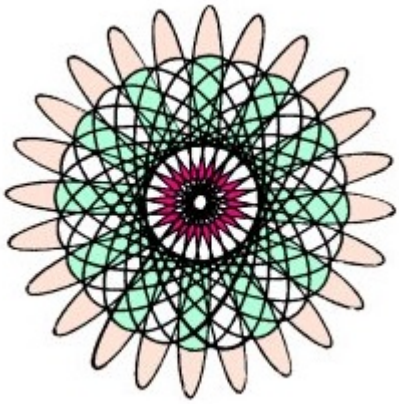

3.6 End-of-Chapter Material

ADDITIONAL EXERCISES

1. How many electrons does it take to make the mass of one proton?
2. How many protons does it take to make the mass of a neutron?

3. Dalton's initial version of the modern atomic theory says that all atoms of the same element are the same. Is this actually correct? Why or why not?

4. How are atoms of the same element the same? How are atoms of the same element different?

5. Give complete atomic symbols for the three known isotopes of hydrogen.

6. A rare isotope of helium has a single neutron in its nucleus. Write the complete atomic symbol of this isotope.

7. Use its place on the periodic table to determine if indium, In, atomic number 49, is a metal or a nonmetal.

8. Only a few atoms of astatine, At, atomic number 85, have been detected. On the basis of its position on the periodic table, would you expect it to be a metal or a nonmetal?

9. Americium-241 is a crucial part of many smoke detectors. How many neutrons are present in its nucleus?

10. Potassium-40 is a radioactive isotope of potassium that is present in the human body. How many neutrons are present in its nucleus?

11. Determine the atomic mass of ruthenium from the given abundance and mass data.

Ruthenium-96	5.54%	95.907 u
Ruthenium-98	1.87%	97.905 u
Ruthenium-99	12.76%	98.906 u
Ruthenium-100	12.60%	99.904 u
Ruthenium-101	17.06%	100.906 u
Ruthenium-102	31.55%	101.904 u
Ruthenium-104	18.62%	103.905 u

12. Determine the atomic mass of tellurium from the given abundance and mass data.

Tellurium-120	0.09%	119.904 u
Tellurium-122	2.55%	121.903 u
Tellurium-123	0.89%	122.904 u
Tellurium-124	4.74%	123.903 u
Tellurium-125	7.07%	124.904 u
Tellurium-126	18.84%	125.903 u
Tellurium-128	31.74%	127.904 u
Tellurium-130	34.08%	129.906 u

13. One atomic mass unit has a mass of 1.6605×10^{-24} g. What is the mass of one atom of sodium?

14. One atomic mass unit has a mass of 1.6605×10^{-24} g. What is the mass of one atom of uranium?

15. One atomic mass unit has a mass of 1.6605×10^{-24} g. What is the mass of one molecule of H_2O?

16. One atomic mass unit has a mass of 1.6605×10^{-24} g. What is the mass of one molecule of PF_5?

17. From their positions on the periodic table, will Cu and I form a molecular compound or an ionic compound?

18. From their positions on the periodic table, will N and S form a molecular compound or an ionic compound?

19. Mercury is an unusual element in that when it takes a 1+ charge as a cation, it always exists as the diatomic ion.

    a. Propose a formula for the mercury(I) ion.
    b. What is the formula of mercury(I) chloride?

20. Propose a formula for hydrogen peroxide, a substance used as a bleaching agent. (Curiously, this compound does not behave as an acid, despite its formula. It behaves more like a classic nonmetal-nonmetal, molecular compound.)

21. The uranyl cation has the formula UO_2^{2+}. Propose formulas and names for the ionic compounds between the uranyl cation and F^-, SO_4^{2-}, and PO_4^{3-}.

22. The permanganate anion has the formula MnO_4^-. Propose formulas and names for the ionic compounds between the permanganate ion and K^+, Ca^{2+}, and Fe^{3+}.

ANSWERS

1. about 1,800 electrons

3. It is not strictly correct because of the existence of isotopes.

5. H_{11}, H_{12}, and H_{13}

7. It is a metal.

9. 146 neutrons

11. 101.065 u

13. 3.817×10^{-23} g

15. 2.991×10^{-23} g

17. ionic

19. a. Hg_2^{2+}
    b. Hg_2Cl_2

21. uranyl fluoride, UO_2F_2; uranyl sulfate, UO_2SO_4; uranyl phosphate, $(UO_2)_3(PO_4)_2$