

___ 8. What is the formula for the compound formed by calcium ions and fluoride ions?
a. CaF b. Ca₂F c. CaF₃ d. CaF₂

___ 9. To balance a chemical equation, it may be necessary to adjust the
a. coefficients. c. formulas of the products.
b. subscripts. d. number of products.

___ 10. Balance the following equation with the **smallest whole number coefficients**.

The coefficients of **ZrO₂** and **CCl₄** are ___ and ___, respectively.



a. 1,1 b. 2,4 c. 1,2 d. 2,2

___ 11. In the expression 3CO₂, the numbers 3 and 2 are, respectively,
a. a subscript and a coefficient. c. two subscripts.
b. a coefficient and a subscript. d. two coefficients.

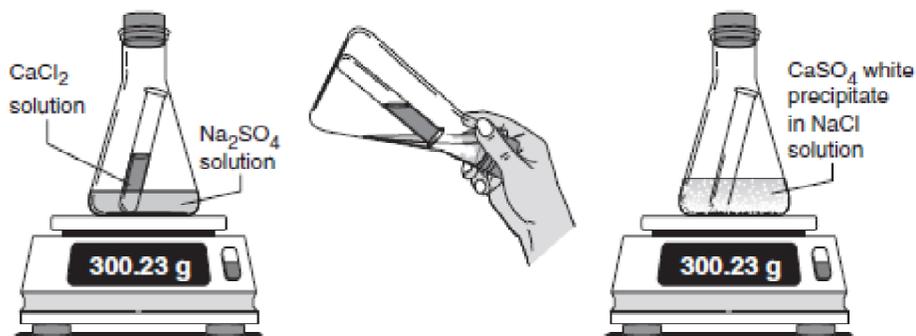
___ 12. The activity series helps to predict
a. the amount of product formed by a chemical reaction.
b. whether or not a specific chemical reaction is possible.
c. the coefficients needed to balance a chemical equation.
d. the amount of energy needed to start a chemical reaction.

___ 13. In a single-displacement reaction, an element in the activity series most likely can replace any element
a. above it on the list. c. below it on the list.
b. in the same group. d. in any other group.

___ 14. In an equation, the symbol for a substance in water solution is followed by
a. (l). b. (g). c. (aq). d. (s).

___ 15. Metal X replaces the ions of metal Y from solution, but it cannot replace the ions of metal Z from solution. The order these metals should have in the activity series (from top to bottom) is
a. x, y, z b. z, x, y c. y, x, z d. z, y, x

___ 16. In writing an equation that produces nitrogen, what is the correct representation of nitrogen?
a. N b. 2N c. N₂ d. NO₃



17. In the procedure shown above, a calcium chloride solution is mixed with a sodium sulfate solution to create the products shown. Which of the following is illustrated by this activity?
- The law of conservation of mass
 - The theory of thermal equilibrium
 - the law of conservation of momentum
 - the theory of covalent bonding
18. Which of the following correctly demonstrates conservation of mass?
- $C_4H_{10} + O_2 \longrightarrow CO_2 + H_2O$
 - $C_4H_{10} + 4O_2 \longrightarrow 4CO_2 + 5H_2O$
 - $2C_4H_{10} + 13O_2 \longrightarrow 8CO_2 + 10H_2O$
 - $C_4H_{10} + 8O_2 \longrightarrow 4CO_2 + 10H_2O$
19. Which observation does NOT indicate that a chemical reaction has occurred?
- formation of a precipitate
 - production of a gas
 - evolution of heat and light
 - change in total mass of substances
20. When the equation below is correctly balanced, what is the coefficient of Fe?
- $$\underline{\hspace{1cm}} FeSO_4 + \underline{\hspace{1cm}} Al \rightarrow \underline{\hspace{1cm}} Al_2(SO_4)_3 + \underline{\hspace{1cm}} Fe$$
- 3
 - 4
 - 6
 - 9
21. The coefficients in a chemical equation represent the
- masses, in grams, of all reactants and products.
 - relative numbers of moles of reactants and products.
 - number of atoms in each compound in a reaction.
 - number of valence electrons involved in the reaction.
22. In the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, what is the mole ratio of nitrogen to ammonia?
- 1:1
 - 1:2
 - 1:3
 - 2:3
23. In the reaction $2Al_2O_3 \rightarrow 4Al + 3O_2$, what is the mole ratio of aluminum to oxygen?
- 10:6
 - 3:4
 - 2:3
 - 4:3
24. In the reaction $Ca + Cl_2 \rightarrow CaCl_2$, what is the mole ratio of chlorine to calcium chloride?
- 2:3
 - 2:1
 - 1:2
 - 1:1

___ 25. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, what is the mole ratio of hydrogen to ammonia?
a. 1:1 b. 2:1 c. 3:2 d. 6:8

