

## Chapter 3 Atoms and the Periodic Table

## Study Guide

## 1. Inside an Atom

## a. Structure of an Atom

## i. Three Kinds of Particles

1. **Nucleus**
2. **Protons**
3. **Neutrons**
4. **Electrons**

ii. **Atomic Number**

## iii. Atomic Mass

1. **Atomic Mass Unit (amu)**
2. *Which particles in an atom are in the nucleus?*

## b. The Role of Electrons

## i. Little Particles, Big Spaces

1. *Where are the electrons in an atom?*

ii. **Valence Electrons**

1. **Electron Dot Diagram**

## 2. Organizing the Elements

## a. Looking for Patterns in the Elements

i. **Atomic Mass**b. **Periodic Table**

## i. Mendeleev's Periodic Table

## ii. The Modern Periodic Table

iii. *What does "periodic" mean?*

## c. Reading the Periodic Table

## i. Inside the Squares

## ii. Organization of the Periodic Table

iii. **Groups**

1. **Families**

iv. **Periods**

1. *What is the name for a column of elements in the periodic table?*

## d. Why the Periodic Table Works

## 3. Metals

## a. What is a Metal?

## i. Physical Properties

1. **Malleable**
2. **Ductile**
3. **Conductors**
4. **Magnetic**

## ii. Chemical Properties

1. **Corrosion**
2. *How do reactive metals behave?*

## b. Alloys

## c. Metals in the Periodic Table

i. **Alkali Metals**ii. **Alkaline Earth Metals**iii. **Transition Metals**

## iv. Metals in Mixed Groups

1. *Which groups are considered transition metals?*

v. **Lanthanides and Actinides**

## 4. Nonmetals and Metalloids

a. What is a **Nonmetal**?

## i. Physical Properties

## ii. Chemical Properties

## iii. Compounds of Nonmetals

1. **Diatomic Molecules**
2. *In which portion of the periodic table do you find nonmetals?*

## b. Families of Nonmetals

## i. The Carbon Family

## ii. The Nitrogen Family

1. *Which elements are in Group 15?*

## iii. The Oxygen Family

iv. The **Halogen Family**

v. **The Noble Gases**

vi. **Hydrogen**

1. *Which elements are called halogens?*

c. **The Metalloids**

i. **Semiconductors**

5. **Elements From Stardust**

a. **Atomic Nuclei Collide**

i. **Plasma**

ii. **Nuclear Fusion**

iii. *What does "nuclear fusion" mean?*

b. **Elements From the Sun**

c. **Elements From Large Stars**

i. **Supernova**

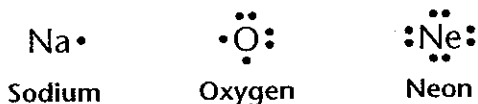
**SECTION 3-1**

**REVIEW AND REINFORCE**

**Inside an Atom**

**◆ Understanding Main Ideas**

Use the diagrams below to answer the following questions on a separate sheet of paper.



1. What kind of diagrams are these?
2. What do the dots represent and what does the number of dots tell us about each atom?
3. Which element shown above is the most chemically stable? Why?
4. What particles make up most of the mass of an atom? What takes up most of the volume of an atom?
5. A neutral atom of sodium has 11 protons. Use this information to explain the total number of electrons that are in a sodium atom.
6. An atom of sodium has a larger mass than an atom of neon. How is this possible when neon has so many more valence electrons?

**◆ Building Vocabulary**

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

- |                   |  |
|-------------------|--|
| _____ 7. electron | a. the central core of the atom which makes up most of the atom's mass                           |
| _____ 8. neutron  | b. a particle inside an atom that carries a positive electrical charge                           |
| _____ 9. nucleus  | c. a particle that rapidly moves around the outside of the nucleus and carries a negative charge |
| _____ 10. proton  | d. a particle inside an atom that does not carry an electrical charge                            |

**SECTION 3-3 REVIEW AND REINFORCE**

# Metals

## ◆ Understanding Main Ideas

Answer the following questions on a separate sheet of paper. Use the periodic table in Appendix D in your textbook.

