Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Chem.G11- Course Practical Work-Qs. Bank

Problem

Below are listed changes that can be observed in everyday life. Tell whether it is a physical change or a chemical change. Then explain the basis on which you made your decision.

1. magnetizing a piece of steel
2. iron rusting

The lists give the density of selected substances. Answer the following questions.

Substance	Density (g/mL)
water (at 4.0ºC)	1.000
hydrogen	0.00090
carbon dioxide	XXX
gasoline	0.68
copper	8.89
silver	10.5
mercury	13.595
tungsten	19.3

3. If you were given a milliliter of copper and a milliliter of silver, which would weigh more?
4. Corks are used on fishing lines because they float. What can you say about the density of cork?

The diagram in Figure 2-2 represents a potassium atom. Answer the questions about the electron transitions that take place in this atom.

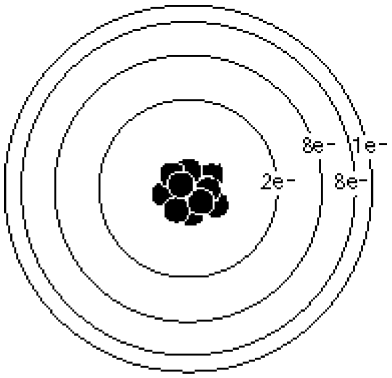


Figure 2-2

5. Draw a Lewis dot diagram for this atom.

6. Suppose you wanted to observe an emission spectrum for this atom. How would you produce such a spectrum? Explain how this action would produce a spectrum.
7. Suppose that a potassium atom absorbs energy that causes two electrons to move up to the fifth energy level: one from the fourth energy level and one from the third. In terms of emission spectra, what will happen when the electrons return to their original levels?
8. If enough energy was added to the atom to permit an electron to escape from the atom, which electron would it be?

This set of data is similar to those on which Joseph Louis Proust based his law of definite proportions in 1799. Answer these questions about these data and their interpretation.

Trial	Nitrogen Mass	Oxygen Mass
101	13.9 g	16.0 g
102	25.8 g	29.2 g
103	19.7 g	22.3 g
104	31.8 g	36.2 g

9. How do the results of these experiments lead to the law of definite proportions?

For each of the numbered elements (1-4) shown in the periodic table in Figure 3-1, give the information asked for in the tables.

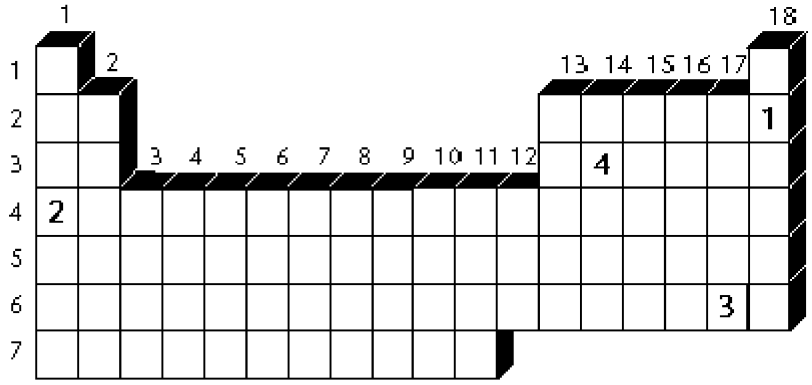


Figure 3-1

10.

	Group	Period	Class	Number of valence electrons	Outermost energy level	Properties
Element 1:						

11.

	Group	**Period**	**Class**	**Number of valence electrons**	**Outermost energy level**	**Properties**
Element 2:						

Suppose that you were asked to select an element for each application listed in the following questions. All you have on which to base your decision is the element's position in the periodic table. Refer to the periodic table in your textbook. Name the element or type of element you would choose for each application and explain your choice.

12. An element that can be used in a study of radioactive metals.
    Choice: _____
    Reason: _____

13. An element for use in making photovoltaic cells that are constructed with semiconductors.
    Choice: _____
    Reason: _____

14. A liquid metal that can be used in electrical switches.
    Choice: _____
    Reason: _____

15. An element that can be used as an insulator (that is, a substance that will not conduct electricity).
    Choice: _____
    Reason: _____

16. An element that can be used as a fuel.
    Choice: _____
    Reason: _____

17. An element other than silicon to use in the construction of a transistor.
    Choice: _____
    Reason: _____

Ionization energy is the term used to describe the energy needed to remove an electron from a gaseous atom of an element. Listed below, in alphabetical order, are the ionization energies of 18 elements. Reorder the elements according to their atomic number, using the periodic table in your textbook. Then graph the data.

Element	Ionization energy (Kilojoules per mole)
aluminum	577
argon	1520
beryllium	900
boron	800
calcium	589
carbon	1086
chlorine	1255
fluorine	1681
lithium	520
magnesium	738
neon	2080
nitrogen	1402
oxygen	1314
phosphorus	1012
potassium	419
silicon	786
sodium	496
sulfur	1000

18. What relationship does the graph you made have to the periodic law?

19. Develop a hypothesis about the connection between ionization energy and the number of valence electrons of an element.

