USING THE PERIODIC TABLE AND SCITOOLS APPS

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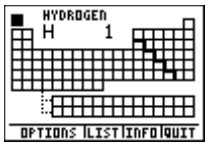
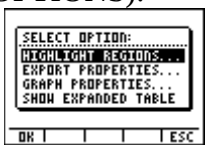
I. Exploring The Periodic App

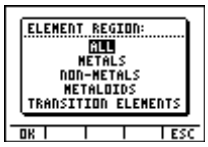
1. Press the [APPS] key on the TI-83 Plus calculator and select **Periodic**.

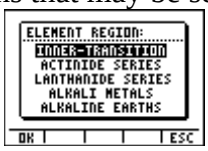


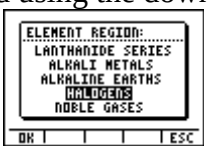
2. Press the [WINDOW] key (below the word OPTIONS).



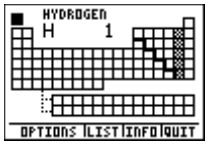
3. The option HIGHLIGHT REGIONS is selected. Press [Y=] to OK this selection. The following screen shots show the regions that may be selected using the down arrow.





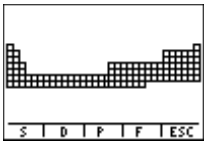


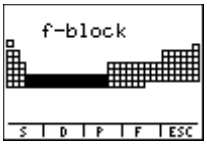
4. Press [Y=] to OK to select HALOGENS.



Notice that the halogens group is highlighted in the periodic table.

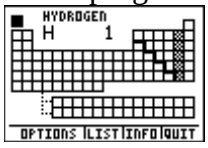
5. Another interesting option is to view the expanded periodic table. Select OPTIONS (press [WINDOW]) and then SHOW EXPANDED TABLE (arrow down three places and then OK with the [Y=] key).



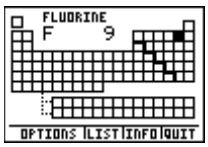


(press [TRACE] to select the f-block)

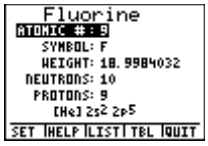
6. The ESC selection (press [GRAPH]) returns the program to the normal view of the periodic table:

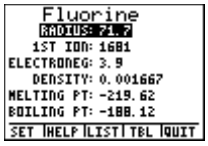


7. Use the arrow keys to move through the table to the first element in the halogens group (fluorine—atomic number 9).

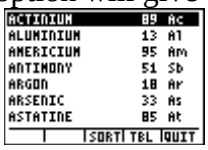


8. At this point pressing the ENTER key and the down arrow keys gives you the following data screens for fluorine.



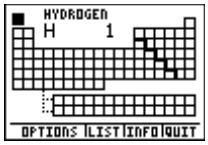


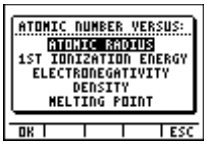
9. The TBL (TRACE key) brings back the periodic table. Press LIST (ZOOM key) to get a list of the elements in order of atomic number. The SORT option will give the list in alphabetic order.



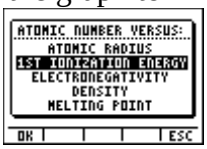
10. Pressing ENTER gives the information on the selected atom.

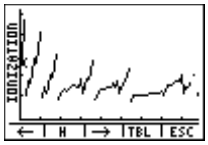
11. Use the TRACE key to return to the table. Then select OPTIONS followed by GRAPH PROPERTIES.

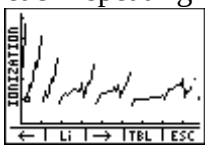


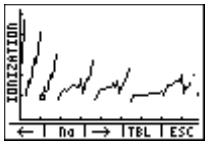


12. Among the graph properties choose 1ST IONIZATION ENERGY and then → (ZOOM key) through the graph to find which elements start each repeating "period" of ionization energies.









II. Discovering Eka-Silicon

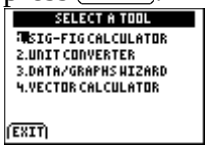
13. Use the Periodic Table APP to fill in the following table.