1. Sodium (Na) and calcium (Ca) are in different families of metals. Name the families of metals in which they belong, and describe each family's characteristics.
2. Would a metal in Group 13 be more or less reactive than a metal in Group 1? Explain.
3. In what periods are the lanthanides and actinides? Where are they placed in the periodic table? Why?
4. What category of element is the most common in the periodic table? Where is that category found in the periodic table?

## ◆ Building Vocabulary

From the list below, choose the term that best completes each sentence.

- |           |           |           |
|-----------|-----------|-----------|
| conductor | ductile   | magnetic  |
| alloy     | corrosion | malleable |

5. The wearing away of metal oxide flakes is an example of \_\_\_\_\_.
6. A material that is \_\_\_\_\_ can be pounded into shapes.
7. A(n) \_\_\_\_\_ material is attracted to magnets and can be made into a magnet.
8. A(n) \_\_\_\_\_ transmits heat and electricity easily.
9. A material that is \_\_\_\_\_ can be drawn into a wire.
10. A(n) \_\_\_\_\_ is a mixture of metals.

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**SECTION 3-5 REVIEW AND REINFORCE**

# Elements from Stardust

## ◆ Understanding Main Ideas

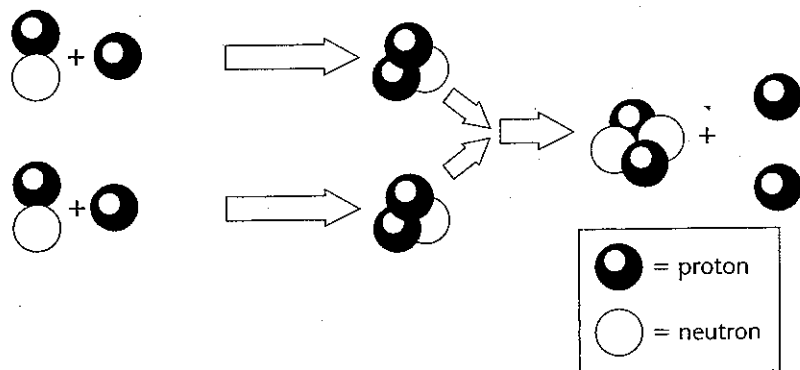
Write an answer for the following questions in the spaces provided.

1. What is the process shown below? What are the results of this process?

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2. What is the plasma state of matter?

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3. What conditions in the sun's core allow the plasma state to exist?

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4. What are the two most common elements in the sun? What three other elements will eventually be produced in the sun?

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5. In what event are the heaviest elements formed? Describe that event.

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Name: \_\_\_\_\_

Class: Physical Sciences  
Ch. 3 Review

Choose the letter of the correct answer.

- Which of the following statements about transition metals is true?  
[A] They are so soft that they can be cut with an ordinary knife.  
[B] They are never found uncombined in nature.  
[C] They are the most reactive of all the types of metals.  
[D] They are so similar that it's often difficult to find differences between them.
- Which member of the carbon family is a nonmetal?  
[A] carbon                      [B] silicon                      [C] tin                      [D] lead
- How does nuclear fusion create new elements inside stars?  
[A] Large nuclei combine, then form smaller nuclei.  
[B] Small nuclei cause large nuclei to break apart.  
[C] Small nuclei combine to form larger nuclei.  
[D] All the nuclei repel one another because of their positive charges.
- Where are nonmetals located on the periodic table?  
[A] to the left of the zigzag line                      [B] to the right of the zigzag line  
[C] in the two bottom rows                      [D] in Groups 1 through 4
- Sodium metal can react with the nonmetal chlorine to form  
[A] a noble gas.    [B] table salt.    [C] a diatomic molecule.    [D] a halogen.
- The state of matter in which atoms are stripped of their electrons and the nuclei are packed close together is called  
[A] a liquid.                      [B] plasma.                      [C] a gas.                      [D] a solid.
- In a period of eight elements in the periodic table, the properties of those elements  
[A] are exactly the same.  
[B] do not show any kind of pattern.  
[C] are extremely similar to one another.  
[D] are related to the number of valence electrons.