___ 26. The Haber process for producing ammonia commercially is represented by the equation



To completely convert 9.0 mol hydrogen gas to ammonia gas, how many moles of nitrogen gas are required?

a. 1.0 mol b. 2.0 mol c. 3.0 mol d. 6.0 mol

___ 27. In the equation $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$, how many moles of oxygen are produced when 3.0 mol of KClO_3 decompose completely?

a. 1.0 mol b. 2.5 mol c. 3.0 mol d. 4.5 mol

___ 28. For the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, how many moles of nitrogen are required to produce 18 mol of ammonia?

a. 9.0 mol b. 18 mol c. 27 mol d. 36 mol

___ 29. For the reaction $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$, how many moles of hydrochloric acid are required to produce 150. g of water?

a. 1.50 mol c. 8.32 mol
b. 4.16 mol d. 12.2 mol

___ 30. A chemical reaction involving reactants A and B stops when B is completely used. B is the
a. excess reactant. b. limiting reactant. c. primary reactant. d. primary product.

___ 31. What is the ratio of the actual yield to the theoretical yield, multiplied by 100%?
a. mole ratio b. percent yield c. Avogadro yield d. excess yield

___ 32. In most chemical reactions the amount of product obtained is
a. equal to the theoretical yield. c. more than the theoretical yield.
b. less than the theoretical yield. d. more than the percent yield.

- ___ 33. Which of these would support the idea that mass is conserved in a reaction that produces a gas as a product?
- Heating the reactants to ensure the reaction occurs in a gaseous state
 - Subtracting the mass of the gas from the mass of the solid and liquid products
 - Mixing the reactants and measuring their total mass
 - Trapping the gas and measuring its mass
- ___ 34. Actual yield must be determined by
- experiments.
 - calculations.
 - theoretical yield.
 - estimation.
- ___ 35. Which expression can be used to solve a mass-to-mole conversion for the following equation:



- $\text{mass HCl} \times \frac{1 \text{ mol HCl}}{\text{molar mass HCl}} \times \frac{1 \text{ mol Cl}_2}{2 \text{ mol HCl}}$
 - $\frac{1 \text{ mol Cl}_2}{2 \text{ mol HCl}} \times \text{mass HCl}$
 - $\frac{1 \text{ mol Cl}_2}{2 \text{ mol HCl}} \times \frac{1 \text{ mol HCl}}{\text{molar mass HCl}} \times \text{mass HCl}$
 - $\text{mass HCl} \times \text{molar mass HCl} \times \frac{1 \text{ mol Cl}_2}{2 \text{ mol HCl}}$
- ___ 36. Which of the following mathematical expressions correctly states the relationship among percentage yield, actual yield, and theoretical yield?
- $\text{actual yield} = \frac{\text{percentage yield}}{\text{theoretical yield}} \times 100$
 - $\text{percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$
 - $\text{theoretical yield} = \frac{\text{percentage yield}}{\text{actual yield}} \times 100$
 - Both (b) and (c)
- ___ 37. For the equation $\text{P}_{4(s)} + 5\text{O}_{2(g)} \rightarrow \text{P}_4\text{O}_{10(s)}$, if 3 mol of phosphorus react with 10 mol of oxygen, the theoretical yield of phosphorus(V) oxide will be:
- 1 mol.
 - 2 mol.
 - 3 mol.
 - 10 mol.

- ___ 38. In the reaction represented by the equation $\text{CH}_4(g) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(g)$, a mass of 125 g CH_4 is reacted with excess oxygen. The expression

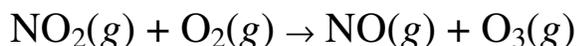
$$125 \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.05 \text{ g CH}_4} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol CH}_4} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}}$$

is used to calculate the:

- mass of oxygen reacted.
 - mass of carbon dioxide produced.
 - mass of water produced.
 - None of the above
- ___ 39. What is the mole ratio of H_2O to H_3PO_4 in the following chemical equation?



- 4 to 6
 - 1 to 6
 - 3 to 2
 - 2 to 3
- ___ 40. Ozone, O_3 , is produced in automobile exhaust by the reaction represented by the equation



What mass of ozone is predicted to form from the reaction of 2.0 g NO_2 in a car's exhaust and excess oxygen?