20. Do your data confirm or refute this hypothesis?

Look at each of the electron dot structures shown below. In each case, decide: how many valence electrons are present; whether or not the particle is reactive; and if it is reactive, what it could do to become part of a stable compound and what kind of bond it would form in the process.

21. ..
:Ne:
..

22. ..
[:Br:]$^-$
..

23. .
·C·
.

Listed below are some imaginary data for a series of compounds. Based on what you have learned, predict whether each compound is probably ionic (I) or covalent (C). If the information given might apply to either kind of compound, put a question mark (?).

24. Has a melting point of 1650ºC.
25. Is a white solid at -100ºC.
26. Is composed of a metal and a nonmetal.
27. Is a hard, rough crystal.

Write the formula and the name for the compound formed when the following atoms or groups of atoms combine with each other.

28. aluminum and fluorine
29. iron (3+) and sulfate
30. sulfur (6+) and oxygen

The compounds listed below are all somewhat different from the kinds of compounds you have studied. Explain how each compound is different and write the formula for the compound.

31. xenon hexafluoride
    a. Difference:
    b. Formula:
32. sodium aluminum sulfate
    a. Difference:
    b. Formula:

A series of eight test tubes is lined up on top of a laboratory bench. The contents of these test tubes are listed. The contents are exposed to O_2 in the air. Water or energy may be added to the contents, if necessary, for reaction to occur. Predict the type of chemical reaction that is most likely to take place in each of the eight test tubes. If no reaction will take place, explain why. Give a balanced chemical equation for each reaction that takes place.

33. calcium hydroxide:
34. neon gas:
35. propane (C_3H_8) gas:

Sulfur dioxide gas (SO_2) reacts with oxygen to form sulfur trioxide gas (SO_3). The graph in Figure 6-1 shows how the concentration of these three gases changes over time in an experiment in which first the concentration of only the sulfur dioxide is increased, and then the concentration of only the oxygen is increased. Answer the following questions relating to this graph.

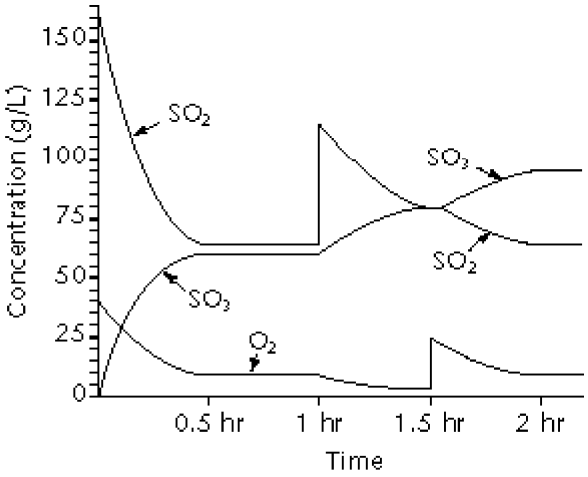


Figure 6-1

36. What are the approximate original concentrations of sulfur dioxide, sulfur trioxide, and oxygen?

37. At about what time did this reaction reach equilibrium?

38. At approximately what time was the concentration of oxygen increased?

Use a table of electronegativities to find the electronegativity difference between each of the following pairs of elements and to predict the kind of bond that will be formed.

39. calcium and fluorine

40. hydrogen and germanium

41. 1,1-difluoroethylene, $C_2H_2F_2$, is a derivative of ethene in which the hydrogen atoms bonded to one of the carbon atoms in ethene have been replaced by fluorine atoms. Draw the electron dot structure of 1,1-difluoroethylene. Is the molecule polar? Explain.

42. Methylamine, CH_3NH_2, is the simplest of a series of amines. Methylamine can be viewed as a derivative of ammonia, in which one of the hydrogens in ammonia is replaced by a CH_3 (methyl) group. Draw the electron dot structure for methylamine. Is the molecule polar?

43. Compare the molecules arsenic triiodide and germanium tetrafluoride. How many pairs of electrons surround the central atom? How many of these pairs are bonding? Nonbonding? What are the shapes of the molecules?

44. F_2O and CS_2 are both triatomic molecules. How are their structures different?

45. The principal source of phosphorus in nature is calcium phosphate, $Ca_3(PO_4)_2$. Draw the electron dot structure of the phosphate ion in calcium phosphate. What is the geometry of the phosphate ion?

46. Convert each of the following temperature measurements to kelvins: 94ºC, -101ºC, 388ºC.

The graph in Figure 10-1 shows what happens when 1 kg sample of each of two different substances are heated. Use the information in the graph to answer the questions. Assume that room temperature in this case is 300 K.

