Name SCI 10 REVIEW PACKAGE Date

Comprehension
Section 4.1

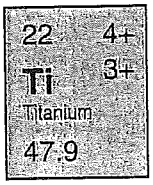
Use with textbook pages 168–180.

The atom and the subatomic particles

1. Use the following vocabulary words to label the diagram.

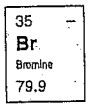
Vocabulary	
common ion charge	symbol
other ion charge	atomic number
name	average atomic mass

(a) _____
(b) _____
(c) _____
(d) _____



(e) _____
(f) _____

2. Examine the periodic table for the element below and complete the blanks.



(a) atomic number _____ (b) average atomic mass _____

(c) ion charge _____ (d) number of protons _____

(e) name of element _____ (f) number of neutrons _____

3. Complete the following table for the different atoms and ions. The first two rows have been completed to help you.

Element Name	Atomic Number	Ion Charge	Number of Protons	Number of Electrons	Number of Neutrons
potassium	19	1+	19	18	20
phosphorus	15	0	15	15	16
	3	0			
		2+	20		
nitrogen		3–			
	5	0			
argon				18	
	13			10	
chlorine		0			
			11	10	

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Applying Knowledge
Section 4.1

Use with textbook pages 174–177.

Bohr diagrams

1. Define the following terms:

   (a) Bohr diagram _____

   (b) stable octet _____

   (c) valence shell _____

   (d) valence electrons _____

2. Complete the following table.

Atom/Ion	Atomic Number	Number of Protons	Number of Electrons	Number of Neutrons	Number of Electron Shells
neon atom					
fluorine atom					
fluoride ion					
sodium atom					
sodium ion					

3. Use the table above to draw the Bohr model diagram for each of the following atoms and ions.

neon atom	fluorine atom	fluoride ion	sodium atom	sodium ion

4. Draw the Bohr model diagram for each of the following compounds.

carbon dioxide (CO_2)	ammonia (NH_3)	calcium chloride ($CaCl_2$)

Use with textbook pages 176–180.

Lewis diagrams

1. Define the following terms:

(a) Lewis diagram

(b) lone pair _____

(c) bonding pair _____

2. Draw Lewis diagrams for each of the following elements.

(a) boron (b) nitrogen (c) aluminium (d) chlorine

3. Draw Lewis diagrams for each of the following ionic compounds.

(a) sodium oxide (b) potassium chloride (c) magnesium bromide

4. Draw Lewis diagrams for each of the following covalent compounds.

(a) carbon dioxide, CO_2 (b) phosphorus trifluoride, PF_3 (c) silicon tetrachloride, $SiCl_4$

5. Draw Lewis diagrams for each of the following diatomic molecules.

(a) chlorine, Cl_2 (b) nitrogen, N_2 (c) hydrogen, H_2

Use with textbook pages 168–180.

Atomic theory and bonding

Match the Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
1. _____ shell	A. a horizontal row on the periodic table
2. _____ period	B. a vertical column on the periodic table
3. _____ family	C. an area around the nucleus where electrons exist
4. _____ ionic bonding	D. chemical bonding that results from a sharing of valence electrons
5. _____ covalent bonding	E. chemical bonding that results when one or more electrons transfers from each atom of a metal to each atom of a non-metal

6. Which of the following is the smallest particle of an element that can exist by itself?

   A. ion

   B. atom

   C. molecule

   D. compound

7. Which of the following correctly matches the subatomic particle with its charge and location in an atom?

	Subatomic Particle	Location	Charge
A.	proton	nucleus	neutral
B.	neutron	nucleus	positive
C.	electron	shell	positive
D.	electron	shell	negative

8. Which of the following are responsible for bonding?

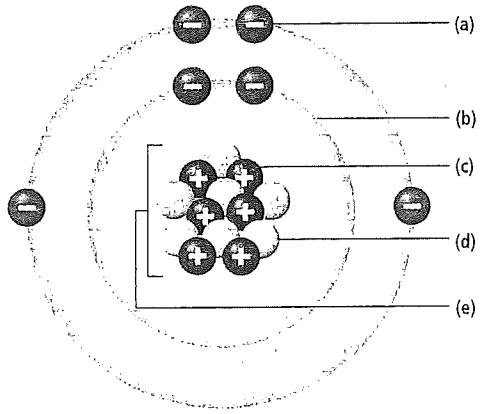
   A. nuclei

   B. protons

   C. neutrons

   D. electrons

Use the following diagram of an atom to answer questions 9 to 12.



