

DISTINGUISHING BETWEEN ATOMS

4.3

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
- mass number
- isotopes
- atomic mass unit (amu)
- atomic mass
- periodic table
- period
- 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 atomic 2 of that element. Because atoms are electrically neutral, the number of protons and 3 in an atom are equal. The total number of 4 and neutrons in an atom is the mass number. Atoms of the same element are identical in most respects, but they can differ in the number of 5 in the nucleus. Atoms that have the same number of protons but different mass numbers are called 6.
- The 7 of an element is the weighted average of the masses of the isotopes of that element. Each of the three known 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.

Part B True-False

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

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

Part C Matching

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

Column A

16. atomic number
17. periodic table
18. mass number
19. group
20. isotopes

Column B

- 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. $\frac{1}{2}$ 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

Part D Questions and Problems

Solve the following problem in the space provided.

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

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