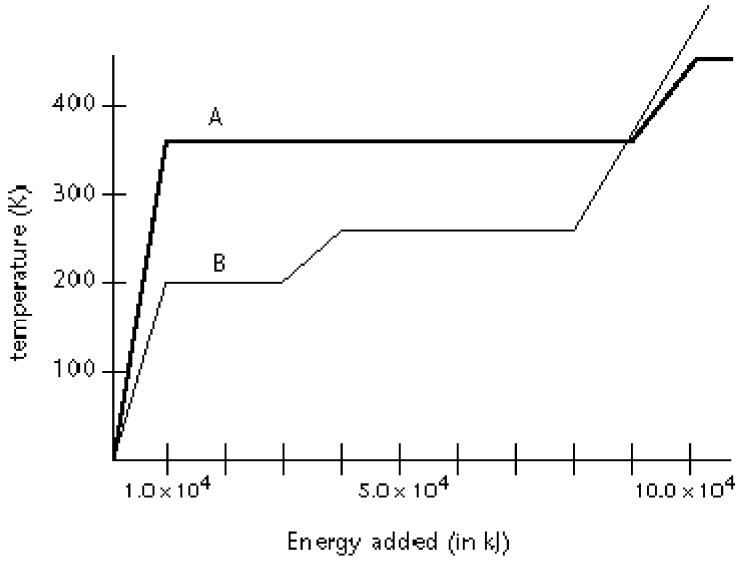


Figure 10-1

47. What is the physical state of substance A at room temperature?
48. What is the melting point of substance A?
49. What is the melting point of substance B?
50. If you mixed substance A, substance B, and water, and steadily increased the temperature, which would boil last?

The table shows the fusion and vaporization data for eight substances. Use the information to answer the following questions.

Substance	Fusion Melting Point (ºC)	Heat of fusion (joules/mole) (ºC)	Vaporization Boiling Point	Heat of vaporization (joules/mole)
O_2 oxygen	-219	444	-183	6820
N_2 nitrogen	-210	720	-196	5577
NH_3 ammonia	-78	5653	-33	23 351
CO_2 carbon dioxide	-56	8326	-78	25 234*
N_2O nitrous oxide	-91	6540	-89	16 552
I_2 iodine	114	15 648	183	4347*
H_2O water	0	6008	100	40 656

*Goes directly to vapor from solid. These are heats of sublimation.

51. Which substance has the lowest melting point? Which has the highest melting point?

52. How much energy, in joules, is required to melt 10.00 moles of ice?

53. Provide the missing data in the columns.

Temperature	Celsius, ºC	Kelvin, K
Melting point of gold	1064	c. _____
Boiling point of carbon monoxide	a. _____	81.7
Cold winter night in Siberia	b. _____	233
Hot summer day in Phoenix, AZ	45	d. _____

54. Octane, C_8H_{18}, melts at -57ºC and boils at 126ºC. A few grams of octane are heated from -80ºC to +140ºC. Graph the heating curve for octane. Show time on the horizontal axis and temperature on the vertical axis.

55. Natural gas is often stored in large tanks kept under constant pressure by a dome that rides up and down on vertical tracks. Suppose the volume of gas in a municipal tank measures 2.50×10^6 m^3 during the evening when the temperature is 15ºC. What will be the volume of the gas in the tank during the day when the temperature rises to 27ºC?

56. A refrigeration system contains 575 mL of a gas at 22ºC and 1.25 atm. The gas is compressed until it has a pressure of 2.00 atm and a temperature of -6ºC. What is the new volume of the gas in the system?

Nitrogen and oxygen combine with each other to form a series of compounds. This chart summarizes laboratory research done on this series of compounds. From the data supplied, calculate the empirical and molecular formulas for each oxide listed.

Compound	Percentage Nitrogen	Percentage Oxygen	Molecular Mass
A	63.6	36.4	44.01 u
B	30.4	69.6	46.00 u
C	36.9	63.1	76.01 u
D	25.9	74.1	108.01 u
E	46.7	53.3	30.01 u

57. Compound A is _____.

58. Compound E is _____.

The amount by which the freezing point of a solution is depressed or the boiling point is elevated is different for various solvents. The approximate values of these two quantities for the solvent water are given below. Calculate the freezing point and the boiling point of each of the solutions listed.

- *Freezing point depression = -1.86ºC for 1 mole of solute particles per liter solution*
- *Boiling point elevation = +0.52ºC for 1 mole of solute particles per liter solution*

59. Solution A: 1*M* sucrose F.P. = _____
B.P. = _____

60. Solution C: 5*M* C_2H_5OH F.P. = _____
B.P. = _____

61. Solution D: 0.5*M* NH_4Cl F.P. = _____
B.P. = _____

62. Solution G: 0.36*M* KNO_3 F.P. = _____
B.P. = _____

63. Solution H: 0.45*M* Na_3PO_4 F.P. = _____
B.P. = _____

A group of students made a number of solutions of known concentration for the class stockroom. Unfortunately, they neglected to record all the information regarding the way in which the solutions were made. From the information provided in the chart below, determine the ten missing values indicated by the question marks.

