

Lesson 3

HOW ARE ATOMS AND MOLECULES ORGANIZED?

WORDS TO KNOW

atom
element
compound
molecule
periodic table

THE BIG IDEA

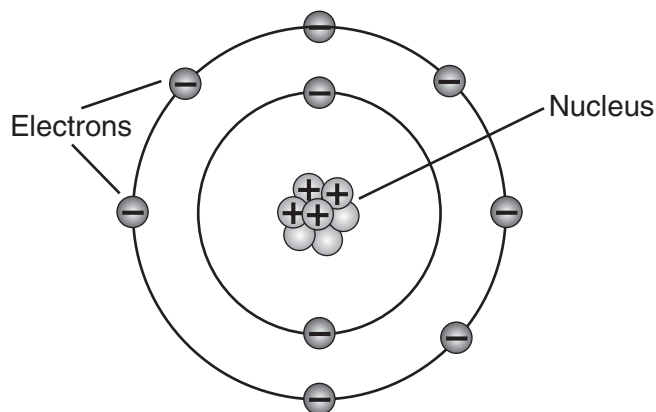
- Atoms of different elements have unique properties and can combine to form compounds.
- Elements are arranged on the periodic table.

WHAT I NEED TO KNOW

An atom is the smallest unit of matter and has a nucleus and electron cloud. An element is an atom made up of specific numbers of subatomic particles. The nucleus contains protons and neutrons. Protons have a positive charge and neutrons have a neutral charge. The electron cloud is outside of the nucleus and made up of electrons, which are negatively charged particles. Elements bond together to form compounds. Compounds that share electrons are called molecules. Examples of molecules include water and carbon dioxide.

TURN AND TALK

Did you know that elements are just atoms with specific characteristics? What are some elements that you can name?



Model of an atom

The periodic table organizes and arranges all known elements in an informative chart. Elements on the periodic table are classified as either metals, nonmetals, or metalloids. The horizontal rows are called periods and the vertical columns are called groups or families.

1 H 1.008 Hydrogen																	2 He 4.0026 Helium														
3 Li 6.941 Lithium	4 Be 9.012 Beryllium																	5 B 10.81 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.179 Neon								
11 Na 22.990 Sodium	12 Mg 24.305 Magnesium																	13 Al 26.982 Aluminum	14 Si 28.086 Silicon	15 P 30.974 Phosphorus	16 S 32.066 Sulfur	17 Cl 35.453 Chlorine	18 Ar 39.948 Argon								
19 K 39.098 Potassium	20 Ca 40.08 Calcium	21 Sc 44.956 Scandium	22 Ti 47.88 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.847 Iron	27 Co 58.933 Cobalt	28 Ni 58.69 Nickel	29 Cu 63.546 Copper	30 Zn 65.39 Zinc	31 Ga 69.72 Gallium	32 Ge 72.61 Germanium	33 As 74.922 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.80 Krypton														
37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.94 Molybdenum	43 Tc (98) Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.906 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.868 Silver	48 Cd 112.41 Cadmium	49 In 114.82 Indium	50 Sn 118.71 Tin	51 Sb 121.763 Antimony	52 Te 127.60 Tellurium	53 I 126.904 Iodine	54 Xe 131.29 Xenon														
55 Cs 132.905 Cesium	56 Ba 137.33 Barium	57 La 138.906 Lanthanum	72 Hf 178.49 Hafnium	73 Ta 180.948 Tantalum	74 W 183.84 Tungsten	75 Re 186.207 Rhenium	76 Os 190.23 Osmium	77 Ir 192.22 Iridium	78 Pt 195.08 Platinum	79 Au 196.967 Gold	80 Hg 200.59 Mercury	81 Tl 204.383 Thallium	82 Pb 207.2 Lead	83 Bi 208.980 Bismuth	84 Po (209) Polonium	85 At (210) Astatine	86 Rn (222) Radon														
87 Fr (223) Francium	88 Ra 226.025 Radium	89 Ac 227.028 Actinium	104 Rf (261) Rutherfordium	105 Db (262) Dubnium	106 Sg (263) Seaborgium	107 Bh (262) Bohrium	108 Hs (265) Hassium	109 Mt (268) Meitnerium	110 (269) Darmstadtium																						
																		58 Ce 140.12 Cerium	59 Pr 140.908 Praseodymium	60 Nd 144.24 Neodymium	61 Pm (145) Promethium	62 Sm 150.36 Samarium	63 Eu 151.97 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.925 Terbium	66 Dy 162.50 Dysprosium	67 Ho 164.930 Holmium	68 Er 167.26 Erbium	69 Tm 168.934 Thulium	70 Yb 173.04 Ytterbium	71 Lu 174.967 Lutetium
																		90 Th 232.038 Thorium	91 Pa 231.036 Protactinium	92 U 238.029 Uranium	93 Np 237.048 Neptunium	94 Pu (244) Plutonium	95 Am (243) Americium	96 Cm (247) Curium	97 Bk (247) Berkelium	98 Cf (251) Californium	99 Es (252) Einsteinium	100 Fm (257) Fermium	101 Md (258) Mendelevium	102 No (259) Nobelium	103 Lr (262) Lawrencium