9. Which labelled part in the diagram represents a neutron?

   A. (a)

   B. (b)

   C. (c)

   D. (d)

10. What is the number of subatomic particle (c) equivalent to?

    A. atomic number

    B. mass number – atomic number

    C. mass number + atomic number

    D. number of electrons + number of protons

11. How many valence electrons are there in this atom?

    A. 2

    B. 4

    C. 6

    D. 7

12. Which of the following describes structure (e)?

	CHARGE	SUBATOMIC PARTICLE(S) PRESENT
A.	neutral	electrons and neutrons
B.	positive	protons and neutrons
C.	positive	protons and electrons
D.	negative	electrons

13. Which of the following describes a cation?

I.	examples include Ca^{2+} and Al^{3+}
II.	a metal atom that has lost electrons
III.	has equal numbers of electrons and protons

A. I and II only

B. I and III only

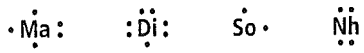
C. II and III only

D. I, II, and III

14. Which row of the table is completed correctly for an atom of potassium?

	Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons
A.	19	39	19	20	19
B.	19	39	39	20	20
C.	19	39	20	20	19
D.	39	19	19	19	20

Use the following Lewis diagrams of four hypothetical elements to answer question 15.



15. Which of the hypothetical elements shown above represents a metal?

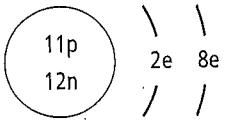
A. Ma

B. Di

C. So

D. Nh

Use the following Bohr model of an element to answer question 16.



16. Which of the following does the Bohr model represent?

A. a neon atom

B. a sodium ion

C. a sodium atom

D. a fluorine atom

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Comprehension
Section 4.2

Use with textbook pages 189–193.

Multivalent metals and polyatomic ions

1. Define the following terms:

(a) ionic compound

_____

(b) multivalent metal

_____

(c) polyatomic ion

_____

2. Write the formulae and names of the compounds with the following combination of ions. The first row is completed to help guide you.

	Positive ion	Negative ion	Formula	Compound name
(a)	Pb^{2+}	O^{2-}	PbO	lead(II) oxide
(b)	Sb^{4+}	S^{2-}		
(c)			TlCl	
(d)				tin(II) fluoride
(e)			Mo_2S_3	
(f)	Rh^{4+}	Br^-		
(g)				copper(I) telluride
(h)			NbI_5	
(i)	Pd^{2+}	Cl^-		

3. Write the chemical formula for each of the following compounds.

(a) manganese(II) chloride _____	(f) vanadium(V) oxide _____
(b) chromium(III) sulphide _____	(g) rhenium(VII) arsenide _____
(c) titanium(IV) oxide _____	(h) platinum(IV) nitride _____
(d) uranium(VI) fluoride _____	(i) nickel(II) cyanide _____
(e) nickel(II) sulphide _____	(j) bismuth(V) phosphide _____

4. Write the formulae for the compounds formed from the following ions. Then name the compounds.

	Ions	Formula	Compound name
(a)	K^+ NO_3^-	KNO_3	potassium nitrate
(b)	Ca^{2+} CO_3^{2-}		
(c)	Li^+ HSO_4^-		
(d)	Mg^{2+} SO_3^{2-}		
(e)	Sr^{2+} CH_3COO^-		
(f)	NH_4^+ $Cr_2O_7^{2-}$		
(g)	Na^+ MnO_4^-		
(h)	Ag^+ ClO_3^-		
(i)	Cs^+ OH^-		
(j)	Ba^{2+} CrO_4^{2-}		

5. Write the chemical formula for each of the following compounds.

(a) barium bisulphate _____	(f) calcium phosphate _____
(b) sodium chlorate _____	(g) aluminum sulphate _____
(c) potassium chromate _____	(h) cadmium carbonate _____
(d) calcium cyanide _____	(i) silver nitrite _____
(e) potassium hydroxide _____	(j) ammonium hydrogen carbonate _____

Use with textbook pages 186–196.