Solute formula	Solute mass	Solution volume	Molarity
KOH	7.8 g	500 mL	?
LiCl	?	4.00 L	0.125*M*
$CaCl_2$	9.0 g	250 mL	?
$Al_2(SO_4)_3$	12.3 g	?	0.900*M*
K_3PO_4	?	250 mL	0.324*M*
$KClO_3$	122.5 g	?	1.0*M*
NH_4Br	?	2.0 L	0.50*M*
HNO_3	20.0 g	500 mL	?
HCl	?	750 mL	0.044*M*
$(NH_4)_2SO_4$	44.2 g	600 mL	?

64. _____ KOH molarity
65. _____ $KClO_3$ solution volume
66. _____ LiCl solute mass
67. _____ NH_4Br solute mass
68. _____ $CaCl_2$ molarity

This table summarizes some properties of eight compounds. Complete the table by supplying the correct information in the spaces provided.

Compound	Degree of ionization	Acid or base	Strong or weak	Ionization equation
$HC_2O_3O_2$	2%	acid	weak	$HC_2H_3O_2 + H_2O \rightarrow H_3O^+ + C_2H_3O_2^-$
RbOH	100%	**a.**	**b.**	**c.**
HCN	**d.**	acid	**e.**	**f.**
H_2O	10^{-5}%	both	**g.**	**h.**
H_3PO_4	**i.**	**j.**	**k.**	**l.**
m.	0.01%	**n.**	**o.**	$CH_3NH_2 + H_2O \rightarrow CH_3NH_3^+ + OH^-$
KNO_3	**p.**	**q.**	**r.**	**s.**
HFO_4	**t.**	**u.**	strong	**v.**

69. a. _____
70. c. _____
71. h. _____
72. m. _____
73. n. _____
74. r. _____
75. v. _____

Each of the following salts is dissolved in water. Predict whether the solution formed would be acidic, basic, or neutral.

76. NaCN
77. K_2SO_4
78. K_2CO_3

The table shows the data collected in a series of five titration experiments between samples of nitric acid and sodium hydroxide. From the information in the table, determine the missing values.

Experiment	**Acid**		**Base**	
	molarity	**volume**	**molarity**	**volume**
101	0.10*M*	40.0 mL	0.20*M*	**a.** _____
102	**b.** _____	50.0 mL	0.14*M*	70.0 mL
103	0.40*M*	30.0 mL	**c.** _____	25.0 mL
104	0.010*M*	**d.** _____	0.0077*M*	65.0 mL
105	2.0*M*	16.0 mL	**e.** _____	25.0 mL

79. a. _____

80. c. _____

81. Write overall, ionic, and net ionic equations for the following reaction: hydrochloric acid, HCl, and calcium hydroxide, $Ca(OH)_2$.

82. Malic acid, $H_2C_4H_4O_5$, is found in apples and other fruits. Write the overall, ionic, and net ionic equations for the reaction of malic acid with sodium hydroxide. Will the pH of the product solution be greater than 7, exactly 7, or less than 7? Explain.

83. An amphoteric substance may act as either an acid or a base. The dihydrogen phosphite ion is amphoteric. Write reactions that demonstrate this property of $H_2PO_3^-$.

A chemist is studying several unknown compounds. For each one, she has narrowed down the final identification to one of the two choices shown. Use the additional data shown in parentheses to make the correct choice for each.

84. methane or octane (Has structural isomers.)

85. butane or 1-butene (Reacts readily with chlorine gas.)

86. propane or propyl alcohol (Is insoluble in water.)

87. hexadecane or hexadecene (Forms a polymer.)

88. 1-decene or 1-decyne (Adds four molecules of HCl for each molecule.)

89. Draw the structure of the unsaturated hydrocarbon 3-heptene.

90. Distinguish between a carboxylic acid and an ester.

91. Distinguish between an aldehyde and an amide.

92. The compound benzacetin was formerly used as a sedative. The structure of benzacetin is shown in Figure 18-4. Name the functional groups in the molecule.

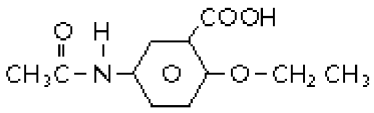


Figure 18-4

93. Draw a halogenated compound, where *R* is $CH_2{=}CHCH_2^-$ and *X* is Cl.

The following questions are some major biochemical families of compounds. Match the letter for the correct formula from Figure 19-1 that belongs to each of these families.

