**Text page 95 #2, 4-6**

2. lithium – positive ion

Nitrate- negative polyatomic ion

Iron- multivalent metal positive ion

Acetate – negative polyatomic ion

Chromium –multivalent positive ion

Chloride – negative ion

perchlorate – negative polyatomic ion

Ammonium – positive polyatomic ion

4. (a) NaCl

(b) MgF2

(c) AlBr3

(d) KI

(e) Li2S

(f) Al2O3

(g) lithium bromide

(h) sodium iodide

(i) potassium sulphide

(j) magnesium fluoride

(k) aluminum oxide

(l) calcium nitride

5. (a) FeBr3

(b) FeBr3

(c) NiF2

(d) NiS

(e) Sn3N4

(f) Mn3P2

(g) chromium(II) fluoride

(h) copper(I) iodide

(i) manganese(II) sulphide

(j) lead(IV) oxide

(k) tin(IV) oxide

(l) chromium(II) nitride

6. (a) Magnesium hydroxide

(b) Potassium sulphate

(c) Aluminum hydrogen carbonate

(d) Copper(I) carbonate

(e) Iron(II) permanganate

(f) Ammonium sulphate

(g) Na2SO4

(h) Ca3(PO4)2

(i) Al(NO3)3

(j) NH4HSO4

(k) Pb(ClO3)4

(l) Fe2(CO3)3

■ **CHAPTER REVIEW ANSWERS p. 106-107**

**Checking Concepts**

1. In an element, only one type of atom is present.

In a compound, atoms or ions from two

or more different elements are chemically

combined.

2. (a) Ionic and covalent

(b) In ionic compounds, one or more electrons

transfers between atoms, producing positive

and negative ions. These ions are

attracted together because of their opposite

charges. In covalent compounds, two

atoms share the same pair of electrons, and

this sharing acts as a bond to hold them

together.

3. (a) Students’ drawings may vary but could

include either of the following:

(b) The covalent bond is represented by the

“sticks” connecting the balls together or

the shared pair of electrons.

4. It is possible to keep dividing water by separating

molecules until there is only one left. If a

molecule is broken up, this is a chemical

change and produces new substances with new

properties. This makes a single water molecule

the smallest possible sample of water.

5. Two neighbouring water molecules are not

covalently bonded. The covalent bonds exist

only between atoms of the same molecule.

6. All positive ions in an ionic lattice are

attracted to all other negative ions anywhere

in the lattice. However, the attraction

decreases with distance, and most of the

attraction is to the nearest negative ions.

7. (a) 2 chromium atoms and 7 oxygen atoms

(b) 2–

8. (a) Ionic

(b) Ionic

(c) Covalent

(d) Covalent

(e) Ionic

9. If the same chemical name applied to more

than one compound, this would lead to confusion

about which chemical is being referred to.

10. (a) International Union of Pure and Applied

Chemistry

(b) One important responsibility is to develop

rules for naming compounds.

11. (a) A reactant is a starting material in a chemical

reaction. The reactant gets used up

during the reaction.

(b) A product is a material that is made during

a chemical reaction. The reactants turn

into products.

12. In an exothermic change, there is an overall

release of energy from the system. Often, this

means the reaction system warms up. In an

endothermic change, there is an overall

absorption of energy by the system as energy

flows into it.

**Understanding Key Ideas**

13. The carbonate ion CO3

2– is like a molecule

because the carbon and three oxygen atoms

are covalently bonded to each other. It is like

an ion because the group of atoms carries an

electric charge of 2–.

14. (a) Sodium iodide

(b) Magnesium nitride

(c) Zinc oxide

(d) Aluminum fluoride

15. (a) Potassium nitride

(b) Calcium sulphide

(c) Silver sulphide

(d) Aluminum phosphide

(e) Strontium nitride

(f) Cesium oxide

16. (a) KBr

(b) K2O

(c) CaO

(d) Al2O3

(e) AlCl3

(f) Al2S

17. (a) Chromium(III) chloride

(b) Chromium(II) chloride

(c) Iron(II) chloride

(d) Iron(III) oxide

(e) Gold(I) oxide

(f) Gold(III) oxide

18. (a) FeF2

(b) FeF3

(c) CuF

(d) Cu2O

(e) CuO

(f) SnO2

19. (a) Ammonium phosphide

(b) Ammonium phosphite

(c) Ammonium phosphate

(d) Sodium phosphate

(e) Magnesium phosphate

(f) Iron(II) carbonate

20. (a) Na2SO4

(b) Ca(NO3)2

(c) Al(OH)3

(d) Sr(HSO4)2

(e) NH4HSO4

(f) Ni(ClO3)3

■ **UNIT 1 REVIEW ANSWERS, p. 112–115**

**Note:** You may wish to have students change the

wording of 9(b) to: “Approximately how many different

naturally occurring elements have been identified?”

**Visualizing Key Ideas**

1. Level 3: elements, compounds

Level 4: atoms

Level 5: electrons, protons

2.

**Using Key Terms**

3. (a) False. Matter is anything that has volume

and mass.

(b) True

(c) False. The three types of subatomic particles

in an atom are the proton, the electron,

and the *neutron*. (**Note:** The

statement is arguably true, if the nucleus is

taken to be a subatomic particle.)

