



## DEFINING THE ATOM

### Section Review

#### Objectives

- Describe Democritus's ideas about atoms
- Explain Dalton's atomic theory
- Describe the size of an atom

#### Vocabulary

- atom
- Dalton's atomic theory

#### Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- Elements are composed of tiny particles called 1. 1. \_\_\_\_\_
- Atoms of any one element are 2 from those of any 2. \_\_\_\_\_
- other element. Atoms of different elements can form 3 3. \_\_\_\_\_
- by combining in whole-number ratios. Chemical reactions 4. \_\_\_\_\_
- occur when atoms are 4.

#### Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- \_\_\_\_\_ 5. Atoms of one element change into atoms of another element during chemical reactions.
- \_\_\_\_\_ 6. Atoms combine in one-to-one ratios to form compounds.
- \_\_\_\_\_ 7. Atoms of one element are different from atoms of other elements.

### Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ 8. atom	a. an instrument used to generate images of individual atoms
_____ 9. scanning tunneling microscope	b. Greek philosopher who was among the first to suggest the existence of atoms
_____ 10. John Dalton	c. the smallest particle of an element that retains its identity in a chemical reaction
_____ 11. Democritus	d. English chemist and schoolteacher who formulated a theory to describe the structure and chemical reactivity of matter in terms of atoms

### Part D Questions and Problems

Answer the following questions in the space provided.

12. In what type of ratios do atoms combine to form compounds?

---

---

---

13. How many copper atoms would you have to line up side by side to form a line 1 m long?

---

---

---



# STRUCTURE OF THE NUCLEAR ATOM

## Section Review

### Objectives

- Identify three types of subatomic particles
- Describe the structure of atoms according to the Rutherford model

### Vocabulary

- electrons
- cathode ray
- protons
- neutrons
- nucleus

### Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Dalton theorized that atoms are indivisible, but the discovery of 1 particles changed this theory. Scientists now know that atoms are made up of electrons, which have a 2 charge; 3, which have a positive charge; and 4, which are neutral. The latter two particles are found in the 5 of the atom. It was 6 who discovered the nucleus of the atom. The nucleus, which has a 7 charge, occupies a very small volume of the atom. In contrast, the negatively charged 8 occupy most of the volume of the atom.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

### Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- \_\_\_\_\_ 9. According to Dalton's atomic theory, atoms are composed of protons, electrons, and neutrons.
- \_\_\_\_\_ 10. Atoms of elements are electrically neutral.
- \_\_\_\_\_ 11. The mass of an electron is equal to the mass of a neutron.
- \_\_\_\_\_ 12. The charge on all protons is the same.



# Principal's Bulletin

to the correct term in Column A

Col **October 10 - 14, 2011**

13. electrons

a. stream of electrons produced at the negative electrode of a tube containing a gas at low pressure

**Week at a Glance**

14. cathode ray

b. the central core of an atom, which is composed of protons and neutrons

**Monday, October 10:**

MEAP Proctor Meeting, 2:40

SIT Meeting, 2:45

16. neutrons

c. negatively charged subatomic particles with no charge

**Tuesday, October 11:**

Art Ed Principal's Meeting 8am

d. subatomic particles with no charge

e. positively charged subatomic particles

**Wednesday, October 12:**

Cabinet

**Part D Questions and Problems**

Answer the following questions in the space provided.

**Thursday, October 13:**

Parent Teacher Conferences

**Friday, October 14:**

19. Which subatomic particles are charged?

Upcoming Meetings/Important Dates:	
CPHS SIT Meeting	10/10
Parent Teacher Conferences	10/13
Department Meetings	10/17
PAC Meeting	10/18
NKHS SIT Meeting	10/19
9 <sup>th</sup> Grade MEAP Testing	10/19
NKHS/CPHS PLC Meeting	10/24
Board of Education:	10/24
1/2 Day Professional Development	10/31
CPEF Panther Classic 5K	11/12
CPEF Holiday Tree Auction	11/19
Board of Education	11/21

**FYI and Reminders:**

1. Remember to make contact (e-mail or phone) with parents if their student is achieving below a C-.

20. Describe Rutherford's model of the atom, including the location of protons, neutrons, and electrons with respect to the nucleus. How does this model explain the deflections of a beam of alpha particles aimed at a sheet of gold foil?

**News and Notes:**

- BIG THANKS to Nancy Dahl and Di Dellinger and the entire office group at both buildings for getting me through my first count day!
- BIG THANKS to Cindy Virkstis, Di Dellinger and the staff in both buildings for all of your work on Progress Reports.
- Great job Sarah Anderson and Maggie Parish with Homecoming Week – Student Leadership did an awesome job!
- Thank you to Martha Kiander and Cassie Arends for sacrificing for Count Day!
- Welcome Back Pam Schaafsma!
- Happy Birthday Harold Schneider!!

*"Children have to be educated, but they have also to be left to educate themselves."*

—Abbe Dimmet, *Art of Thinking*, 1928

© Pearson Education, Inc., publishing as Pearson Prentice Hall. All rights reserved.