Element	Molar mass
Nitrogen	14.01 g/mol
Oxygen	16.00 g/mol

- 1.1 g O_3
 - 1.8 g O_3
 - 2.1 g O_3
 - 4.2 g O_3
- ___ 41. The pressure of a sample of helium is 2.0 atm in a 200-mL container. If the container is compressed to 10 mL without changing the temperature, what is the new pressure?
- 200 atm
 - 0.10 atm
 - 100 atm
 40. atm
- ___ 42. In the equation $\text{H}_2(g) + \text{Cl}_2(g) \rightarrow 2\text{HCl}(g)$, one liter of hydrogen yields how many liters of hydrogen chloride?
- 4
 - 3
 - 2
 - 1

- ___ 43. The equation for the complete combustion of methane is $\text{CH}_4(g) + 2\text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(g) + \text{CO}_2(g)$. If 50 L of methane at STP are burned, what volume of carbon dioxide will be produced at STP?
- 16.6 L
 - 25 L
 - 50 L
 - 100 L
- ___ 44. A real gas
- does not obey all the assumptions of the kinetic-molecular theory.
 - consists of particles that do not occupy space.
 - cannot be condensed.
 - cannot be produced in scientific laboratories.
- ___ 45. Convert the pressure 0.840 atm to mm Hg.
- 365 mm Hg
 - 437 mm Hg
 - 638 mm Hg
 - 780 mm Hg
- ___ 46. What is the approximate volume of gas in a 1.50 mol sample that exerts a pressure of 0.922 atm and has a temperature of 10.0°C ?
- 13 L
 - 14.2 L
 - 37.8 L
 - 378 L
- ___ 47. An ideal gas is an imaginary gas
- not made of particles.
 - that conforms to all of the assumptions of the kinetic theory.
 - whose particles have zero mass.
 - made of motionless particles.
- ___ 48. When hydrogen burns, water vapor is produced.

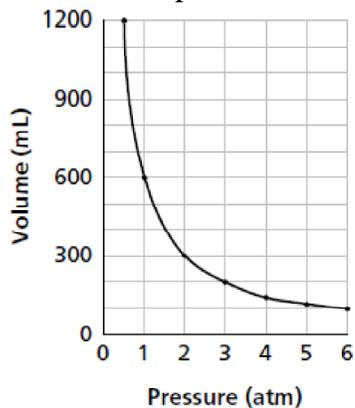
The equation is $2\text{H}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{H}_2\text{O}_{(g)}$.

If 12 L of oxygen are consumed, what volume of water vapor is produced?

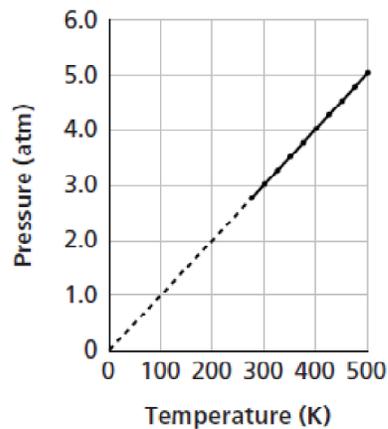
- 1 L
 - 2 L
 - 12 L
 - 24 L
- ___ 49. The volume of a gas is 93 mL when the temperature is 91°C . If the temperature is reduced to 0°C without changing the pressure, what is the new volume of the gas?
- 100 mL
 - 70 mL
 - 120 mL
 - 273 mL

- ___ 50. Calculate the approximate volume of a 0.600 mol sample of gas at 15.0°C and a pressure of 1.10 atm.
- 129 L
 - 22.4 L
 - 24.6 L
 - 12.9 L
- ___ 51. On a cold winter morning when the temperature is -13°C , the air pressure in an automobile tire is 1.5 atm. If the volume does not change, what is the pressure after the tire has warmed to 15°C ?
- -1.5 atm
 - 1.7 atm
 - 3.0 atm
 - 19.5 atm
- ___ 52. If a gas with an odor is released in a room, it quickly can be detected across the room because it
- diffuses.
 - is dense.
 - is compressed.
 - condenses.
- ___ 53. The volume of a gas collected when the temperature is 11.0°C and the pressure is 710 mm Hg measures 14.8 mL. What is the calculated volume of the gas at 20.0°C and 740 mm Hg?
- 7.8 mL
 - 13.7 mL
 - 146 mL
 - 15 mL
- ___ 54. What pressure is exerted by 0.750 mol of a gas at a temperature of 0.00°C and a volume of 5.00 L?
- 3.4 atm
 - 2.1 atm
 - 4.98 atm
 760. atm
- ___ 55. A mixture of four gases exerts a total pressure of 860 mm Hg. Gases A and B each exert 220 mm Hg. Gas C exerts 110 mm Hg. What pressure is exerted by gas D?
- 165 mm Hg
 - 310 mm Hg
 - 860 mm Hg
 - cannot be determined
- ___ 56. Sublimation involves changing from a
- solid to a gas.
 - liquid to a gas.
 - gas to a liquid.
 - gas to a solid.
- ___ 57. On a phase diagram, the point at which all equilibrium lines join is the
- melting point.
 - boiling point.
 - critical point.
 - triple point.