(d) False. Elements can be divided into metals,

metalloids, and *non-metals.*

(e) False. A group of elements that have similar

chemical properties is called a *family* (or

*group*).

(f) False. The atomic number counts the

number of *protons* in the nucleus of an

atom.

(g) False. A valence electron is an electron in

the *highest* occupied energy level of an

atom.

(h) True

(i) True

(j) True

**Checking Concepts**

4. (a) Solid, liquid, gas

(b) Drawings may vary but should include particles

tightly packed in a definite shape in a

solid, particles able to slip and slide past

each other and taking the shape of their

container in a liquid, and particles very

spread out within a container in a gas.

solid

gas

liquid

melting

solidification

deposition

sublimation

condensation

evaporation

5. The main points of the kinetic molecular theory

are:

– All matter is made up of very small particles.

– There is empty space between particles.

– Particles are constantly moving. In liquids

and gases, the particles are colliding with

each other and the walls of their container.

– Energy makes particles move. The more

energy the particles have, the faster they can

move and the farther apart they can get.

6. A physical property is a characteristic of matter

in which the appearance may change but

no chemical bonds are broken or made and no

new substance is formed.

7. (a) Electron, proton, neutron

(b) Protons and neutrons are located in the

nucleus, while electrons occupy energy levels

surrounding the nucleus.

8. (a) In the nucleus

(b) The region surrounding the nucleus containing

electrons

9. (a) An element is a pure substance that cannot

be broken down or separated into simper

substances. It is also a substance in which

all the atoms contain the same number of

protons.

(b) About 92 elements occur naturally.

(Approximately 115 to 120 elements have

been identified including those created in

the laboratory.)

10. Metallic elements are typically shiny, silver or

grey coloured, conduct electricity, conduct

heat, and are malleable and ductile.

11. Any four of the following. Non-metals may be

in any of the three states of solid, liquid, and

gas at room temperature; the solids are not

shiny, malleable, or ductile; they tend not to

conduct heat or electricity very well; they are

brittle; and if they react, they tend to form

negative ions.

12. Elements in the same column of the periodic

table tend to share the similar physical and

chemical properties.

13. (a) Period

(b) Family

14. Name, symbol, atomic number, atomic mass,

common ion charge

15. (a) Alkali metals (group 1) and alkaline earth

metals (group 2)

(b) Halogens (group 17) and noble gases

(group 18)

16. 2, 8, 8, 2

**TR 1-58 MHR • Atoms, Elements, and Compounds**

**Chapter 3 • MHR TR 1-59**

17. (a) A valence electron is an electron in the

outer shell of an atom, which determines

its ability to combine with another atom.

(b) One

18. The valence shell is full.

19. A compound is a pure substance made up of

two or more elements that have been chemically

combined.

20. (a) Ionic

(b) Covalent

21. A polyatomic ion is a molecular ion composed

of more than one type of atom joined by covalent

bonds.

22. A positive metal ion and a negative non-metal

ion

23. In a chemical change, old chemical bonds are

broken and new chemical bonds are formed,

which produces new substances with new

properties. In a physical change, there is no

breaking or forming of bonds and a new material

is not formed.

24. In an exothermic reaction, energy is released,

whereas in an endothermic reaction, energy is

consumed.

**Understanding Key Ideas**

25. When energy in the form of heat is added to a

solid, the particles in the solid begin to move

more quickly. This weakens the attraction

between the particles and allows them to flow

past each other, forming a liquid.

26. For example, water is a colourless liquid that

has no tendency to be attracted to a magnet.

Pure water has a melting point of 0°C and a

boiling point of 100°C.

27. Sodium cannot be used as a container to boil

water because it melts at 98°C, below water’s

boiling point. It also reacts explosively with

water.

28. The periodic table is arranged in increasing

order by atomic number. New rows are added

in such a way that elements with similar properties

line up one below the other, forming

columns, or families, of elements.

29. (a) Metals tend to be on the left.

(b) Non-metals tend to be on the right.

(c) Metalloids form a diagonal line from left

to right toward the right side of the table

between the metals and the non-metals.

30. Noble gases

31. (a) NaBr

(b) CaS

(c) AlF3

(d) Mg3N2

(e) Ag3N

(f) Cs2O

(g) AuI3

(h) Cu2S

(i) Sn3P4

(j) Pb(SO4)2

(k) NH4Cl

(l) KMnO4

(m)Fe(OH)2

(n) NaHCO3

(o) Al2(CrO4)3

(p) Li2Cr2O7

(q) Mn2(SO4)3

(r) Ti(HSO4)4

(s) Cr(OH)3

32. (a) Sodium chloride

(b) Potassium oxide

(c) Cesium phosphide

(d) Calcium fluoride

(e) Aluminum bromide

(f) Magnesium nitride

(g) Copper(I) iodide

(h) Copper(II) iodide

(i) Mercury sulphide

(j) Iron(II) nitrate

(k) Nickel(II) sulphate

(l) Ammonium sulphite

(m)Lead(IV) hydroxide

(n) Calcium chromate

(o) Manganese(II) cyanide

(p) Aluminum perchlorate

(q) Ammonium nitrate

(r) Magnesium carbonate

(s) Potassium acetate

33. K2Cr2O7