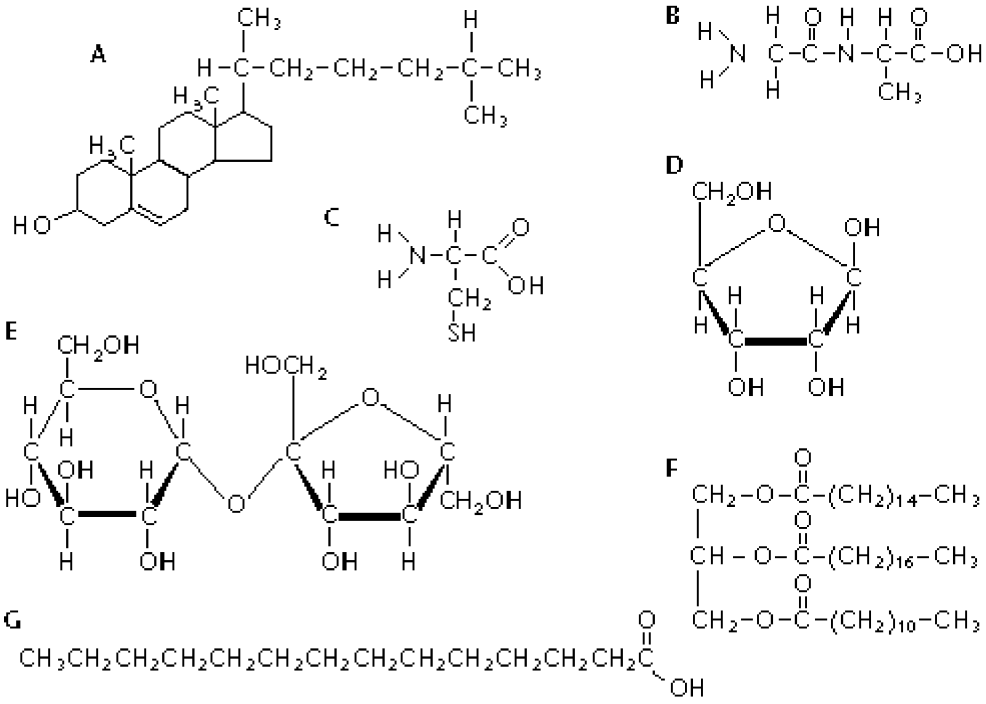


Figure 19-1

94. Amino acid _____
95. Dipeptide _____
96. Disaccharide _____
97. Fatty acid _____
98. Steroid _____
99. How much heat in kilojoules is released when 25.0 g of water is cooled from 85.0ºC to 40.0ºC?

Technetium-99m is widely used in diagnosing medical problems. The graph in Figure 21-1 shows the rate at which a 200-gram sample of technetium-99m decays. Answer the following questions using the graph.

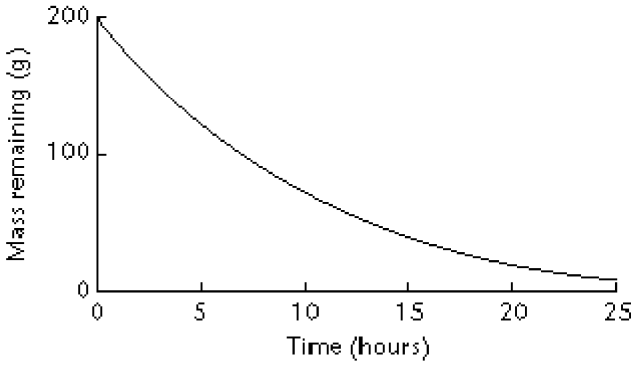


Figure 21-1

100. Estimate the amount of the original sample of technetium-99m that would remain after 1 h; after 10 h.

Chem.G11- Course Practical Work-Qs. Bank
Answer Section

PROBLEM

1. ANS:
physical change; The steel does not change its composition during magnetization.

PTS: 1 DIF: B OBJ: 1-5

2. ANS:
chemical change; The iron is converted into a new substance (iron oxide, or rust).

PTS: 1 DIF: B OBJ: 1-5

3. ANS:
Silver would weigh more.

PTS: 1 DIF: B OBJ: 1-4

4. ANS:
The density of cork must be less than 1.000 g/mL.

PTS: 1 DIF: B OBJ: 1-4

5. ANS:
The Lewis dot diagram is K·

PTS: 1 DIF: B OBJ: 2-6

6. ANS:
Supply high-voltage electricity or radiation to the atom. Electrons will be raised to higher energy levels. Then they fall back to lower energy levels, giving off radiation that forms line spectra.

PTS: 1 DIF: A OBJ: 2-4

7. ANS:
Each electron will release energy, but the one that falls back to the third level will release more energy. Two spectral lines of differing energy will therefore result.

PTS: 1 DIF: A OBJ: 2-4

8. ANS:
The first electron to leave the atom would be one in the highest energy level. It is least attracted to the nucleus because that electron is the most distant.