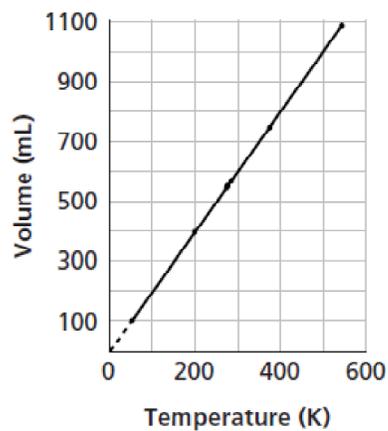
58. Which graph illustrates Boyle's law?
 a. *Volume vs. Pressure for a Gas at Constant Temperature*



- c. *Pressure Vs. Temperature for a Gas at Constant Volume*



- b. *Volume Vs. Temperature for a Gas at Constant Pressure*

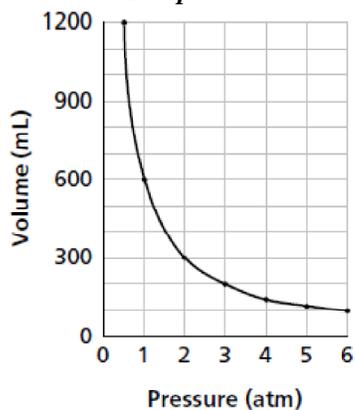


- d. None of the graphs

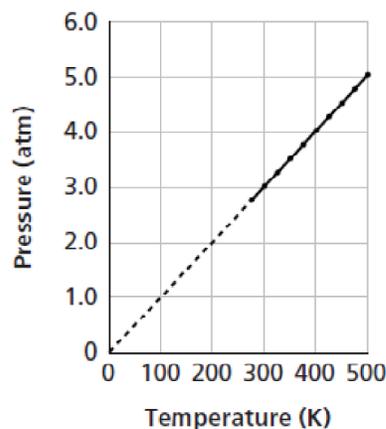
59. The law that relates the temperature and volume of a gas to each other is known as
 a. Charles's law.
 b. Boyle's law.
 c. Gay-Lussac's law.
 d. Graham's law.

60. Which graph illustrates Charles's law?

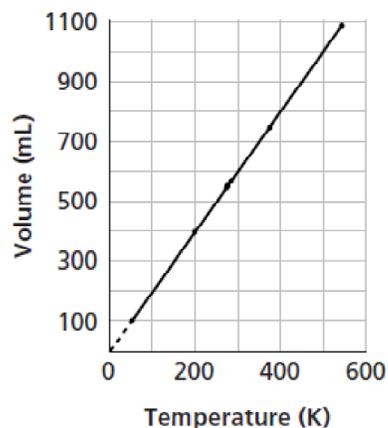
a. *Volume vs. Pressure for a Gas at Constant Temperature*



c. *Pressure Vs. Temperature for a Gas at Constant Volume*



b. *Volume Vs. Temperature for a Gas at Constant Pressure*



d. None of the graphs

61. Which of the following will dissolve most rapidly?

- | | |
|--------------------------------|---------------------------------|
| a. powdered sugar in hot water | c. sugar cubes in hot water |
| b. sugar cubes in cold water | d. powdered sugar in cold water |

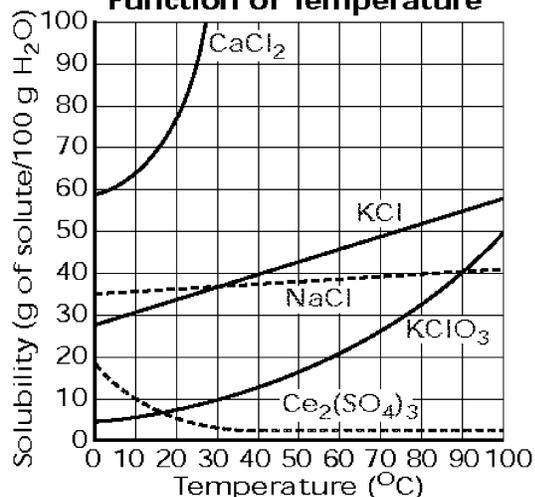
62. What volume of 1.75 M hydrochloric acid must be diluted with water to prepare 500 mL of 0.250 M hydrochloric acid?

