

Names \_\_\_\_\_ Period \_\_\_\_\_

### The Mendeleev Lab of 1869

**Problem:**

Use your knowledge of the periodic table to determine the identity of each of the seven unknown elements in this activity.

- The unknown elements are from the A groups on the periodic table. Each group contains at least one unknown.
- None of the known elements serve as one of the seven unknown elements.
- No radioactive elements are used during this experiment. The relevant radioactive elements include Fr, Ra, At, and Rn.
- You may not use your textbook or other reference materials. You have been provided with enough information to determine each of the unknown elements.

**Procedure:**

1. Separate the unknowns and set aside.
2. Inspect the properties of the known elements.
3. Arrange the cards of the known elements in a crude representation of the periodic table.
4. Once the known elements are in place, inspect the properties of the unknowns to see where their properties would best "fit" the trends of the elements of each group.
5. In your data table, assign the proper element name to each of the unknowns. Record the symbol for each of the "unknowns" in your data table.

| Unknown | Identity | Evidence? |
|---------|----------|-----------|
| 1       |          |           |
| 2       |          |           |
| 3       |          |           |
| 4       |          |           |
| 5       |          |           |
| 6       |          |           |
| 7       |          |           |

1. What trend in size of the atom do you see as you move across a period?

2. What trend in size of the atom do you see as you move down a group?

3. What trend in ionization energy do you see as you move across a period?

4. What trend in ionization energy do you see as you move down a group?

→  
Flip Side

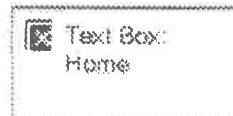
Name \_\_\_\_\_













## Periodic Table Magic Square












Directions: Put the number of the definition from the list below into the square with the appropriate term. Check your answers by adding the numbers to see if all the sums of all rows, both across and down add up to the same number, the Magic Number.













|                       |                        |                       |                       |
|-----------------------|------------------------|-----------------------|-----------------------|
| Periods<br>_____      | Atomic number<br>_____ | Symbol<br>_____       | Magic Number<br>_____ |
| Families<br>_____     | Valence<br>_____       | Neutron<br>_____      | Magic number<br>_____ |
| Electron<br>_____     | Mass number<br>_____   | Proton<br>_____       | Magic number<br>_____ |
| Magic number<br>_____ | Magic number<br>_____  | Magic number<br>_____ |                       |

1. positive subatomic particle
2. vertical columns on the periodic table
3. number of protons in an element
4. the electrons in the outermost energy level
5. represents an element
6. negative subatomic particle
7. horizontal rows on the periodic table
8. number of protons and neutrons
9. neutral subatomic particle



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|---|---|---|
| <p><b>In</b></p> <p>Atomic number 49<br/>Physical State solid<br/>Density 7.31 g/cm<sup>3</sup><br/>Conductivity medium<br/>Melting Point 157°C<br/>Color silvery white<br/>Ionization energy 5.786</p>  <p>In</p>                                 | <p><b>Ba</b></p> <p>Atomic number 56<br/>Physical State solid<br/>Density 3.6 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 710°C<br/>Color silvery white<br/>Reactivity reactive</p>  <p>Ba</p>      | <p><b>K</b></p> <p>Atomic number 19<br/>Physical State solid<br/>Density 0.86 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 63°C<br/>Color silver<br/>Reactivity very reactive<br/>Ionization energy 4.341</p>  <p>K</p>                |
| <p><b>Ar</b></p> <p>Atomic number 18<br/>Physical State gas<br/>Density 0.00178 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -189.2°C<br/>Color colorless<br/>Reactivity almost none<br/>Ionization energy 15.759</p>  <p>Ar</p>  | <p><b>Ga</b></p> <p>Atomic number 31<br/>Physical State solid<br/>Density 5.904 g/cm<sup>3</sup><br/>Conductivity medium<br/>Melting Point 30°C<br/>Color silvery<br/>Ionization energy 5.999</p>  <p>Ga</p>     | <p><b>Cs</b></p> <p>Atomic number 55<br/>Physical State solid<br/>Density 1.87 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 29°C<br/>Color silvery white<br/>Reactivity very reactive</p>  <p>Cs</p>                                   |
| <p><b>O</b></p> <p>Atomic number 8<br/>Physical State gas<br/>Density 0.0013 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point -219°C<br/>Color colorless<br/>Reactivity reactive<br/>Ionization energy 13.618</p>  <p>O</p>              | <p><b>P</b></p> <p>Atomic number 15<br/>Physical State solid<br/>Density 1.823 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point 44.2°C<br/>Color white<br/>Ionization energy 10.486</p>  <p>P</p>      | <p><b>As</b></p> <p>Atomic number 33<br/>Physical State solid<br/>Density 5.776 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point 817°C<br/>Color gray<br/>Ionization energy 9.81</p>  <p>As</p>  |
| <p><b>Xe</b></p> <p>Atomic number 54<br/>Physical State gas<br/>Density 0.00585 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -119.9°C<br/>Color colorless<br/>Reactivity almost none<br/>Ionization energy 12.13</p>  <p>Xe</p> | <p><b>B</b></p> <p>Atomic number 5<br/>Physical State solid<br/>Density 2.34 g/cm<sup>3</sup><br/>Conductivity poor at r.t.<br/>Melting Point 2076°C<br/>Color brown<br/>Ionization energy 8.298</p>  <p>B</p> | <p><b>I</b></p> <p>Atomic number 53<br/>Physical State solid<br/>Density 4.93 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point 113.5°C<br/>Color blue-black<br/>Reactivity very reactive<br/>Ionization energy 10.451</p>  <p>I</p> |