PTS: 1 DIF: B OBJ: 2-5

9. ANS:
The compound formed between nitrogen and oxygen always has the same proportion.

PTS: 1 DIF: B OBJ: 2-2

10. ANS:
18, 2, nonmetal, 8, 2, unreactive

PTS: 1 DIF: B OBJ: 3-2

11. ANS:
1, 4, metal, 1, 4, good conductor and lustrous

PTS: 1 DIF: B OBJ: 3-2

12. ANS:
an actinide; The actinides are all radioactive.

PTS: 1 DIF: B OBJ: 3-5

13. ANS:
a metalloid; Metalloids are commonly used in the manufacture of semiconductors.

PTS: 1 DIF: B OBJ: 3-5

14. ANS:
mercury; Mercury is the only liquid metal.

PTS: 1 DIF: B OBJ: 3-5

15. ANS:
a solid nonmetal; Nonmetals do not conduct electrical current, and a solid is needed to make the insulation.

PTS: 1 DIF: B OBJ: 3-5

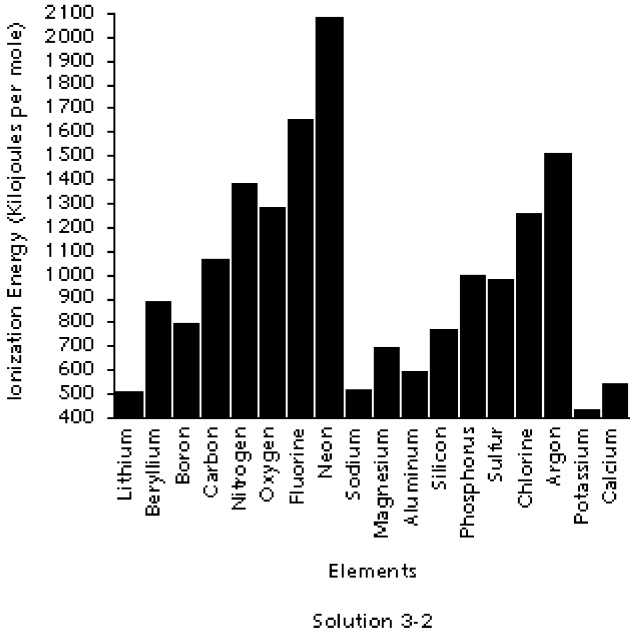
16. ANS:
carbon; Carbon burns easily.

PTS: 1 DIF: B OBJ: 3-5

17. ANS:
phosphorus, arsenic, antimony, or boron; All are commonly used to dope semiconductors.

PTS: 1 DIF: B OBJ: 3-5

18. ANS:
The ionization energies of the elements repeat in a regular pattern when the elements are arranged in order of increasing atomic number. The pattern is repeated for each period of elements. See Solution 3-2.



Solution 3-2

PTS: 1 DIF: B OBJ: 3-2

19. ANS:
The more valence electrons an element has, the greater is the ionization energy of the element.

PTS: 1 DIF: B OBJ: 3-2

20. ANS:
In general, the data confirm this hypothesis, although there are variations in the pattern.

PTS: 1 DIF: B OBJ: 3-2

21. ANS:
8, not reactive

PTS: 1 DIF: A OBJ: 4-4

22. ANS:
8, not reactive

PTS: 1 DIF: A OBJ: 4-4

23. ANS:
4, reactive, It would probably share electrons with other atoms to form four covalent bonds.

PTS: 1 DIF: A OBJ: 4-4

24. ANS:
I

PTS: 1 DIF: B OBJ: 4-6

25. ANS:
?

PTS: 1 DIF: B OBJ: 4-6

26. ANS:
I

PTS: 1 DIF: B OBJ: 4-4

27. ANS:
I

PTS: 1 DIF: B OBJ: 4-6

28. ANS:
AlF_3; aluminum fluoride

PTS: 1 DIF: B OBJ: 5-2

29. ANS:
$Fe_2(SO_4)_3$; iron(III) sulfate

PTS: 1 DIF: B OBJ: 5-2

30. ANS:
SO_3; sulfur trioxide

PTS: 1 DIF: B OBJ: 5-6

31. ANS:
Noble gases usually do not form compounds.
XeF_6

PTS: 1 DIF: A OBJ: 5-4

32. ANS:
It is uncommon for two different positive elements to combine at the same time with one negative polyatomic ion.
$NaAl(SO_4)_2$

PTS: 1 DIF: A OBJ: 5-4

33. ANS:
Decomposition will occur with heating. $Ca(OH)_2 + \text{energy} \rightarrow CaO + H_2O$

PTS: 1 DIF: A OBJ: 6-5

34. ANS:
Neon is an inert gas that will not take part in a chemical reaction.

PTS: 1 DIF: A OBJ: 6-5

35. ANS:
Combustion will occur if heat is provided. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

PTS: 1 DIF: A OBJ: 6-5

36. ANS:
160 g/L; 0 g/L; 40 g/L

PTS: 1 DIF: A OBJ: 6-1

37. ANS:
30 minutes

PTS: 1 DIF: B OBJ: 6-7

38. ANS:
about 1 hour 30 minutes

PTS: 1 DIF: B OBJ: 6-7

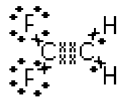
39. ANS:
$\Delta EN = 3.0$; ionic

PTS: 1 DIF: A OBJ: 9-1

40. ANS:
$\Delta EN = 0.3$; nonpolar covalent

PTS: 1 DIF: A OBJ: 9-1

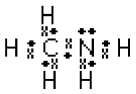
41. ANS:
The molecule is polar because the highly electronegative fluorine atoms are at one end of the molecule. (See Solution 9-4.)