- 8.50×10^{-4} mL
- 71.4 mL
- 128 mL
- 429 mL

63. Making sweet tea requires tea leaves, sugar, and optional lemon mixed together in water. Which is the solvent?

- | | |
|---------------|----------|
| a. sugar | c. lemon |
| b. tea leaves | d. water |

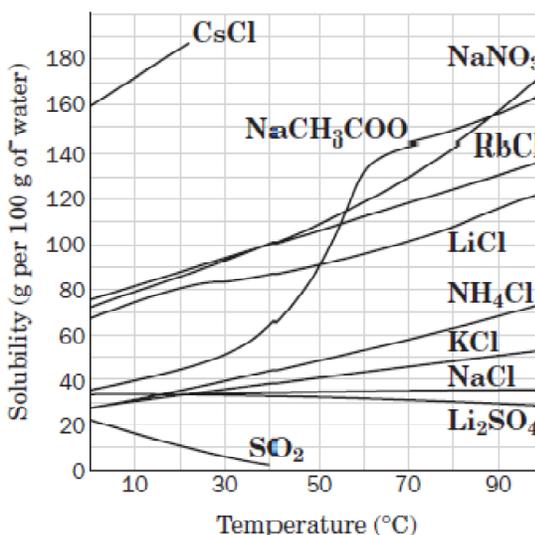
FIGURE 1
Solubilities as a
Function of Temperature



- ___ 64. How much KCl can you dissolve in 200 g of 40 °C water according to figure 1?
 a. 40 g b. 80 g c. 120 g d. 160 g
- ___ 65. Which amount of KClO₃ dissolves in 100 g of 30°C water makes a saturated solution?
 a. 5 g b. 7.5 g c. 10 g d. 12.5 g
- ___ 66. A scientist makes a solution by dissolving 50 grams of potassium chloride in 100 g of water that is heated to 90°C. What kind of solution did the scientist make? (Use Figure 1)
 a. Supersaturated c. Ionic
 b. Saturated d. Unsaturated
- ___ 67. As shown in Figure 1, what solute decreases in solubility as temperature increases?
 a. CaCl₂ c. Ce₂(SO₄)₃
 b. NaCl d. KClO₃
- ___ 68. Use Figure 1 Above: An unsaturated solution containing 20 grams of KClO₃ is dissolved in 100 g of water at a temperature of 70°C. If the temperature is cooled to 30°C, how much KClO₃ would fall out of solution and solidify if the solution was disturbed.
 a. 5 g c. 20 g
 b. 10 g d. none, it would still be unsaturated
- ___ 69. If the amount of solute present in a solution at a given temperature is less than the maximum amount that can dissolve at that temperature, the solution is said to be
 a. unsaturated. b. concentrated. c. supersaturated. d. saturated.
- ___ 70. An NaOH solution contains 1.90 mol of NaOH, and its concentration is 0.555 M. What is its volume?
 a. 0.623 L b. 0.911 L c. 1.05 L d. 3.42 L
- ___ 71. How many moles of HCl are present in 0.70 L of a 0.33 M HCl solution?
 a. 0.47 mol c. 0.23 mol
 b. 0.38 mol d. 0.28 mol

- ___ 72. What is the volume of a 1.5 M solution if it was diluted from 250 mL of 6.0 M solution?
 a. 500 mL
 b. 62.5 mL
 c. 1,000 mL
 d. 1,500 mL
- ___ 73. What is the molarity of a solution that contains 0.202 mol KCl in 7.98 L solution?
 a. 0.459 M
 b. 0.0132 M
 c. 0.0253 M
 d. 1.363 M
- ___ 74. What is the term for a substance whose water solution conducts electric current?
 a. miscible
 b. immiscible
 c. electrolyte
 d. nonelectrolyte
- ___ 75. What is the concentration of a 750 mL solution containing 1.5 mols of solute?
 a. 0.002 M
 b. 2.0 M
 c. 500 M
 d. 0.5 M

Use this figure to answer the following two questions.



- ___ 76. According to solubility curves shown in the figure, which of the following solutions is supersaturated?
 a. 40 g of NaCH₃COO in 100 g of water at 40°C
 b. 140 g of NaCH₃COO in 100 g of water at 80°C
 c. 80 g of NaCH₃COO in 100 g of water at 40°C
 d. 80 g of NaCH₃COO in 200 g of water at 40°C
- ___ 77. A solution containing 35 g of Li₂SO₄ dissolved in 100 g of water is heated from 10°C to 90°C. According to information in the figure, this temperature change would result in
 a. an additional 5 g of Li₂SO₄ in solution.
 b. an additional 30 g of Li₂SO₄ in solution.
 c. 5 g of Li₂SO₄ precipitate.
 d. no change in Li₂SO₄ concentration.

