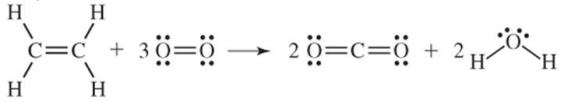
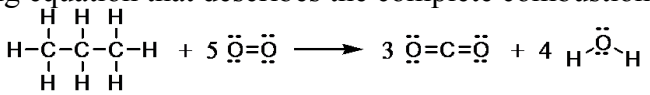
1. Which common process on earth is endothermic?
   A.the production of oxygen by photosynthesis
   B.ozone decomposing into O_2 in the upper atmosphere
   C.water freezing to form ice at 0°C
   D.the reaction of wood with oxygen to form carbon dioxide, water, and ash

2. Use the equation to help you calculate the heat of combustion of ethylene, C_2H_4. The bond energies are: C — H 416 kJ/mol; C — C 356 kJ/mol; C ═ C 598 kJ/mol; O ═ O 498 kJ/mol; C ═ O 803 kJ/mol; H — O 467 kJ/mol.



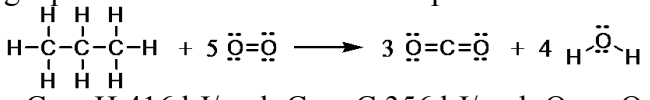
   The heat of combustion of ethylene is
   A.+220 kJ/mol.
   B.+1216 kJ/mol.
   C.-754 kJ/mol.
   D.-1324 kJ/mol.

3. Consider the following equation that describes the complete combustion of propane, C_3H_8.



   The bond energies are: C — H 416 kJ/mol; C — C 356 kJ/mol; O ═ O 498 kJ/mol; C ═ O 803 kJ/mol; H — O 467 kJ/mol. Which is the total amount of energy required to break all of the bonds in propane?
   A.712 kJ/mol
   B.3328 kJ/mol
   C.4040 kJ/mol
   D.4396 kJ/mol

4. Consider the following equation that describes the complete combustion of propane, C_3H_8.



   The bond energies are: C — H 416 kJ/mol; C — C 356 kJ/mol; O ═ O 498 kJ/mol; C ═ O 803 kJ/mol; H — O 467 kJ/mol. Which is the amount of energy gained on making all the bonds in carbon dioxide and water according to the equation?
   A.-1270 kJ/mol
   B.-2540 kJ/mol
   C.-4277 kJ/mol
   D.-8554 kJ/mol

5. Cracking is
   A.the breaking of larger molecules into smaller ones.
   B.the combination of small molecules to form larger molecules.
   C.any reaction that is accompanied by the release of heat.
   D.any reaction that is accompanied by the absorption of heat.

6. If a snack cake contains 450 food Calories and you are able to burn 250 Calories by running for one-half an hour, how long must you run to completely burn off the snack cake?
   A.54 minutes
   B.18 minutes
   C.1.21 hours
   D.You can't tell

7. The recommended daily requirement of calcium is 1,000 mg. Tap water in a Midwestern city contains approximately 150 mg Ca/L. A person living in the city who drinks two liters of water in one day would receive _____ percent of his/her RDA of calcium.
   A.3
   B.7.5
   C.15
   D.30

8. A 4-L sample of water contains 80 µg of lead. What is this lead concentration, in parts per billion (ppb)? (You may assume 1 mL of water has a mass of 1 g)
   A.20
   B.80
   C.320
   D.500

9. A student wants to prepare exactly 250 mL of a 0.500 M aqueous potassium hydroxide solution. What mass of potassium hydroxide (molar mass = 56.10 g/mol) must the student dissolve in the 250 mL of solution?
   A.56.1 g
   B.28.1 g
   C.14.0 g
   D.7.01 g

10. If the lead concentration in water is 1 ppm, then we should be able to recover 1 mg of lead from ____ L of water.
    A.0.01
    B.0.1
    C.1
    D.10

11. The fact that carbon (C) is less electronegative than nitrogen (N) means that in a C — N bond, the
    A.shared electrons are closer to the C atom than to the N atom.
    B.shared electrons are closer to the N atom than to the C atom.
    C.C atom takes the electrons from the N atom forming C^{-} and N^{+}.
    D.N atom takes the electrons from the C atom forming C^{+} and N^{-}.

