

## Mendeleev's Periodic Chart

### Discussion: Part A

Dimetri Mendeleev arranged the elements by atomic mass and properties in his periodic table. His operating principle was that if the elements were arranged in order of increasing atomic weight the properties would repeat in a regular fashion. (Note he used atomic weight, today we use atomic number which is slightly better.) His work was published in 1871 some 25 years before the discovery of the electron. The families of elements in his chart have similar properties with these properties changing in a systematic way as we proceed from one element to another within each family. One of the things that Mendeleev was successful at doing was to predict the properties of unknown elements. In fact, he even instructed investigators where to look for these undiscovered elements.

In this experiment, you will be presented with the properties of eighteen "known" elements or compounds and ten "unknowns". You are asked to place the "unknowns" in appropriate positions in their respective families by correlating the properties of these elements with the properties of the "knowns" in each family.

### Procedure: Part A

1. Examine the samples of "knowns" on the next page and record properties missing on the worksheet.
2. Examine the samples of "unknowns" and using the worksheet, locate these "unknowns" in their proper positions on the chart.
3. Note that the families of elements included in this experiment are only families IA, IIA, IB, IVA, VIIA, and VIIIA.
4. It is not within the spirit of this experiment to refer to additional sources of information other than a periodic chart.

### Unknown Elements for Part A

Name	Physical State	Density (G/mL)	Hardness	Conductivity	Melting Point (C)	Solubility	Color
A	solid	19.3	soft	excellent	1063	none	yellow
B	solid	1.90	brittle	none	405	good	white
C	gas	0.00973		poor	-71	none	colorless
D	gas	0.00373		poor	-157	none	colorless
E	solid	3.05	brittle	none	873	good	white
F	solid	2.33	brittle	semi-cond.	1410	none	steel-gray
G	solid	1.53	soft	good	39	explodes	silver-metallic
H	gas	0.00170		none	-220	reacts	pale-yellow
I	solid	5.32	brittle	semi-cond.	937	none	gray-white
J	solid	1.87	soft	good	28	explodes	silver-metallic

**Chemistry with Mr. Lui**  
**Knowns for Part A**

Period	Properties	I A	II A	I B	IV A	VII A	VIII A
1	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color			N/A	N/A	N/A	He gas 0.00018  very poor -269 none colorless
2	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color	Lithium solid 0.534 soft good 180 reacts		N/A	Carbon  2.24 soft-brittle fair 3237 none		Neon gas 0.00090  very poor -248 none colorless
3	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color	Sodium  0.971 soft good 98 rapid reaction	MgCl <sub>2</sub>  2.33 brittle none 708 good	N/A		Chlorine gas 0.00321  very poor -101 slight yel-green	Argon gas 0.00178  very poor -189 none colorless
4	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color	Potassium  0.86 soft good 64 explodes	CaCl <sub>2</sub>  2.15 brittle none 772 good	Copper  8.96 soft excellent 1083 none		Bromine  3.12  very poor -7.2 negligible	
5	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color			Silver  10.49 soft excellent 961 none	Tin  7.30 soft good 232 none	Iodine  4.94 soft very poor 114 negligible	Xenon gas 0.00585  very poor -112 none colorless
6	Name physical state density (G/mL) hardness conductivity melting pt. (C) solubility (water) color		BaCl <sub>2</sub>  3.85 brittle none 925 good		Lead  11.4 soft good 327 none		