- ___ 78. Which temperature and mass combination represents a saturated solution for lithium chloride?
- a. 100 grams at 40°C c. 50 grams at 70°C
b. 70 grams at 30°C d. 100 grams at 70°C
- ___ 79. Water acts as a solvent of ionic compounds because ___.
- a. water molecules are polar
b. water is found in three states of matter
c. water is liquid over a wide range of temperatures
d. water takes the shape of its container
- ___ 80. What can you do to make a solute dissolve faster in a solvent?
- a. crush it
b. heat it
c. stir it
d. all of the above
- ___ 81. Substances with pH-sensitive dyes that change to different colors for different pH are used as
- a. titrants. c. indicators.
b. primary standards. d. None of the above

pH	Methyl green	Methyl orange	Indigo Carmine	Phenolphthalein
1	light yellow	red	yellow	clear
2	light yellow	blue	yellow	clear
3	dark yellow	green	yellow	clear
4	orange	orange	yellow	clear
5	pink	orange	yellow	clear
6	light red	orange	yellow	clear
7	red	orange	yellow	clear
8	red	orange	light blue	clear
9	red	orange	dark blue	light purple
10	red	orange	orange	light purple
11	red	orange	red	light purple
12	red	orange	red	dark purple
13	red	orange	red	dark purple
14	red	orange	red	dark purple

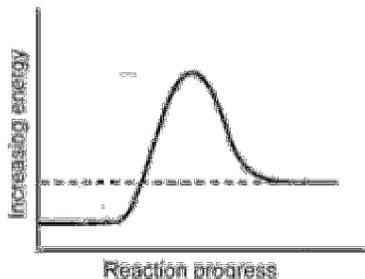
- ___ 82. What is the pH of an unknown solution that is tested in the indicators as follows:
- Methyl Green: Red
Methyl Orange: Orange
Indigo Carmine: Dark Blue
Phenolphthalein: Light Purple
- a. 9 b. 5 c. 7 d. 11
- ___ 83. If $[H^+] = 8.26 \times 10^{-5} \text{ M}$, calculate the pH of the solution.
- a. 2.161 b. 8.024 c. 4.083 d. 3.912

- ___ 84. In a Brønsted-Lowry acid-base reaction, what are transferred from one reactant to another?
 a. H^+ ions b. OH^- ions c. electrons d. water molecules
- ___ 85. Calculate the hydronium ion concentration of a solution whose pH is 4.12.
 a. $4.4 \times 10^{-8} \text{ M}$ b. $6.4 \times 10^{-5} \text{ M}$ c. $7.6 \times 10^{-5} \text{ M}$ d. $5.1 \times 10^{-6} \text{ M}$
- ___ 86. In a neutralization reaction, acids react with
 a. water to produce bases and salts. c. bases to produce salts and water.
 b. salts to produce bases and water. d. neither bases, salts, nor water.
- ___ 87. If $[\text{H}_3\text{O}^+]$ of a solution is less than $[\text{OH}^-]$, the solution
 a. is always acidic. c. is always neutral.
 b. is always basic. d. might be acidic, basic, or neutral.
- ___ 88. A substance that increases the concentration of OH^- ions in an aqueous solution is known as a(n)
 a. Brønsted-Lowry acid. c. Arrhenius acid.
 b. Brønsted-Lowry base. d. Arrhenius base.
- ___ 89. What is the pH of a neutral solution $[\text{H}^+] = [\text{OH}^-]$?
 a. 1 b. 0 c. 7 d. 14
- ___ 90. A substance whose water solution conducts a current is a(n)
 a. electrolyte. c. nonelectrolyte.
 b. solute. d. nonpolar substance.
- ___ 91. Calculate the hydronium ion $[\text{H}_3\text{O}^+]$ concentration of a solution whose pH is 7.30.
 a. $1.4 \times 10^{-11} \text{ M}$ b. $5.0 \times 10^{-8} \text{ M}$ c. $3.8 \times 10^{-8} \text{ M}$ d. $7.1 \times 10^{-6} \text{ M}$
- ___ 92. Which compound can be produced by a neutralization reaction between an acid and a base?
 a. $\text{H}_2\text{O}_{(l)}$ b. $\text{HNO}_3_{(aq)}$ c. $\text{H}_3\text{PO}_4_{(aq)}$ d. $\text{Ca}(\text{OH})_{2(s)}$
- ___ 93. In the reaction that follows, what substance is the conjugate base?

$$\text{H}_2\text{SO}_3_{(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{H}_3\text{O}^+_{(s)} + \text{HSO}_3^-_{(aq)}$$
 a. $\text{H}_3\text{O}^+_{(s)}$ b. $\text{H}_2\text{O}_{(l)}$ c. $\text{H}_2\text{SO}_3_{(aq)}$ d. $\text{HSO}_3^-_{(aq)}$
- ___ 94. A water solution whose pH is 4
 a. is always acidic. c. is always neutral.
 b. is always basic. d. might be neutral, basic, or acidic.
- ___ 95. Strong acids are
 a. weak electrolytes. c. nonionized.
 b. nonelectrolytes. d. strong electrolytes.

