Name _____ Date _____

Comprehension
Section 4.1

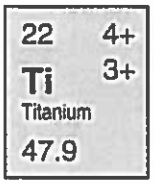
Use with textbook pages 168–180.

The atom and the subatomic particles

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

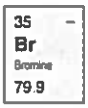
Vocabulary	
common ion charge	symbol
other ion charge	atomic number
name	average atomic mass

(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	

Name _____ Date _____

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?

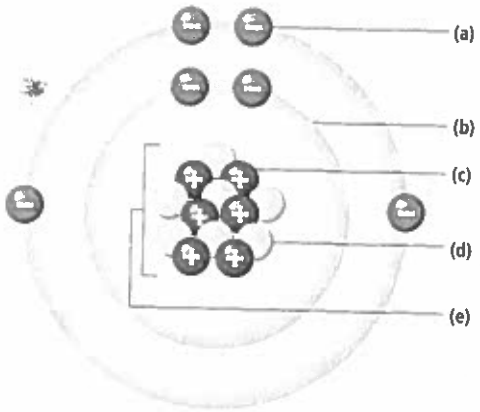
   A. nuclei

   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?

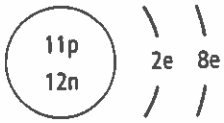
A. Ma

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