Mineral Commodities

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For this exercise, we consider the following elements: aluminum, iron, copper, nickel, zinc, uranium, lead, gold, mercury and tin (Al, Fe, Cu, Ni, Zn, U, Pb, Au, Hg, Sn).

1. Below is a table listing the common uses for these elements. Decide which description matches which and put the element name and symbol in the empty space provided. (If you don't know the atomic symbols, try reading on in this handout!)

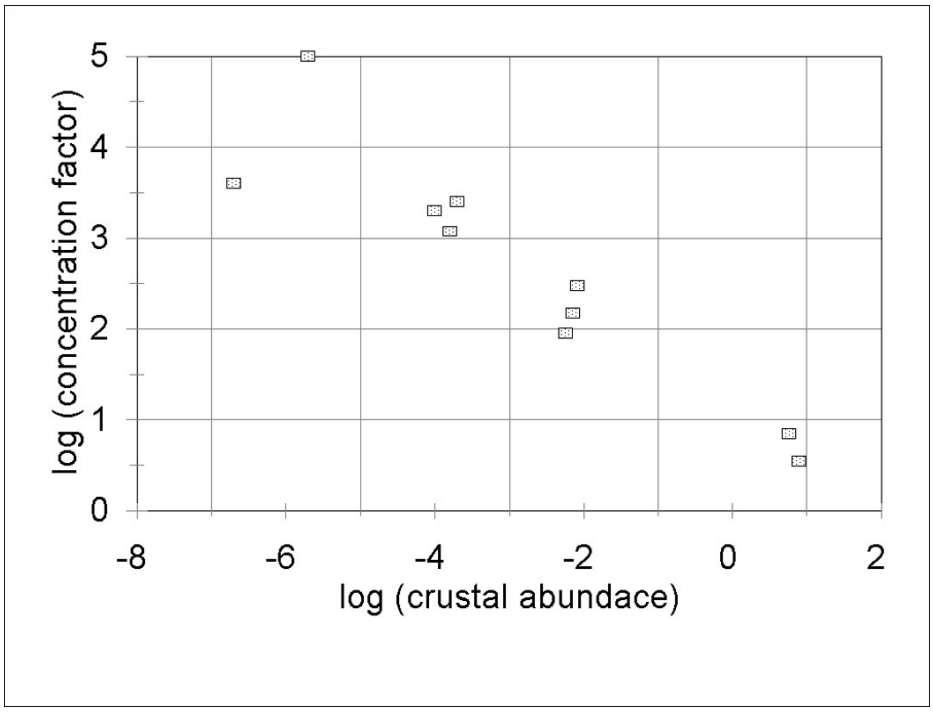
element name and symbol	uses
	It is used in the manufacturing of thermometers and switches. The biggest use is by chemical and allied industries for processes such as chlorine and caustic preparation, and in the manufacturing of pigments, catalysts, pharmaceuticals and agricultural chemicals. It is also used in dental preparations such as fillings, and batteries.
	Because of its resistance to oxidation, efficient electrical conductivity, relatively low density, and low price, it is widely used in the manufacturing industry--mainly for aircraft, motor vehicles, electrical equipment, machinery, drink cans, containers and a variety of home-consumer products. It is also used as an abrasive.
	It is used chiefly in the automobile, household appliance, and hardware industries. The three major uses are for alloy die castings, for galvanizing iron and steel, and in the manufacture of copper based alloys and brass. It is also used in the manufacturing of other chemicals, in photocopying, fabrics, plastics, as a pigment, and in sun screens.
	Used mainly in storage batteries, gasoline, and the construction industry. Some of its main uses are in ammunition, as bearing metals, inn brass and bronze, in cable coverings, as a casting metal, and as a caulking material. It is also used as a pigment.
	The principal metal employed in modern industry. It is alloyed with other metals to form a variety of steels used in manufacturing, equipment, tools, containers, building, etc.
	It is an important energy resource. It is mainly used as the fuel for nuclear powered electricity generators and reactors. It has important military uses.
	The main uses are for making stainless steels and super alloys, in electroplating, and in the manufacture of heat resistant and corrosion resistant alloys. It is also used in making alloys for permanent magnets and in the chemical industry.
	The major uses are in solder and electroplating. It is also used in the manufacture of bearing alloys, bronze, chemicals and coatings. It was once used to make containers.
	The primary uses is as bullion, stored in banks. It is also used in jewelry and art works, in dental appliances and fillings, and in the electronics industry.
	Many industrial applications because of its high electrical and thermal conductivity, its good corrosion resistance, its good ductility and high strength. About half is used in electrical applications. It can be joined by welding or soldering. It is an ingredient of brass and bronze.

2. Some commodities (commodities = elements in this exercise) are more valuable than others. To be economical, ore deposits must contain sufficient amount of the commodity of interest to make mining profitable. "Minable wt%," which geologists call **minable grade**, values are given in the table below. Use the data to calculate the *concentration factor* for each commodity. (*Concentration factor* is the amount it must be enriched over normal crustal abundance to be economically minable.)

		A	B	B/A
element		crustal wt %	minable grade (wt %)	conc. factor
aluminum	Al	8.	28.	
iron	Fe	5.8	40.	
copper	Cu	0.0058	0.52	
nickel	Ni	0.0072	1.08	
zinc	Zn	0.0082	2.46	
uranium	U	0.00016	0.19	
lead	Pb	0.00010	0.20	
gold	Au	0.0000002	0.0008	
mercury	Hg	0.000002	0.2	
tin	Sn	.0002	.5	

Use your calculations from the previous page to label the points on the graph ==>

NOTE THE LOG SCALES!



Draw a line through the data. Explain the trend on the graph.

For many of these commodities, there are only a few mines in the world operating at any one time. Why?