Lesson Check Answers

1. as indivisible and indestructible
2. by using experimental methods
3. a scanning electron microscope
4. Answers should include the ideas that all matter is composed of atoms; atoms of different elements differ; and chemical change involves a rearrangement of atoms.
5. Democritus's ideas were not based on experimental results and did not explain chemical behavior. Dalton's ideas were empirically based and did explain chemical behavior; his experiments showed that the ratios in which elements combined were whole numbers.
6. 5×10^{-2} nm to 2×10^{-1} nm
7. 1.05×10^{-22} g
8. **BIG**IDEA Atoms of one element are never changed into atoms of another element as a result of a chemical reaction.

Lesson Check Answers

9. protons, neutrons, and electrons
10. A positively charged nucleus surrounded by electrons, which occupy most of the volume.
11. proton, positive charge, relative mass = 1; electron, negative charge, relative mass = 1/1840; neutron, no charge, relative mass = 1
12. Thomson passed an electric current through sealed glass tubes filled with gases. The resulting glowing beam consisted of tiny negatively charged particles moving at high speed. Thomson concluded that electrons must be parts of the atoms of all elements. Millikan determined the charge and mass of the electron.
13. Rutherford expected all the alpha particles to pass straight through with little deflection. He found that most alpha particles passed straight through, but some particles were deflected at very large angles—and some even bounced straight back.
14. The great majority of the alpha particles passed straight through the gold foil.
15. Rutherford's atomic model described the atom as having a positively charged, dense nucleus that is tiny compared to the atom as a whole. In Thomson's plum-pudding model, electrons were stuck in a chunk of positive charge.

Sample Problems

Answers

FIGURE 4.8: 79 electrons

16. **a.** 9 protons and 9 electrons
b. 20 protons and 20 electrons
c. 13 protons and 13 electrons
d. 19 protons and 19 electrons

17. **a.** 16 **e.** B
b. 16 **f.** 5
c. 23 **g.** 5
d. 23

Answers

FIGURE 4.9 They have different numbers of neutrons but the same number of protons: hydrogen-1, hydrogen-2, hydrogen-3

18. a. 45 b. 16 c. 61 d. 125

19. a. $_{6}C^{12}$ b. $_{5}B^{11}$ c. $_{4}Be^{9}$ d. $_{8}O^{16}$

20. $^{16}_{8}O$, $^{17}_{8}O$, $^{18}_{8}O$

21. Chromium-50 has 26 neutrons; chromium-52 has 28 neutrons; chromium-53 has 29 neutrons.

Answers

22. boron-11
23. Silicon-28 must be by far the most abundant. The other two isotopes must be present in very small amounts.
24. 63.6 amu
25. 79.91 amu

The atomic mass will be closest to the most abundant isotope.

Lesson Check Answers

26. Atoms of different elements contain different numbers of protons.

29 mass number − atomic number = number of neutrons

27 They have different mass numbers and different numbers of neutrons.

28 For each isotope, multiply its atomic mass by its percent abundance, then add the products.

30. Atomic number corresponds to the number of protons. Mass number represents the total number of protons and neutrons.

31. Mass number, $^{194}_{78}Pt$

32. The atomic mass is the weighted average of the masses of its isotopes.

34 **a.** lithium-6: 3 p^+, 3 e^-, 3 n^0 ; lithium-7: 3 p^+, 3 e^-, 4 n^0

b. calcium-42: 20 p^+, 20 e^-, 22 n^0; calcium-44: 20 p^+, 20 e^-, 24 n^0

c. selenium-78: 34 p^+, 34 e^-, 44 n^0; selenium-80: 34 p^+, 34 e^-, 46 n^0

34. Argon-40 is most abundant. The atomic mass of argon is 39.948 represents an average of all the isotopes of argon. Using relative abundance, scientists determined that average, which is closest to argon-40.