- ___ 96. Which reaction below is a neutralization reaction?
- $\text{BaSO}_3(s) \rightarrow \text{BaO}(s) + \text{SO}_2(g)$
 - $2\text{K}(s) + \text{Br}_2(l) \rightarrow 2\text{KBr}(s)$
 - $\text{SnS}_2(s) + 6\text{HCl}(aq) \rightarrow \text{H}_2\text{SnCl}_6(s) + 2\text{H}_2\text{S}(aq)$
 - $\text{H}_2\text{CO}_3(aq) + \text{Ca}(\text{OH})_2(aq) \rightarrow \text{CaCO}_3(s) + 2\text{H}_2\text{O}(l)$
- ___ 97. A substance that can react as either an acid or a base is a(n)
- amphoteric substance.
 - Lewis acid.
 - oxyacid.
 - organic substance.
- ___ 98. To conduct electricity, a solution must contain
- free electrons.
 - polar molecules.
 - nonpolar molecules.
 - ions.
- ___ 99. If $[\text{H}^+] = 1.7 \times 10^{-3} \text{ M}$, calculate the pH of the solution.
- 2.77
 - 2.42
 - 1.81
 - 2.13
- ___ 100. Which of the following is a *diprotic* acid?
- H_2SO_4
 - $\text{HC}_2\text{H}_3\text{O}_2$
 - H_3PO_4
 - HCl
- ___ 101. Calculate the temperature change of a 2,000 g block of glass ($c = 0.664 \text{ J/g}\cdot^\circ\text{C}$) which absorbs 13,280 J of energy from a heater.
- 100°C
 - 50°C
 - 10°C
 - 150°C

___ 115. Given the energy diagram below:



The reaction

- releases energy.
- absorbs energy.
- occurs without a net change in energy.
- is impossible.

___ 116. Calculate the energy (in joules) produced by a food sample in a calorimeter containing 157 grams of water. The temperature of the water in the calorimeter increases by 11.2°C.

Assume the specific heat of the water is 4.184 J/g•°C.

- 7360 J
- 1758 J
- 7.36 J
- 58.6 J

Specific Heats at 25°C			
Substance	c (J/g•°C)	Substance	c (J/g•°C)
Water (liquid)	4.186	Copper	0.385
Steam	1.870	Gold	0.129
Ammonia (gas)	2.060	Iron	0.449
Ethanol (liquid)	2.440	Mercury	0.140
Aluminum	0.902	Lead	0.129
Carbon (graphite)	0.709	Silver	0.234

___ 117. Using the table, determine which substance can absorb the most energy in a temperature increase of 1 °C.

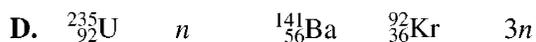
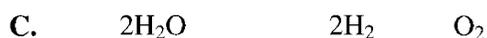
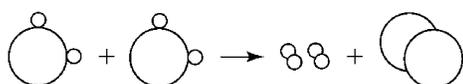
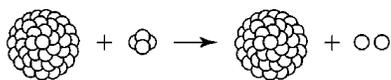
- liquid water
- aluminum
- gold
- lead

___ 118. Aluminum has a specific heat of 0.902 J/g•°C. How many joules of heat are required to change the temperature of 8.50 grams of aluminum from 25.0°C to 93.4°C?

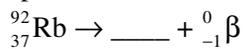
- 7.67 J
- 483 J
- 192 J
- 524 J

- ___ 119. The half-life of carbon is 5715 years. How many milligrams of carbon-14 remain after 11430 years if you start with 100 mg?
- a. 50 mg
b. 12.5 mg
c. 25 mg
d. 6.25 mg
- ___ 120. A species contains 15 protons, 17 electrons and 15 neutrons. Which statement is true about this substance?
- a. It is an ion with -2 charge and a mass of 30 amu.
b. It is an atom with no charge and a mass of 32 amu.
c. It is an ion with +2 charge and a mass of 30 amu.
d. It is an atom with no charge and a mass of 30 amu.
- ___ 121. Complete and balance the following equation. The missing term is ____.
- $${}_{36}^{85}\text{Kr} \rightarrow \text{____} + {}_{-1}^0\beta$$
- a. ${}_{36}^{84}\text{Kr}$
b. ${}_{37}^{85}\text{Rb}$
c. ${}_{35}^{85}\text{Br}$
d. ${}_{35}^{85}\text{Kr}$
- ___ 122. Balance the following equation:
- $${}_{4}^9\text{Be} + {}_{2}^4\text{He} \rightarrow {}_{6}^{12}\text{C} + \text{____}$$
- a. ${}_{2}^4\text{He}$
b. ${}_{1}^1\text{H}$
c. ${}_{-1}^0e$
d. ${}_{0}^1n$
- ___ 123. Which of the following particles has the same mass as an electron but a positive charge and is sometimes emitted from the nucleus during radioactive decay?
- a. beta particle
b. alpha particle
c. positron
d. gamma ray
- ___ 124. Which of the following lists ranks nuclear radiation from most massive to least massive?
- a. alpha, beta, and gamma
b. gamma, alpha, and beta
c. gamma, beta, and alpha
d. beta, gamma, and alpha
- ___ 125. Beta particles are
- a. electrons.
b. helium nuclei.
c. electromagnetic waves.
d. neutrons.
- ___ 126. Alpha particles are
- a. neutrons.
b. helium nuclei.
c. electrons.
d. electromagnetic waves.
- ___ 127. Which of the following is the correct relationship between mass and energy?
- a. $E = mc^2$
b. $E = mc$
c. $E^2 = mc$
d. $E = m^2c$