12. What is the formula of the ionic compound formed from magnesium, Mg, and chlorine, Cl?
    A.MgCl
    B.Mg_2Cl_2
    C.Mg_2Cl
    D.$MgCl_2$

13. When the _____molecules of ethanol, C_2H_5OH, are added to water, the ethanol molecules _____.
    A.nonpolar; are attracted to the nonpolar water molecules.
    B.polar; form hydrogen bonds with the polar water molecules.
    C.polar; form covalent bonds with the polar water molecules.
    D.nonpolar; are not attracted to the polar water molecules.

14. The attractions between anions and cations throughout a crystal are known collectively as
    A.covalent bonds.
    B.polar covalent bonds.
    C.hydrogen bonds.
    D.ionic bonds.

15. Which compound is insoluble in water?
    A.sodium carbonate
    B.potassium nitrate
    C.ammonium chloride
    D.calcium carbonate

16. Which compound has an **incorrect** formula?
A.$MgPO_4$
B.$(NH_4)_2S$
C.$Mg(HSO_3)_2$
D.$NaClO_4$

17. Mixing which of the following will produce a precipitation reaction (give an insoluble product)?
A.HNO_3 (aq) and $Sr(OH)_2$(aq)
B.$LiNO_3$ and NaI
C.Na_2SO_4(aq) and $Ba(OH)_2$(aq)
D.NaOH and KBr

18. Which chemical equation shows the dissociation of magnesium hydroxide?
A.$Mg(OH)_2 \rightarrow Mg^{2+} + 2OH^-$
B.$MgOH \rightarrow Mg^{2+} + OH^{2-}$
C.$Mg(OH)_3 \rightarrow Mg^{3+} + 3OH^-$
D.$Mg(OH)_2 \rightarrow Mg^{2+} + H_2O + O^{2-}$

19. When dissolved in water, hydrogen bromide (HBr) forms hydrobromic acid. Determine the hydroxide ion concentration in a 4,500 mL solution containing 3.78 g hydrogen bromide; $K_w = 1.00 \times 10^{-14}$.
A.$[OH^-] = 9.63 \times 10^{-13}$ M
B.$[OH^-] = 2.14 \times 10^{-13}$ M
C.$[OH^-] = 4.67 \times 10^{-2}$ M
D.$[OH^-] = 0.0104$ M

20. Which anthropogenic pollutants are implicated in the formation of most acidic precipitation?
A.carbon oxides
B.phosphoric acid and hydrochloric acid
C.ozone and carbon monoxide
D.nitrogen oxides and sulfur oxides

21. Sulfur oxides have been implicated as important contributors to the problem of acid rain. What is the principal anthropogenic source of these compounds?
A.transportation
B.coal fired power plants
C.lightning
D.volcanoes

22. A proton released by an acid in aqueous solution quickly reacts with water to form a hydronium ion. What product is formed when a proton reacts with ammonia (NH_3)?
A. NH_3^+
B. NH_4
C. NH_2^-
D. NH_4^+

23. The hydronium ion concentration in a solution with pH 10 is _____ than the hydronium ion concentration in a solution with pH 13.
A. 1,000 times less
B. 3 times greater
C. 1,000 times greater
D. 100 times less

24. Which reaction represents an acid-base neutralization reaction?
A. $HNO_2 + H_2O \rightarrow H_3O^+ + NO_2^-$
B. $NaOH + H_2O \rightarrow H_3O^+ + NaO^-$
C. $Ba(OH)_2 + 2LiCl \rightarrow BaCl_2 + 2LiOH$
D. $Be(OH)_2 + H_2SO_4 \rightarrow BeSO_4 + 2H_2O$

25. Which reaction accounts for the fact that the pH of rain is naturally slightly acidic?
A. $CO_2 + H_2O \rightarrow H^+ + HCO_3^-$
B. $SO_3 + H_2O \rightarrow 2\ H^+ + SO_4^{2-}$
C. $Ca^{2+} + CO_2 + H_2O \rightarrow CaCO_3 + 2\ H^+$
D. $NO_2 + H_2O \rightarrow 2\ H^+ + NO_3^-$

26. Predict the products of the chemical equation: $3\ LiOH + H_3PO_4 \rightarrow$
A. $3\ LiH + (OH)_3PO_4$
B. $3\ H + 3\ O_2 + H_3Li_3$
C. $Li_3PO_4 + 3\ H_2O$
D. $Li_3P + 2\ H_2O + H_3O_5$

27. Every increase of one pH unit indicates
A. an increase in acidity.
B. 10 times more hydrogen ions in solution.
C. 10 times less hydrogen ions in solution.
D. none of the above.

ANSWER KEY:

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