

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.

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|--------------------------------------|--|
| _____ 1. atomic theory | a. 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. This states that atoms are the building blocks of all matter. |
| _____ 3. law of conservation of mass | c. 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 | d. 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.

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|-------------------------|--|
| _____ 1. alpha particle | a. the electrode attached to the positive terminal of a voltage source |
| _____ 2. anode | b. the electrode attached to the negative terminal of a voltage source |
| _____ 3. atomic number | c. a subatomic particle that has a negative charge |
| _____ 4. cathode | d. an atom's central region, which is made up of protons and neutrons |
| _____ 5. Coulomb's law | e. 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 | f. the number of protons that compose the nucleus of an atom; this number is the same for all atoms of an element. |
| _____ 7. proton | g. a subatomic particle that has no charge and that composes the nucleus of an atom |
| _____ 8. isotope | h. a small, positively charged particle, which Rutherford directed at thin, gold foil |
| _____ 9. mass number | i. the sum of the number of protons and neutrons of the nucleus of an atom |
| _____ 10. neutron | j. 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 | k. 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 6.022×10^{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, CO_2 ?

- 12.** Calculate the mass of one mole of carbon dioxide, CO_2 .