Chemical names and formulas of ionic compounds

1. Write the name for each of the following compounds.

(a) BeS _____

(b) Hg_3N_2 _____

(c) $Cu(NO_3)_2$ _____

(d) Ag_2O _____

(e) $CoBr_2$ _____

(f) $Bi_3(PO_4)_5$ _____

(g) CaF_2 _____

(h) Mn_2O_3 _____

(i) $Cr_2(SO_4)_3$ _____

(j) $ZnCl_2$ _____

(k) $Ni(OH)_2$ _____

(l) $K_2Cr_2O_7$ _____

(m) ScF_3 _____

(n) NaI _____

(o) $Pb(CO_3)_2$ _____

(p) $RbClO_2$ _____

(q) K_3P _____

(r) $Mg(CN)_2$ _____

(s) SnS _____

(t) $NaHCO_3$ _____

2. Write the chemical formula for each of the following compounds.

(a) aluminum bromide _____

(b) platinum(II) sulphide _____

(c) strontium sulfite _____

(d) scandium oxide _____

(e) titanium(IV) nitrite _____

(f) ammonium sulphate _____

(g) lithium selenide _____

(h) lead(II) hydrogen sulphate _____

(i) sodium acetate _____

(j) cesium chloride _____

(k) cadmium(II) hydroxide _____

(l) zinc phosphate _____

(m) barium chloride _____

(n) tin(II) permanganate _____

(o) lithium hypochlorite _____

(p) gold(III) sulphate _____

(q) sodium nitrate _____

(r) chromium(III) chloride _____

(s) potassium carbonate _____

(t) iron(III) bisulphate _____

Name _____ Date _____

Comprehension
Section 4.2

Use with textbook pages 193–197.

Chemical names and formulas of covalent compounds

1. What is a covalent compound?

_____

2. What type of bond is formed in a covalent compound?

_____

3. What is used in naming covalent compounds?

_____

4. Write the chemical formula for each of the following compounds.

(a) silicon dioxide _____	(i) dinitrogen pentoxide _____
(b) chlorine dioxide _____	(j) dinitrogen monoxide _____
(c) tellurium dioxide _____	(k) arsenic tetrabromide _____
(d) selenium trioxide _____	(l) arsenic pentachloride _____
(e) carbon disulphide _____	(m) disulphide pentoxide _____
(f) arsenic trichloride _____	(n) sulphur monochloride _____
(g) chlorine heptoxide _____	(o) phosphorus trichloride _____
(h) selenium difluoride _____	(p) diphosphorus pentoxide _____

Use with textbook pages 184–197.

Names and formulas of compounds

Match each Chemical Name on the left with the correct Chemical Formula on the right.

Chemical Name	Chemical Formula
1. _____ tin(II) chlorate	A. SCl
2. _____ sulphur dichloride	B. S_2Cl
3. _____ strontium perchlorate	C. SCl_2
	D. SnClO
	E. $Sn(ClO_2)_2$
	F. $Sn(ClO_3)_2$
	G. $Sn(ClO_4)_2$
	H. $Sr(ClO_3)_2$
	I. $Sr(ClO_4)_2$