Atomic Symbol	Atomic Number	Atomic Weight	Atomic Radius (pm)	Density (g/cm^3)
C	6			
Si	14			
Sn	50			

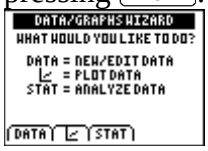
14. In 1871 Mendeleev had access to the data in the table above. In his periodic table there was a missing element with atomic number 32. Using the known properties of C, Si, and Sn, he was able (without the benefit of a graphing calculator) to predict the properties of germanium (he called it eka-silicon) that had not been discovered at the time. The SciTools APP will now be used to repeat Mendeleev's work by fitting this data to a linear regression line.

15. Exit the Periodic program using [2nd] QUIT.

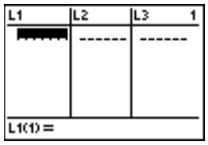
16. Press the [APPS] key and select SciTools. And then press [ENTER].



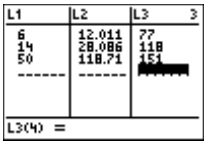
17. Select DATA/GRAPHS WIZARD by pressing [3].

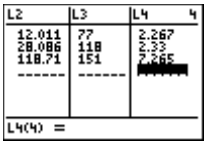


18. Select DATA by pressing [Y=]. If necessary use the arrow keys to move through the EDITOR to highlight the first element in list L1.



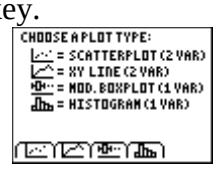
19. Enter the atomic numbers in L1, the atomic weights in L2, the atomic radii in L3, and the densities in L4.



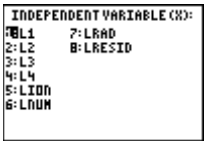


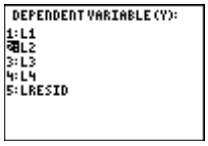
20. [2nd] QUIT returns the program to the DATA/GRAPHS WIZARD screen.

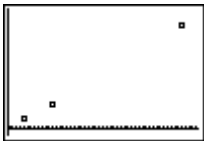
21. Select PLOT DATA with the [WINDOW] key.



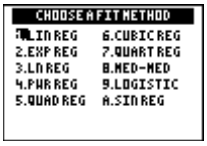
22. Select SCATERPLOT with the [Y=] key. Choose L1 for the independent variable and L2 for the dependent variable.



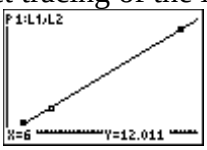


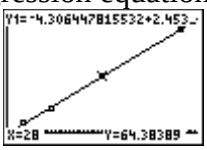


23. Pressing [2nd] QUIT brings up the CHOOSE A FIT menu.

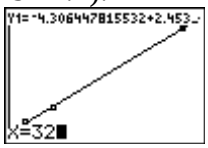


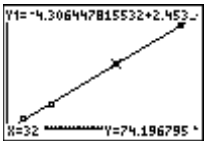
24. Press the [ENTER] key and then [TRACE] to view the graph of the linear regression line. Next press the up arrow once to select tracing of the linear regression equation Y1.





25. Enter the number 32 followed by [ENTER] to get the predicted atomic weight of the element with atomic number 32 (which is 74.2).





26. Press [2nd] QUIT to return to the DATA/GRAPHS WIZARD menu. Repeat steps 19 through 23 changing the dependent variable from L2 to L3. The predicted value in step 23 will now be the predicted atomic radius. Repeat this process again with L4 to get the predicted density of eka-silicon.

27. Place the predicted values for atomic weight, atomic radius, and density in the following table. Use the Periodic Table APP to get the actual values for germanium and compare the predicted and actual values.

	Atomic Weight	Atomic Radius (pm)	Density (g/cm^3)
predicted			
actual			

Answers:

Atomic Symbol	Atomic Number	Atomic Weight	Atomic Radius (pm)	Density (g/cm^3)
C	6	12.011	77	2.267
Si	14	28.0855	118	2.33
Sn	50	118.710	151	7.265

	Atomic Weight	Atomic Radius (pm)	Density (g/cm^3)
predicted	74.2	128	5.00
actual	72.61	128	5.323