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|--|--|---|
| <p align="center"><b>Si</b></p> <p>Atomic number 14<br/>Physical State solid<br/>Density 2.33 g/cm<sup>3</sup><br/>Conductivity intermediate<br/>Melting Point 1410°C<br/>Color gray<br/>Ionization energy 8.151</p>  <p align="center">Si</p>                | <p align="center"><b>Unknown #2</b></p> <p>Atomic number ?<br/>Physical State gas<br/>Density 0.00170 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -219.6°C<br/>Color pale yellow<br/>Reactivity very reactive<br/>Ionization energy 17.422</p>  | <p align="center"><b>Unknown #3</b></p> <p>Atomic number ?<br/>Physical State solid<br/>Density 1.53 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 39°C<br/>Color silvery white<br/>Reactivity very reactive<br/>Ionization energy 4.177</p>                |
| <p align="center"><b>Unknown #4</b></p> <p>Atomic number ?<br/>Physical State gas<br/>Density 0.00374 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -156.6°C<br/>Color colorless<br/>Reactivity almost none<br/>Ionization energy 13.999</p>  | <p align="center"><b>Unknown #5</b></p> <p>Atomic number ?<br/>Physical State solid<br/>Density 1.96 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point 115 °C<br/>Color yellow<br/>Reactivity reactive<br/>Ionization energy 10.36</p>                     | <p align="center"><b>Sr</b></p> <p>Atomic number 38<br/>Physical State solid<br/>Density 2.54 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 769°C<br/>Color silvery white<br/>Reactivity reactive<br/>Ionization energy 5.695</p>  <p align="center">Sr</p> |
| <p align="center"><b>Unknown #7</b></p> <p>Atomic number ?<br/>Physical State solid<br/>Density 5.32 g/cm<sup>3</sup><br/>Conductivity fair to poor<br/>Melting Point 937°C<br/>Color gray<br/>Ionization energy 7.899</p>                                  | <p align="center"><b>Al</b></p> <p>Atomic number 13<br/>Physical State solid<br/>Density 2.7 g/cm<sup>3</sup><br/>Conductivity medium<br/>Melting Point 303°C<br/>Color silvery white<br/>Ionization energy 5.986</p>  <p align="center">Al</p>                 | <p align="center"><b>Unknown #1</b></p> <p>Atomic number ?<br/>Physical State solid<br/>Density 1.74 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 651°C<br/>Color silvery white<br/>Reactivity reactive<br/>Ionization energy 7.646</p>                  |
| <p align="center"><b>Unknown #6</b></p> <p>Atomic number ?<br/>Physical State solid<br/>Density 6.69 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point 631 °C<br/>Color bluish-white<br/>Ionization energy 8.641</p>                                 | <p align="center"><b>Tellurium</b></p> <p>Atomic number 52<br/>Physical State solid<br/>Density 6.24 g/cm<sup>3</sup><br/>Conductivity varies<br/>Melting Point 450°C<br/>Color silvery gray<br/>Ionization energy 9.009</p>  <p align="center">Te</p>          |   |