4. Which of the following is a covalent compound?

A. SrO **C.** SnO_2

B. SeO_2 **D.** Sc_2O_3

5. In which of the following do covalent bonds hold the atoms together?

A. silver

B. calcium carbonate

C. silicon tetrafluoride

D. magnesium bromide

6. What is the total number of atoms that make up iodine pentachloride?

A. 2 **C.** 5

B. 4 **D.** 6

7. Which of the following occurs when carbon forms a compound with oxygen?

A. oxygen and carbon share electrons

B. both oxygen and carbon lose electrons

C. oxygen gains electrons, while carbon loses electrons

D. carbon gains electrons, while oxygen loses electrons

8. In the chemical reaction $CuO + CO_2 \rightarrow CuCO_3$, which of the following are ionic compounds?

I.	CO_2
II.	CuO
III.	$CuCO_3$

A. I and II only **C.** II and III only

B. I and III only **D.** I, II, and III

9. Which of the following is the formula for the compound formed by ammonium and dichromate?

A. $NH_4Cr_2O_7$

B. $(NH_4)_2CrO_4$

C. $NH_4(Cr_2O_7)_2$

D. $(NH_4)_2Cr_2O_7$

10. In which of the following compounds does manganese have the highest ion charge?

A. MnO_3 **C.** $MnSO_3$

B. $MnBr_2$ **D.** $Mn(OH)_4$

11. In which of the following compounds is the ion charge on copper the same?

I.	Cu_2O
II.	$CuCl_2$
III.	$CuCO_3$

A. I and II only **C.** II and III only

B. I and III only **D.** I, II, and III

12. In the name arsenic(III) chloride, what does the Roman numeral reveal about arsenic?

A. it has an ion charge of 3–

B. it has an ion charge of 3+

C. it has gained three electrons

D. it can form three positive ions

Name Date

Comprehension
Section 4.3

Use with textbook pages 206–211.

Balancing equations

Starting with the skeleton equations, balance the following equations by adding coefficients where appropriate.

1. $H_2 + F_2 \rightarrow HF$
2. $Sn + O_2 \rightarrow SnO$
3. $MgCl_2 \rightarrow Mg + Cl_2$
4. $KNO_3 \rightarrow KNO_2 + O_2$
5. $BN + F_2 \rightarrow BF_3 + N_2$
6. $CuI_2 + Fe \rightarrow FeI_2 + Cu$
7. $Li + H_2O \rightarrow LiOH + H_2$
8. $NH_3 + O_2 \rightarrow N_2 + H_2O$
9. $V_2O_5 + Ca \rightarrow CaO + V$
10. $C_9H_6O_4 + O_2 \rightarrow CO_2 + H_2O$
11. $H_2S + PbCl_2 \rightarrow PbS + HCl$
12. $C_3H_7OH + O_2 \rightarrow CO_2 + H_2O$
13. $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$
14. $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$
15. $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$
16. $Al + H_2SO_4 \rightarrow H_2 + Al_2(SO_4)_3$
17. $FeCl_3 + Ca(OH)_2 \rightarrow Fe(OH)_3 + CaCl_2$
18. $Pb(NO_3)_2 + K_2CrO_4 \rightarrow PbCrO_4 + KNO_3$
19. $Cd(NO_3)_2 + (NH_4)_2S \rightarrow CdS + NH_4NO_3$
20. $Ca(OH)_2 + NH_4Cl \rightarrow NH_3 + CaCl_2 + H_2O$

Use with textbook pages 202–211.

Word equations

Write the skeleton equation for each of the following reactions. Then balance each of the following chemical equations.

1. hydrogen + oxygen → water

2. iron(III) oxide + hydrogen → water + iron

3. sodium + water → sodium hydroxide + hydrogen

4. calcium carbide + oxygen → calcium + carbon dioxide

5. potassium iodide + chlorine → potassium chloride + iodine

6. chromium + tin(IV) chloride → chromium(III) chloride + tin

7. magnesium + copper(II) sulphate → magnesium sulphate + copper

8. zinc sulphate + strontium chloride → zinc chloride + strontium sulphate

9. ammonium chloride + lead(III) nitrate → ammonium nitrate + lead(III) chloride

10. iron(III) nitrate + magnesium sulphide → iron(III) sulphide + magnesium nitrate

11. aluminum chloride + sodium carbonate → aluminum carbonate + sodium chloride

12. sodium phosphate + calcium hydroxide → sodium hydroxide + calcium phosphate

Use with textbook pages 202–203, 206–211.