- ___ 128. What does the 218 in polonium-218 represent?
- the atomic number
 - the neutron number
 - the mass defect
 - the mass number



- ___ 129. Which of the illustrations above represents a fission reaction?
- A
 - B
 - C
 - D
- ___ 130. Which of the following forms of radiation has the greatest penetrating power?
- positrons
 - beta particles
 - alpha particles
 - gamma rays
- ___ 131. Complete and balance the following equation. The missing term is ____.



- a. ${}_{38}^{92}\text{Sr}$ b. ${}_{36}^{92}\text{Kr}$ c. ${}_{36}^{91}\text{K}$ d. ${}_{38}^{92}\text{U}$

- ___ 132. Balance the following equation: ${}_{93}^{239}\text{Np} \rightarrow \text{____} + {}_{-1}^0e$
- a. ${}_{90}^{239}\text{Th}$ b. ${}_{92}^{239}\text{U}$ c. ${}_{94}^{239}\text{Pu}$ d. ${}_{94}^{238}\text{Pu}$

- ___ 133. Which material is the fuel for the fission process used in nuclear reactors to produce power?
- carbon
 - hydrogen
 - uranium
 - helium
- ___ 134. The spontaneous disintegration of a nucleus into a slightly lighter and more stable nucleus, accompanied by emission of particles, electromagnetic radiation, or both, is
- nuclear fission.
 - radioactive decay.
 - nuclear fusion.
 - nuclear radiation.

- ___ 135. Reactions that affect the nucleus of an atom are called
- fusions.
 - fissions.
 - radioactive decays.
 - nuclear reactions.
- ___ 136. Balance the following equation:
- $${}_{92}^{238}\text{U} + \text{_____} \rightarrow {}_{92}^{239}\text{U}$$
- a neutron
 - an alpha particle
 - hydrogen-1
 - a beta particle
- ___ 137. Radioactive materials have unstable
- electrons.
 - protons.
 - nuclei.
 - neutrons.
- ___ 138. Which of the following nuclear equations is correctly balanced?
- $\frac{37}{18}\text{Ar} + \frac{0}{-1}e \rightarrow \frac{37}{17}\text{Cl}$
 - $\frac{6}{3}\text{Li} + 2\frac{1}{0}n \rightarrow \frac{4}{2}\text{He} + \frac{3}{1}\text{H}$
 - $\frac{254}{99}\text{Es} + \frac{4}{2}\text{He} \rightarrow \frac{258}{101}\text{Md} + 2\frac{1}{0}n$
 - $\frac{14}{7}\text{N} + \frac{4}{2}\text{He} \rightarrow \frac{17}{8}\text{O} + \frac{2}{1}\text{H}$
- ___ 139. Gamma rays are
- electrons.
 - helium nuclei.
 - electromagnetic waves.
 - neutrons.
- ___ 140. How many half-lives are required for three-fourths of the nuclei of one isotope in a sample to decay?
- $\frac{3}{4}$
 - $\frac{3}{2}$
 - 2
 - 3
- ___ 141. The half-life of cobalt-60 is 10.47 min.. How many milligrams of cobalt-60 remain after 41.88 min. if you start with 100 mg?
- 3.13 mg
 - 12.5 mg
 - 6.25 mg
 - 25 mg
- ___ 142. The half-life of C-14 is 5,715 years. A 400 g sample of carbon has 12.5 grams remaining. How many half-lives passed for this amount to remain?
- 3
 - 4
 - 5
 - 6
- ___ 143. Complete and balance the following equation. The missing term is ____.
- $${}_{32}^{78}\text{Ge} \rightarrow \text{_____} + {}_{-1}^0\beta$$
- ${}_{33}^{78}\text{Pt}$
 - ${}_{33}^{79}\text{As}$
 - ${}_{31}^{80}\text{Ga}$
 - ${}_{33}^{78}\text{As}$