|  |  |   |
|--|--|---|
| <p style="text-align: center;"><b>Li</b></p> <p>Atomic number 3<br/>Physical State solid<br/>Density 0.534 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 180°C<br/>Color silver<br/>Reactivity very reactive<br/>Ionization energy 5.392</p>  <p style="text-align: center;">Li</p>            | <p style="text-align: center;"><b>Cl</b></p> <p>Atomic number 17<br/>Physical State gas<br/>Density 0.00321 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -101°C<br/>Color greenish yellow<br/>Reactivity very reactive<br/>Ionization energy 12.967</p>  <p style="text-align: center;">Cl</p> | <p style="text-align: center;"><b>Se</b></p> <p>Atomic number 34<br/>Physical State solid<br/>Density 4.81 g/cm<sup>3</sup><br/>Conductivity semi-<br/>Melting Point 221 °C<br/>Color gray/red/black<br/>Ionization energy 9.752</p>  <p style="text-align: center;">Se</p>                    |
| <p style="text-align: center;"><b>N</b></p> <p>Atomic number 7<br/>Physical State gas<br/>Density 0.00125 g/cm<sup>3</sup><br/>Conductivity poor<br/>Melting Point -210°C<br/>Color colorless<br/>Ionization energy 14.534</p>  <p style="text-align: center;">N</p>                                      | <p style="text-align: center;"><b>He</b></p> <p>Atomic number 2<br/>Physical State gas<br/>Density 0.00018 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -272°C<br/>Color colorless<br/>Reactivity almost none<br/>Ionization energy 24.587</p>  <p style="text-align: center;">He</p>          | <p style="text-align: center;"><b>Na</b></p> <p>Atomic number 11<br/>Physical State solid<br/>Density 0.971 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 98°C<br/>Color silver<br/>Reactivity very reactive<br/>Ionization energy 5.139</p>  <p style="text-align: center;">Na</p> |
| <p style="text-align: center;"><b>C</b></p> <p>Atomic number 6<br/>Physical State solid<br/>Density 2.10 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 3550°C<br/>Color black<br/>Ionization energy 11.26</p>  <p style="text-align: center;">C</p>  | <p style="text-align: center;"><b>Ca</b></p> <p>Atomic number 20<br/>Physical State solid<br/>Density 1.57 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 845°C<br/>Color silvery white<br/>Reactivity reactive<br/>Ionization energy 6.113</p>  <p style="text-align: center;">Ca</p>              | <p style="text-align: center;"><b>Be</b></p> <p>Atomic number 4<br/>Physical State solid<br/>Density 1.85 g/cm<sup>3</sup><br/>Conductivity excellent<br/>Melting Point 1287°C<br/>Color gray<br/>Reactivity reactive<br/>Ionization energy 9.322</p>  <p style="text-align: center;">Be</p> |
| <p style="text-align: center;"><b>Ne</b></p> <p>Atomic number 10<br/>Physical State gas<br/>Density 0.00090 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -249°C<br/>Color colorless<br/>Reactivity almost none<br/>Ionization energy 21.564</p>  <p style="text-align: center;">Ne</p> | <p style="text-align: center;"><b>Br</b></p> <p>Atomic number 35<br/>Physical State gas<br/>Density 3.12 g/cm<sup>3</sup><br/>Conductivity very poor<br/>Melting Point -7.2°C<br/>Color reddish brown<br/>Reactivity very reactive<br/>Ionization energy 11.814</p>  <p style="text-align: center;">Br</p>    | <p style="text-align: center;"><b>Sn</b></p> <p>Atomic number 50<br/>Physical State solid<br/>Density 7.31 g/cm<sup>3</sup><br/>Conductivity good<br/>Melting Point 232°C<br/>Color silver<br/>Ionization energy 7.344</p>  <p style="text-align: center;">Sn</p>                            |