Solution 9-4

PTS: 1 DIF: B OBJ: 9-4

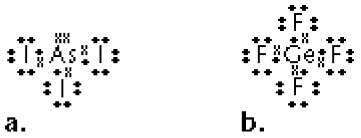
42. ANS:
The molecule is polar; the more electronegative nitrogen atom has a partial negative charge. (See Solution 9-5.)



Solution 9-5

PTS: 1 DIF: B OBJ: 9-4

43. ANS:
In each case, an octet of four electron pairs surrounds the central atom. In AsI_3, one of these pairs is nonbonding; in GeF_4, there are no nonbonding pairs. AsI_3 has a triangular pyramidal shape, while GeF_4 is tetrahedral. (See Solution 9-6.)



Solution 9-6

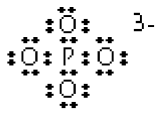
PTS: 1 DIF: A OBJ: 9-4

44. ANS:
F_2O is a bent molecule, similar to H_2O; CS_2 is a linear molecule, similar to CO_2. (See Solution 9-7.)

Solution 9-7

PTS: 1 DIF: B OBJ: 9-5

45. ANS:
The phosphate ion has a tetrahedral geometry. Note that the ion has three more valence electrons than the separate atoms have. (See Solution 9-8.)



Solution 9-8

PTS: 1 DIF: A OBJ: 9-4

46. ANS:
367 K, 172 K, 661 K

PTS: 1 DIF: B OBJ: 10-5

47. ANS:
It is a solid.

PTS: 1 DIF: B OBJ: 10-1

48. ANS:
The melting point is approximately 350 K.

PTS: 1 DIF: B OBJ: 10-4

49. ANS:
It is approximately 200 K.

PTS: 1 DIF: B OBJ: 10-4

50. ANS:
Substance A would boil last.

PTS: 1 DIF: B OBJ: 10-2

51. ANS:
Oxygen has the lowest melting point; iodine has the highest.

PTS: 1 DIF: B OBJ: 10-4

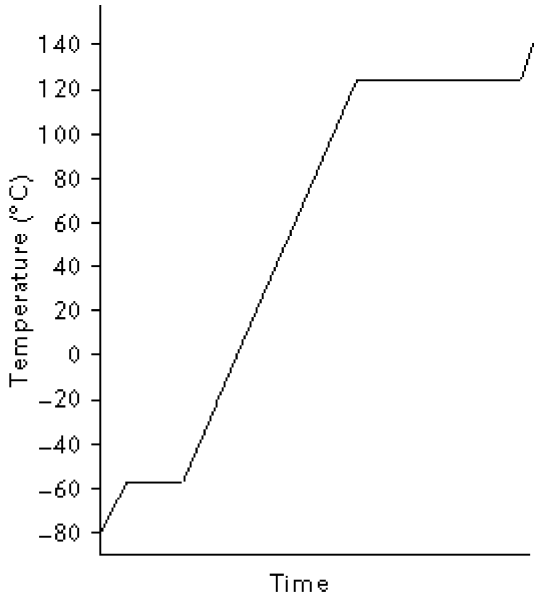
52. ANS:
6008 J/mol × 10.00 mol = 60 080 J.

