



Introduction

Using the properties of a mystery element and using the Periodic Table App, you need to identify the element that has the following properties:

1. It is a transition metal.
2. Its outermost (valence) electrons are in the fourth energy level.
3. It has an atomic radius larger than Ru and smaller than Cd.
4. It has a first ionization energy greater than Ru and less than Cd.
5. It has an electronegativity greater than Cd and less than Rh.
6. It has the highest density of the remaining possible choices.

Objectives

In this activity, you will:

- use the properties of a mystery element to determine its identity using the Periodic Table App

What You'll Need

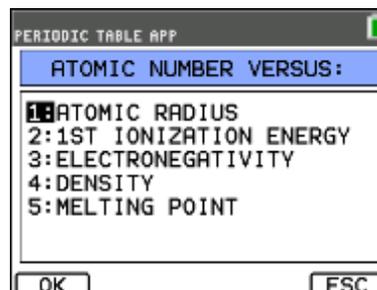
- TI-84 Plus CE, with Periodic Table App

Begin Your Investigation

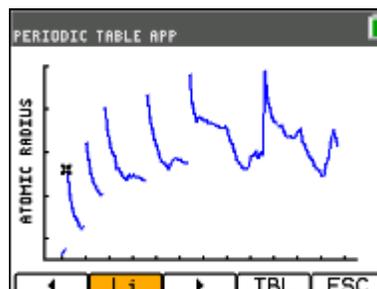
1. Turn the calculator on and press **[APPS]**. Use the arrow keys to move down to PERIODIC, and press **[ENTER]**. Your applications menu may look different from the one here. That's OK; just scroll down or up until PERIODIC is highlighted.



2. Press **[V=]** to select OPTIONS. Use the arrow keys to highlight GRAPH PROPERTIES. Press **[ENTER]**. ATOMIC RADIUS should be highlighted. Press **[V=]** to select OK.



3. The graph should look like the one shown to the right. Use the arrow keys to move the cursor along the points in the graph. The element corresponding to each point is displayed between arrow tabs **[← Li →]** at the bottom of the screen. Use the arrow keys to move the cursor through the elements. Find the trend line that includes the elements Ru and Cd. Identify all of the elements on this trend line that have atomic radii larger than Ru and smaller than Cd. Write the symbols of these elements in the data table





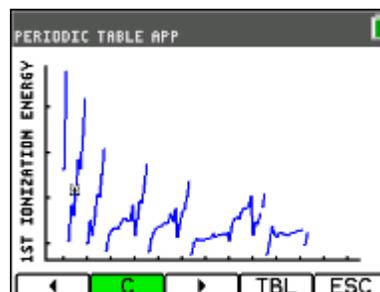
It's a Mystery

Student Activity

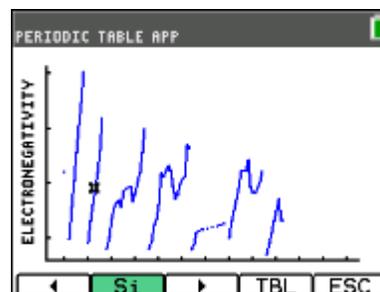
Name _____

Class _____

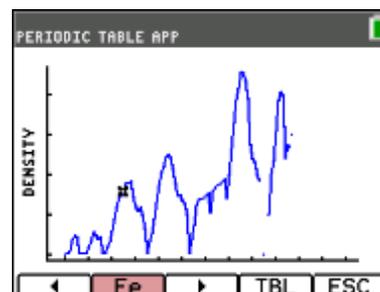
4. When you finish step 3, press **[GRAPH]** to select **[ESC]** and return to the menu. Use the arrow keys to highlight **1ST IONIZATION ENERGY**. Press **[ENTER]**. Find the trend line that includes the elements Ru and Cd. Move the cursor to identify all the elements on this trend line that have first ionization energies larger than Ru and smaller than Cd. Write the symbols of these elements in the data table



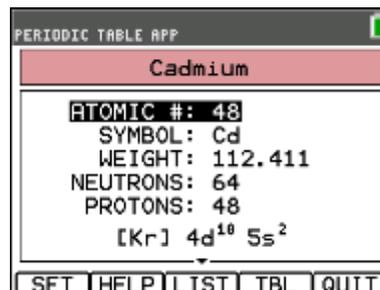
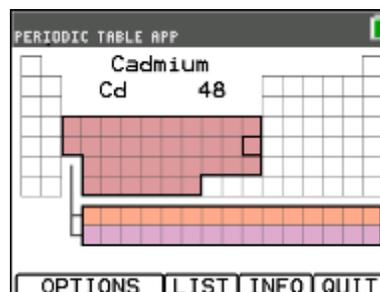
5. When you finish step 4, select **[ESC]** to return to the menu. Use the arrow keys to highlight **ELECTRONEGATIVITY**. Press **[ENTER]**. Find the trend line that includes the elements Rh and Cd. Move the cursor to identify all the elements on this trend line that have electronegativities higher than Cd and smaller than Rh. Write the symbols of these elements in the data table. Cross off the element that does not appear in all of the rows of the data table.



6. When you finish step 5, select **[ESC]** to return to the menu. Use the arrow keys to highlight **DENSITY**. Press **[ENTER]**. Find the trend line that includes the two elements that remain in the data table. Move the cursor to locate which remaining element has the higher density. This is the symbol of the mystery element. Write this symbol in your data table



7. Next, check that the mystery element you have identified has the correct electron configuration. Remember that the mystery element's outer electrons are in the fourth energy level. To learn more about the mystery element, select **[ESC]** twice to return to the **OPTIONS** menu. Press **[enter]** to select **HIGHLIGHT REGIONS**. Highlight **TRANSITION ELEMENTS** and press **[ENTER]**. You should see the transition elements highlighted on the periodic table. Use the arrow keys to move through the periodic table until you highlight your mystery element. Press **[enter]** to show the information about the element. Make sure that the outermost (valence) electrons are found in the fourth energy level. If they are not, repeat steps 2 through 6, making sure to record the correct elements. Record the name, electron configuration, and atomic number for the mystery element in the data table.





Data Table

Graph	Element	Element	Element
Atomic radius between those of Ru and Cd			
First ionization energy between those of Ru and Cd			
Electronegativity between those of Rh and Cd			

Identify the symbol of the mystery element. _____

Data Analysis

1. Name the mystery element.
2. Determine the electron configuration of the mystery element.
3. Determine the atomic number (number of protons) for the mystery element.

Going Further

Use the procedures above to identify a different mystery element #2 with the following properties:

1. It is a metalloid (semi-metal).
2. Its valence electrons are in the third energy level.
3. It has an atomic radius larger than Ar and smaller than Al.
4. It has a first ionization energy greater than Al and less than Ar.
5. It has an electronegativity greater than Al and less than Cl.
6. It has the highest density of the remaining possible choices.



It's a Mystery

Student Activity

Name _____

Class _____

Mystery element #2:

Element Symbol _____

Element Name _____

Electron configuration: _____

Atomic number: _____