxylic acid?
- a. NaH                      b.  $K_2Cr_2O_7$                       c.  $H_2$                       d. Na
26. What is the product of the reduction of propanal with sodium borohydride?
- a. 2-propanol                      b. acetone                      c. 1-propanol                      d. propane
27. What is the name of the product of the reaction that occurs when a mixture of ethanol and butanoic acid is heated in the presence of acid?
- a. 2-ethylbutanol                      b. butyl ethanoate                      c. 2-ethylbutanal                      d. ethyl butanoate
28. An amine reacts with a(n) \_\_\_\_\_ to form an amide.
- a. ester                      b. aldehyde                      c. carboxylic acid                      d. ether
29. Which of the following statements is INCORRECT?
- a. Thermoplastics soften and flow when they are heated and harden when they are cooled.
- b. Elastomers are materials that spring back to their original shape when stretched.
- c. A condensation reaction involves reacting two monomers and splitting out a small molecule, often water.
- d. Polymers formed from two or more different monomers are called addition polymers.
30. The process by which long chain hydrocarbons in petroleum are shortened is called \_\_\_\_\_.
31. Hydrolysis of fats and oils in the presence of a strong base produces glycerol and the salts of fatty acids. The name for this reaction is \_\_\_\_\_, which means "soap making."
32. In vulcanized rubber, the polymer chains of natural rubber are cross-linked with sulfur atoms. The polymer chains stretch when stressed, but they return to their original shape when the stress is removed. Substances that behave this way are called \_\_\_\_\_.
33. Examples of structural \_\_\_\_\_ are ethanol and dimethyl ether.
34. A peptide bond is the amide linkage that is formed in a condensation reaction involving the \_\_\_\_\_ group of one amino acid with the carboxylic acid group of a second amino acid.
35. Draw Lewis structures for all possible isomers of  $C_3H_6O$ .
36. The molecule 2-chloro-4-methylhexane is made by addition of HCl to an alkene. Write a balanced chemical equation for this reaction.

37. Amino acids polymerize in condensation reactions that result in the formation of an amide linkage (or peptide bond) between amino acid molecules. What dipeptide(s) may be formed in the reaction of glycine with phenylalanine?

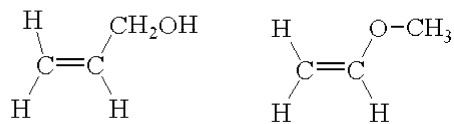
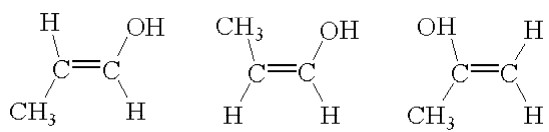


- a. 1 only                      c. 3 only                      d. 4 only                      e. 1 and 4  
b. 2 only

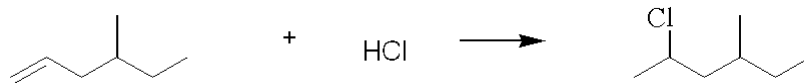
**1BFinal RP**  
**Answer Section**

1. ANS: A
2. ANS: B
3. ANS: B
4. ANS: A
5. ANS: C
6. ANS: D
7. ANS: C
8. ANS: C
9. ANS: B
10. ANS: B
11. ANS: C
12. ANS: D
13. ANS: D
14. ANS: C
15. ANS: B
16. ANS: A
17. ANS: D
18. ANS: D
19. ANS: D
20. ANS: C
21. ANS: B
22. ANS: A
23. ANS: B
24. ANS: A
25. ANS: B
26. ANS: C
27. ANS: D
28. ANS: C
29. ANS: D
30. ANS:  
cracking
31. ANS:  
saponification
32. ANS:  
elastomers
33. ANS:  
isomers
34. ANS:  
amine

35. ANS:



36. ANS:



37. ANS: E