

# Concept Review

## Section: Substances Are Made of Atoms

In the blank at the left of each word or phrase, write the letter of the expression on the right that is most closely related.

- |                                      |  |
|--------------------------------------|--|
| _____ 1. atomic theory               | <b>a.</b> This states that a chemical compound always contains the same elements in exactly the same proportions by weight or mass.  |
| _____ 2. law of definite proportions | <b>b.</b> This states that atoms are the building blocks of all matter.  |
| _____ 3. law of conservation of mass | <b>c.</b> This states that when two elements combine to form two or more compounds, the mass of one element that combines with a given mass of the other is in the ratio of small whole numbers. |
| _____ 4. law of multiple proportions | <b>d.</b> This states that mass cannot be created or destroyed during ordinary chemical and physical changes.  |

Answer the following in the space provided.

5. State the five principles in Dalton's atomic theory.

- a.** \_\_\_\_\_  
\_\_\_\_\_
- b.** \_\_\_\_\_  
\_\_\_\_\_
- c.** \_\_\_\_\_  
\_\_\_\_\_
- d.** \_\_\_\_\_  
\_\_\_\_\_
- e.** \_\_\_\_\_  
\_\_\_\_\_

# Concept Review

## Section: Structure of Atoms

In the blank at the left of each word or phrase, write the letter of the expression on the right that is most closely related.

- |                         |  |
|-------------------------|--|
| _____ 1. alpha particle | <b>a.</b> the electrode attached to the positive terminal of a voltage source  |
| _____ 2. anode          | <b>b.</b> the electrode attached to the negative terminal of a voltage source  |
| _____ 3. atomic number  | <b>c.</b> a subatomic particle that has a negative charge  |
| _____ 4. cathode        | <b>d.</b> an atom's central region, which is made up of protons and neutrons   |
| _____ 5. Coulomb's law  | <b>e.</b> a subatomic particle that has a positive charge and that composes the nucleus of an atom; the number of these particles determines the identity of an element. |
| _____ 6. electron       | <b>f.</b> the number of protons that compose the nucleus of an atom; this number is the same for all atoms of an element.  |
| _____ 7. proton         | <b>g.</b> a subatomic particle that has no charge and that composes the nucleus of an atom   |
| _____ 8. isotope        | <b>h.</b> a small, positively charged particle, which Rutherford directed at thin, gold foil   |
| _____ 9. mass number    | <b>i.</b> the sum of the number of protons and neutrons of the nucleus of an atom  |
| _____ 10. neutron       | <b>j.</b> states that the closer two charges are, the greater the force between them; in fact, the force increases by a factor of 4 as the distance is halved.           |
| _____ 11. nucleus       | <b>k.</b> an atom that has the same number of protons (atomic number) as other atoms of the same element but has a different number of neutrons (atomic mass)            |

**Concept Review** *continued*

---

**Answer the following items in the space provided.**

- 12.** In Thomson's cathode-ray experiment, what evidence led him to believe that the ray consisted of particles, and why did he conclude that the ray was negatively charged?

---

---

---

---

- 13.** Describe the evidence for the existence of electrons.

---

---

---

- 14.** Describe the evidence for the existence of protons.

---

---

---

- 15.** Describe the evidence for the existence of neutrons.

---

---

---

- 16.** Describe the properties of electrons, protons, and neutrons.

---

---

---

- 17.** In your own words, define *isotope*.

---

---

**Concept Review** *continued*

Use the appropriate term from the list below to fill in the blanks. Use each term only once.

volume                      nucleus                      small                      alpha  
positive                      deflected                      mass                      undeflected

**18.** In the Rutherford gold foil experiment, positively charged \_\_\_\_\_ particles were directed at a thin gold foil. It was found that most of the particles passed through the foil \_\_\_\_\_. However, a small number of particles were \_\_\_\_\_, some even backward. These two observations suggested that most of the \_\_\_\_\_ of an atom is empty space but that there was a central core with a charge that repelled the \_\_\_\_\_ particles. This core is a very \_\_\_\_\_ part of an atom. It contains most of the \_\_\_\_\_ of the atom and is called the \_\_\_\_\_.

**19.** Complete the following table.

Isotope	Number of protons	Number of electrons	Number of neutrons	Number of particles in nucleus	Symbol for isotope
Hydrogen-2					
Helium-3					
Lithium-7					
Beryllium-9					
Boron-11					

**20.** Define *atomic number* and *mass number*.

---

---

---

---

---

# Concept Review

## Section: Counting Atoms

In the blanks at the left of each word or phrase, write the letter of the expression on the right that is most closely related.

- |                            |   |
|----------------------------|---|
| _____ 1. Avogadro's number | a. the mass of an atom expressed in atomic mass units   |
| _____ 2. atomic mass       | b. the SI base unit used to measure the amount of a substance whose number of particles is the same as the number of atoms in 12 grams of carbon-12 |
| _____ 3. mole              | c. the mass in grams of one mole of a substance   |
| _____ 4. molar mass        | d. the number of atoms or molecules in 1 mol, equal to $6.022 \times 10^{23}$   |

Answer the following items in the space provided.

5. Which isotope defines the atomic mass unit, and how is the atomic mass unit defined?

---

---

6. Why is a mole used to count atoms?

---

---

7. What is the relationship between an atom's atomic mass and one mole of that atom?

---

---

---

**Concept Review** *continued*

---

- 8.** The atomic mass of lithium is 6.939 amu. Would you expect the isotopes  ${}^6_3\text{Li}$  and  ${}^7_3\text{Li}$  to be equally common? Why or why not? If not, which isotope would you expect to be more common?

---

---

---

---

---

- 9.** What is the mass in atomic mass units of one fluorine atom?

---

- 10.** What is the mass in grams of one fluorine atom?

- 11.** How many molecules are in one mole of carbon dioxide,  $\text{CO}_2$ ?

- 12.** Calculate the mass of one mole of carbon dioxide,  $\text{CO}_2$ .