PTS: 1 DIF: B OBJ: 10-6

53. ANS:
a. -191.5, b. -40, c. 1337, d. 318

PTS: 1 DIF: B OBJ: 10-5

54. ANS:
See Solution 10-1.



Solution 10-1

PTS: 1 DIF: A OBJ: 10-6

55. ANS:
The volume of the gas will be 2.60×10^6 m^3.

PTS: 1 DIF: B OBJ: 11-4

56. ANS:
The new volume is 325 mL.

PTS: 1 DIF: B OBJ: 11-4

57. ANS:
N_2O (Empirical and molecular formulas are the same.)

PTS: 1 DIF: B OBJ: 12-5

58. ANS:
NO (Empirical and molecular formulas are the same.)

PTS: 1 DIF: B OBJ: 12-5

59. ANS:
-1.86ºC; 100.52ºC

PTS: 1 DIF: B OBJ: 13-6

60. ANS:
-9.30ºC; 102.60ºC

PTS: 1 DIF: B OBJ: 13-6

61. ANS:
-1.86ºC; 100.52ºC

PTS: 1 DIF: B OBJ: 13-6

62. ANS:
-1.34ºC; 100.37ºC

PTS: 1 DIF: B OBJ: 13-6

63. ANS:
-3.35ºC; 100.94ºC

PTS: 1 DIF: B OBJ: 13-6

64. ANS:
0.28*M*

PTS: 1 DIF: A OBJ: 13-4

65. ANS:
1.0 L

PTS: 1 DIF: A OBJ: 13-4

66. ANS:
21.2 g

PTS: 1 DIF: A OBJ: 13-4

67. ANS:
98.0 g

PTS: 1 DIF: A OBJ: 13-4

68. ANS:
0.324*M*

PTS: 1 DIF: A OBJ: 13-4

69. ANS:
base

PTS: 1 DIF: A OBJ: 14-1

70. ANS:
$RbOH \rightarrow Rb^+ + OH^-$

PTS: 1 DIF: A OBJ: 14-6

71. ANS:
$H_2O + H_2O \rightarrow H_3O^+ + OH^-$

PTS: 1 DIF: A OBJ: 14-6

72. ANS:
CH_3NH_2

PTS: 1 DIF: A OBJ: 14-1

73. ANS:
base

PTS: 1 DIF: A OBJ: 14-1

74. ANS:
N/A

PTS: 1 DIF: A OBJ: 14-6

75. ANS:
$HFO_4 + H_2O \rightarrow H_3O^+ + FO_4^-$

PTS: 1 DIF: A OBJ: 14-5

76. ANS:
basic

PTS: 1 DIF: B OBJ: 15-2

77. ANS:
neutral

PTS: 1 DIF: B OBJ: 15-2

78. ANS:
basic

PTS: 1 DIF: B OBJ: 15-2

79. ANS:
20.0 mL

PTS: 1 DIF: B OBJ: 15-5

80. ANS:
0.48*M*

PTS: 1 DIF: B OBJ: 15-5

81. ANS:
$2HCl(aq) + Ca(OH)_2(aq) \rightarrow CaCl_2(aq) + 2H_2O(l)$
$2H^+(aq) + 2Cl^-(aq) + Ca^{2+}(aq) + 2OH^-(aq) \rightarrow$
$Ca^{2+}(aq) + 2Cl^-(aq) + 2H_2O(l)$
$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

PTS: 1 DIF: B OBJ: 15-1

82. ANS:
$H_2C_4H_4O_5(aq) + 2NaOH(aq) \rightarrow Na_2C_4H_4O_5(aq) + 2H_2O(l)$
$H_2C_4H_4O_5(aq) + 2Na^+(aq) + 2OH^-(aq) \rightarrow$
$2Na^+(aq) + C_4H_4O_5^{2-}(aq) + 2H_2O(l)$
$H_2C_4H_4O_5(aq) + 2OH^-(aq) \rightarrow C_4H_4O_5^{2-}(aq) + 2H_2O(l)$
The final pH should be greater than 7, since $C_4H_4O_5^{2-}$ is a weak base.

PTS: 1 DIF: B OBJ: 15-3

83. ANS:
$H_2PO_3^- + H_2O \rightarrow H_3PO_3 + OH^-$; $H_2PO_3^-$ acts as a base
$H_2PO_3^- + H_2O \rightarrow HPO_3^{2-} + H_3O^+$; $H_2PO_3^-$ acts as an acid

PTS: 1 DIF: B OBJ: 15-2

84. ANS:
octane

PTS: 1 DIF: B OBJ: 18-2

85. ANS:
1-butene

PTS: 1 DIF: B OBJ: 18-5

86. ANS:
propane

PTS: 1 DIF: B OBJ: 18-5

87. ANS:
hexadecene

PTS: 1 DIF: B OBJ: 18-6

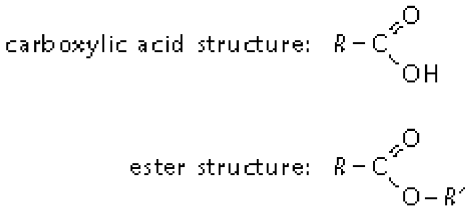
88. ANS:
1-decyne

PTS: 1 DIF: B OBJ: 18-5

89. ANS:
$CH_3CH_2CH{=}CHCH_2CH_2CH_3$

PTS: 1 DIF: B OBJ: 18-1

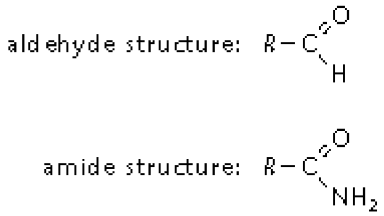
90. ANS:
See Solution 18-2. In an ester, the H atom in a carboxylic acid is replaced by *R*', a hydrocarbon group.



Solution 18-2

PTS: 1 DIF: B OBJ: 18-4

91. ANS:
See Solution 18-3. In an amide, the H atom in an aldehyde is replaced by an NH_2 group.



Solution 18-3

PTS: 1 DIF: B OBJ: 18-4

92. ANS:

The functional groups are an amide link (–C–N–), an aromatic ring, a carboxyl group (-COOH), and an ether group (*R*-O-*R*').

PTS: 1 DIF: B OBJ: 18-4

93. ANS:
$CH_2{=}CHCH_2Cl$

PTS: 1 DIF: B OBJ: 18-4

94. ANS:
C

PTS: 1 DIF: B OBJ: 19-1

95. ANS:
B

PTS: 1 DIF: B OBJ: 19-1

96. ANS:
E

PTS: 1 DIF: B OBJ: 19-1

97. ANS:
G

PTS: 1 DIF: B OBJ: 19-1

98. ANS:
A

PTS: 1 DIF: B OBJ: 19-1

99. ANS:
4.71 kJ

PTS: 1 DIF: B OBJ: 20-4

100. ANS:
180 g; 70 g

PTS: 1 DIF: A OBJ: 21-3