Chemical reactions and chemical equations

Rewrite the following sentences as chemical word equations. Then write the skeleton equation and balance the equation.

1. Iron combines with oxygen to form rust, which is also known as iron(II) oxide.

   Word equation: _____
   Balanced equation: _____

2. A solution of hydrogen chloride reacts with sodium carbonate to produce carbon dioxide, sodium chloride, and water.

   Word equation: _____
   Balanced equation: _____

3. When aluminum metal is exposed to oxygen, a metal oxide called aluminum oxide is formed.

   Word equation: _____
   Balanced equation: _____

4. Water reacts with powered sodium oxide to produce a solution of sodium hydroxide.

   Word equation: _____
   Balanced equation: _____

5. Hydrogen gas reacts with nitrogen trifluoride gas to form nitrogen gas and hydrogen fluoride.

   Word equation: _____
   Balanced equation: _____

6. Chromium(III) sulphate reacts with potassium carbonate to form chromium(III) carbonate and potassium sulphate.

   Word equation: _____
   Balanced equation: _____

7. Potassium chlorate when heated becomes oxygen gas and potassium chloride.

   Word equation: _____
   Balanced equation: _____

8. A piece of metallic zinc is placed in a blue solution of copper(II) sulphate. A reddish brown layer of metallic copper forms in a clear solution of zinc sulphate.

   Word equation: _____
   Balanced equation: _____

Use with textbook pages 202–211.

Chemical equations

Match the Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
1. _____ product	A. a chemical that reacts in a chemical reaction
2. _____ reactant	B. a chemical that forms in a chemical reaction
3. _____ coefficient	C. a chemical change in which new substances are formed
4. _____ word equation	D. a chemical equation that is written using chemical names
5. _____ skeleton equation	E. an integer placed in front of a formula in a chemical equation
6. _____ chemical reaction	F. a chemical equation that is written using chemical formulas
7. _____ chemical equation	G. a set of chemical formulas that identify the reactants and products in a chemical reaction

8. Which of following describes the law of conservation of mass?

I.	The mass is conserved in a chemical reaction.
II.	The total mass of the products is equal to the total mass of the reactants in a chemical reaction.
III.	The total number of each kind of atom at the start of the reaction is equal to the total number of each kind of atom after the reaction.

A. I and II only

B. I and III only

C. II and III only

D. I, II, and III

9. How many oxygen atoms are there in the compound lead(IV) bisulphate, $Pb(HSO_4)_4$?

A. 2 **C.** 8

B. 4 **D.** 16

10. Which of the following are diatomic elements?

I.	iodine
II.	nitrogen
III.	hydrogen

A. I and II only **C.** II and III only

B. I and III only **D.** I, II, and III

Use the following unbalanced equation to answer question 11.

$$PCl_5 + H_2O \rightarrow HCl + H_3PO_4$$

11. Which of the following sets of coefficients will balance the equation?

A. 1, 4, 5, 1 **C.** 1, 3, 5, 2

B. 1, 5, 4, 1 **D.** 1, 4, 2, 1

12. A solution of sodium sulphide is mixed with a solution of copper(II) nitrate. A precipitate of copper sulphide is formed in a solution of sodium nitrate. What are the reactants in this chemical reaction?

A. Na_2S and CuS

B. CuS and $NaNO_3$

C. Na_2S and $Cu(NO_3)_2$

D. Na_2SO_4 and Cu_2NO_3

13. A piece of aluminum metal is placed in a solution of sulphuric acid, H_2SO_4. A compound, aluminum sulphate, forms and bubbles are seen going to the surface. What type of gas formed during this reaction?

A. oxygen **C.** carbon dioxide

B. hydrogen **D.** carbon monoxide