▶ THINK ABOUT IT

What other properties do elements in the rows and columns of the periodic table have in common?

The periodic table is arranged using the atomic number. The atomic number represents the number of protons found in the nucleus of the atom. The atomic number increases by one as you move from left to right on the table. The mass number is the number of protons and neutrons in the nucleus. To find the number of neutrons you subtract the mass number from the atomic number. The number of electrons can be assumed to be the same as the number of protons for neutral atoms.

The periodic table tiles consist of information that can be used to further analyze the individual elements.

6	← Atomic number
C	← Element symbol
12.011	← Mass number
Carbon	← Element name

WHAT I HAVE LEARNED

1. Which element has nine protons?

- (A) Fluorine
- (B) Beryllium
- (C) Oxygen
- (D) Boron

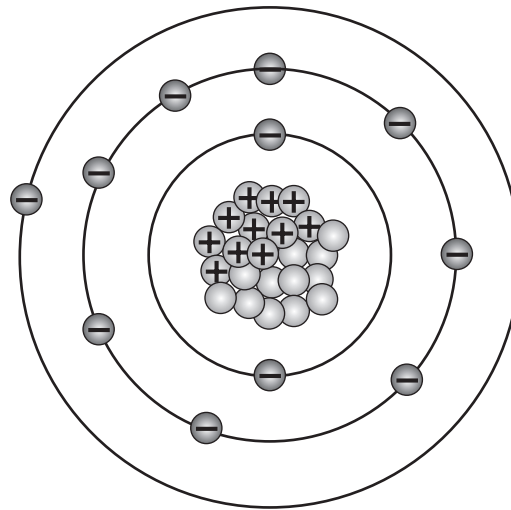
2. Which of the following describes the element sulfur?

- (A) A molecule containing 16 protons, 16 electrons, and 32 neutrons
- (B) An element containing 16 protons, 16 electrons, and 32 neutrons
- (C) A molecule containing 16 protons, 16 electrons, and 16 neutrons
- (D) An atom containing 16 protons, 16 electrons, and 16 neutrons

HINT, HINT

Think about the definitions of atom, element, and molecule and what these types of models show.

3. What does this model represent?



- (A) An atom of sodium
- (B) A molecule of sodium
- (C) An atom of magnesium
- (D) A molecule of magnesium

4. A student is building a model of boron. How many neutrons should the atom contain?

- (A) 5
- (B) 6
- (C) 10
- (D) 11

HINT, HINT

A molecule is a compound. The subscripts represent the number of atoms.

5. Water is a molecule and a compound. Its chemical formula is H_2O . Which describes the nature and composition of water?

- (A) Water is made up of one hydrogen atom and one oxygen atom.
- (B) Water is made up of two oxygen atoms and one hydrogen atom.
- (C) Water is made up of one oxygen atom and two hydrogen atoms.
- (D) Water is made up of two oxygen atoms and two hydrogen atoms.