Exploring the chemistry of the earth's crust

> This is "for fun". It may be a useful exercise to explore this some, but you are not responsible for remembering the conclusions. Most of it is "general", and can be done at any time after you have been introduced to the elements and the periodic table. One question deals with moles.

The questions below refer to a graph, which is available at http://bbruner.org/ic/crust2.pdf . The graph shows the abundance of the elements in the earth's crust. The data are plotted as amount (in ppm, which equals mg per kg) vs the atomic number. The data are from J Emsley, The Elements, 3/e, p 289. I have included all the elements for which he shows a numeric value (i.e., other than "trace").

Note that the data cover many orders of magnitude; some of the data points, especially for rarer elements, are good to only one significant figure. Further, the composition varies with location. Thus these data should all be taken as "approximate"; don't make much of small differences.

To help you explore, here are some questions. Some of them are open-ended.

At the web site, you can get the spreadsheet from which I made this graph. You may find that useful. There is also an "answer sheet", which discusses some of these questions. All the files for this are at: http://bbruner.org/chemprob.htm#Crust .

1. For perspective, we should see what the graph would look like if all elements were equally abundant. Assuming that there are about 100 elements, how much of each would there be? Mark this value on the graph.

2. What is the single biggest trend you find in the graph?

3. Which elements would you classify as "very abundant"? If you add them all up, how much of the crust do they account for, total?

4. The graph shows abundance in terms of weight. How would the graph differ if we showed moles instead of weight? To explore this, I suggest you look at it in two steps…

> a. As a specific example… The ratio of H to C on this graph is about 3:1. What would it be in moles?
>
> b. Now, can you generalize how the main trend (#2) would look if we used moles?

5. The two most abundant elements in the universe are H (74%) and He (24%). How do they fare in the earth's crust? Why -- in chemical terms?

6. Which elements seem unusually rare in the crust? Comments?

7. Look up some elements you thought were common. Are they? Some elements you thought were rare. Are they? It would be interesting to hear about some that surprise you.