

Activity**Mineral Makeup****Part A** Elementary, My Dear

Rocks and minerals, like all other forms of matter, are made of one or more elements. Elements are the simplest pure substances. Examples of elements include carbon, oxygen, silicon, and gold.

Take a look at the periodic table of the elements on page 136. The periodic table gives a great deal of information about the known elements. (Don't worry! You won't need all the information in the periodic table for this activity. However, a copy of the periodic table is always a useful thing to have when you're studying geology or any other science.)

As you can see, each element has a one- or two-letter symbol. Hydrogen is represented by the symbol H, helium is represented by He, and so on. Each element also has an atomic number. Lithium, for instance, has the atomic number 3.

1. What are the chemical symbols for oxygen (atomic number 8), silicon (atomic number 14), and zinc (atomic number 30)? _____
2. What is the name and chemical symbol of the element with atomic number 13?

3. What are the chemical symbols for copper (atomic number 29), silver (atomic number 47), and gold (atomic number 79)? _____

You might be wondering why some elements have chemical symbols that do not seem to make much sense—the symbol Hg, for example, looks nothing like the word mercury! This is because many of the symbols are based on the Latin names for the elements. And the Latin words for mercury, copper, silver, and gold are *hydrargyrum*, *cuprum*, *argentum*, and *aurum*, respectively.

Part B Cracking the Code

Chemical symbols are used to write down chemical formulas. Chemical formulas are used to represent substances that are made of more than one kind of element. The combinations of letters and numbers in chemical formulas may seem a bit confusing at first glance. But they are actually quite simple to read, once you know how. Consider the chemical formula for water: H₂O. The H means that water contains the element hydrogen. The O means that water also contains the element oxygen. The subscript numeral 2 means that a molecule of water contains two atoms of hydrogen and one atom of oxygen. (A molecule is made of two or more atoms chemically bonded, or joined, together.)

Using what you have learned about chemical symbols and formulas, complete the table on page 134. The first row has been completed for you.

Mineral	Chemical Formula	Atoms of Each Element per Molecule of the Mineral
Biotite (a mica)	$K(Mg,Fe)_3AlSi_3(OH)_2$	1 potassium; 3 magnesium or iron; 1 aluminum; 3 silicon; 2 oxygen-hydrogen groups = 2 oxygen and 2 hydrogen
Halite	NaCl	
Pyrite	FeS	
Cinnabar	HgS	
Galena	PbS	
Covellite	CuS	
Quartz	SiO_2	
Cassiterite	SnO_2	
Marcasite	FeS_2	
Fluorite	CaF_2	
Hematite	Fe_2O_3	
Calcite	$CaCO_3$	
Anhydrite	$CaSO_4$	
Orthoclase (a feldspar)	$K(AlSi_3O_8)$	
Albite (a feldspar)	$Na(AlSi_3O_8)$	
Corundum	Al_2O_3	
Jadeite	$NaAl(Si_2O_6)$	
Beryl	$Be_3Al_2(SiO_3)_6$	
Apatite	$Ca_5(F,Cl)(PO_4)$	
Muscovite (a mica)	$KAl_3Si_3O_{10}(OH)_2$	
Talc	$Mg_3Si_4O_{10}(OH)_2$	

Periodic Table of the Elements

1—New designation
1A—Original designation

1	H Hydrogen 1.00794	2	He Helium 4.003		
3	Li Lithium 6.941	4	Be Beryllium 9.0122		
5	B Boron 10.81	6	C Carbon 12.011		
7	N Nitrogen 14.007	8	O Oxygen 15.999		
9	F Fluorine 18.998	10	Ne Neon 20.179		
11	Na Sodium 22.990	12	Mg Magnesium 24.305		
13	Al Aluminum 26.98	14	Si Silicon 28.086		
15	P Phosphorus 30.974	16	S Sulfur 32.06		
17	Cl Chlorine 35.453	18	Ar Argon 39.948		
19	K Potassium 39.098	20	Ca Calcium 40.08		
21	Sc Scandium 44.956	22	Ti Titanium 47.88		
23	V Vanadium 50.94	24	Cr Chromium 51.996		
25	Mn Manganese 54.938	26	Fe Iron 55.847		
27	Co Cobalt 58.932	28	Ni Nickel 58.69		
29	Cu Copper 63.546	30	Zn Zinc 65.39		
31	Ga Gallium 69.72	32	Ge Germanium 72.59		
33	As Arsenic 74.922	34	Se Selenium 78.96		
35	Br Bromine 79.904	36	Kr Krypton 83.80		
37	Rb Rubidium 85.468	38	Sr Strontium 87.62		
39	Y Yttrium 88.9059	40	Zr Zirconium 91.224		
41	Nb Niobium 92.91	42	Mo Molybdenum 95.94		
43	Tc Technetium (98)	44	Ru Ruthenium 101.07		
45	Rh Rhodium 102.906	46	Pd Palladium 106.42		
47	Ag Silver 107.868	48	Cd Cadmium 112.41		
49	In Indium 114.82	50	Sn Tin 118.71		
51	Sb Antimony 121.75	52	Te Tellurium 127.60		
53	I Iodine 126.905	54	Xe Xenon 131.29		
55	Cs Cesium 132.91	56	Ba Barium 137.33		
57 to 71	Lanthanoid Series		57 to 71		
72	Hf Hafnium 178.49	73	Ta Tantalum 180.95		
74	W Tungsten 183.85	75	Re Rhenium 186.207		
76	Os Osmium 190.2	77	Ir Iridium 192.22		
78	Pt Platinum 195.08	79	Au Gold 196.967		
80	Hg Mercury 200.59	81	Tl Thallium 204.383		
82	Pb Lead 207.2	83	Bi Bismuth 208.98		
84	Po Polonium (209)	85	At Astatine (210)		
86	Rn Radon (222)	87	Fr Francium (223)		
88	Ra Radium (226)	89 to 103	Actinoid Series		
104	Unq Ununquadium (261)	105	Unp Ununpentium (262)	106	Unh Ununhexium (263)
107	Uns Ununseptium (262)	108	Uno Ununoctium (265)	109	Uue Ununennium (266)

Key

- 6 — Atomic number
- C — Element's symbol
- 12.011 — Element's name
- 12.011 — Atomic mass

Solid
 Liquid
 Gas

Transition Metals

Nonmetals

The symbols shown here for elements 104-109 are being used temporarily until names for these elements can be agreed upon.

Metals

The new Group designations are those assigned by IUPAC in 1984.

Rare-Earth Elements

Mass numbers in parentheses are those of the most stable or common isotope.

57	La Lanthanum 138.906	58	Ce Cerium 140.12	59	Pr Praseodymium 140.908	60	Nd Neodymium 144.24	61	Pm Promethium (145)	62	Sm Samarium 150.36	63	Eu Europium 151.96	64	Gd Gadolinium 157.25	65	Tb Terbium 158.925	66	Dy Dysprosium 162.50	67	Ho Holmium 164.93	68	Er Erbium 167.26	69	Tm Thulium 168.934	70	Yb Ytterbium 173.04	71	Lu Lutetium 174.967
89	Ac Actinium 227.028	90	Th Thorium 232.038	91	Pa Protactinium 231.036	92	U Uranium 238.029	93	Np Neptunium 237.048	94	Pu Plutonium (244)	95	Am Americium (243)	96	Cm Curium (247)	97	Bk Berkelium (247)	98	Cf Californium (251)	99	Es Einsteinium (252)	100	Fm Fermium (257)	101	Md Mendelevium (258)	102	No Nobelium (259)	103	Lr Lawrencium (260)