**4.3**

**DISTINGUISHING BETWEEN ATOMS**

**Section Review**

**Objectives**

- Explain how isotopes differ from one another
- Use the atomic number and mass number of an element to find the numbers of protons, electrons, and neutrons
- Calculate the atomic mass of an element from isotope data

**Vocabulary**

- |                 |                          |                  |
|-----------------|--------------------------|------------------|
| • atomic number | • isotopes               | • periodic table |
| • mass number   | • atomic mass unit (amu) | • period         |
|                 | • atomic mass            | • group          |

**Key Equations**

- atomic number = number of protons = number of electrons
- number of neutrons = mass number – atomic number

**Part A Completion**

*Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.*

The number of   1   in the nucleus of an atom is the   1. \_\_\_\_\_   
 atomic   2   of that element. Because atoms are electrically   2. \_\_\_\_\_   
 neutral, the number of protons and   3   in an atom are equal.   3. \_\_\_\_\_   
 The total number of   4   and neutrons in an atom is the mass   4. \_\_\_\_\_   
 number. Atoms of the same element are identical in most respects,   5. \_\_\_\_\_   
 but they can differ in the number of   5   in the nucleus. Atoms   6. \_\_\_\_\_   
 that have the same number of protons but different mass numbers   7. \_\_\_\_\_   
 are called   6  .   8. \_\_\_\_\_   
 The   7   of an element is the weighted average of the   9. \_\_\_\_\_   
 masses of the isotopes of that element. Each of the three known   10. \_\_\_\_\_   
 isotopes of hydrogen has   8   proton(s) in the nucleus. The  
 most common hydrogen isotope has   9   neutrons. It has a  
 mass number of   10   and is called hydrogen-1.

oxygen-16: 99.76%  
 oxygen-17: 0.037%  
 oxygen-18: 0.204%

24. Given the relative abundance of the following naturally occurring isotopes of oxygen, calculate the average atomic mass of oxygen.

Solve the following problem in the space provided.

### Part D Questions and Problems

- \_\_\_\_\_ 23. period
- \_\_\_\_\_ 22. atomic mass
- \_\_\_\_\_ 21. atomic mass unit (amu)
- \_\_\_\_\_ 20. isotopes
- \_\_\_\_\_ 19. group
- \_\_\_\_\_ 18. mass number
- \_\_\_\_\_ 17. periodic table
- \_\_\_\_\_ 16. atomic number
- a. atoms that have the same number of protons but different numbers of neutrons
- b. weighted average mass of the atoms in a naturally occurring sample of an element
- c. equals the number of neutrons plus the number of protons in an atom
- d.  $\frac{1}{12}$  the mass of a carbon-12 atom
- e. the number of protons in the nucleus of an atom of an element
- f. an arrangement of elements according to similarities in their properties
- g. a vertical column of elements in the periodic table
- h. a horizontal row of the periodic table

### Column A Column B

Match each description in Column B to the correct term in Column A

### Part C Matching

- \_\_\_\_\_ 15. The number of neutrons in the nucleus can be calculated by subtracting the atomic number from the mass number.
- \_\_\_\_\_ 14. Relative atomic masses are expressed in amus.
- \_\_\_\_\_ 13. An atom of nitrogen has 7 protons and 7 neutrons.
- \_\_\_\_\_ 12. The atomic number of an atom is the total number of protons in an atom of that element.
- \_\_\_\_\_ 11. The atomic number of an element is the sum of the protons and electrons in an atom of that element.

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

### Part B True-False



# ATOMIC STRUCTURE

## Practice Problems

*In your notebook, solve the following problems.*

### SECTION 4.1 DEFINING THE ATOM

1. According to Figure 5.2, 100,000,000 copper atoms would form a line 1 cm long. How long would a line formed by  $1 \times 10^7$  copper atoms be? Express your answer in millimeters.

### SECTION 4.2 STRUCTURE OF THE NUCLEAR ATOM

1. A sulfur-32 atom contains 16 protons, 16 neutrons, and 16 electrons. What is the mass (in grams) of a sulfur-32 atom?
2. The mass of a neutron is  $1.67 \times 10^{-24}$  g. Approximately what number of neutrons would equal a mass of one gram?
3. Which statement is consistent with the results of Rutherford's gold foil experiment?
  - a. All atoms have a positive charge.
  - b. Atoms are mostly empty space.
  - c. The nucleus of an atom contains protons and electrons.
  - d. Mass is spread uniformly throughout an atom.

### SECTION 4.3 DISTINGUISHING BETWEEN ATOMS

1. How many protons are found in an atom of each of the following?
 

a. boron	c. neon
b. sulfur	d. lithium
2. Complete the table for the following elements.

Element	Number of Protons	Number of Electrons	Number of Neutrons	Atomic Number	Mass Number
Manganese	25		30		
Sodium		11	12		
Bromine	35		45		
Yttrium				39	89
Arsenic		33			75
Actinium					227

18

7

18

18

3. How many neutrons are in each atom?
  - a.  ${}^{23}_{11}\text{Na}$
  - b.  ${}^{238}_{92}\text{U}$
  - c.  ${}^{81}_{35}\text{Br}$
  - d.  ${}^{19}_{9}\text{F}$
4. The two most abundant isotopes of carbon are carbon-12 (mass = 12.00 amu) and carbon-13 (mass = 13.00 amu). Their relative abundances are 98.9% and 1.10%, respectively. Calculate the atomic mass of carbon.
5. Element X has two isotopes: X-100 and X-104. If the atomic mass of X is 101 amu, what is the relative abundance of each isotope in nature?