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?

_____

Li

Atomic number	3
Physical State	solid
Density	0.534 g/cm^3
Conductivity	good
Melting Point	180^{o}C
Color	silver
Reactivity	very reactive
Ionization energy	5.392

Cl

Atomic number	17
Physical State	gas
Density	0.00321 g/cm^3
Conductivity	very poor
Melting Point	-101^{o}C
Color	greenish yellow
Reactivity	very reactive
Ionization energy	12.967

Se

Atomic number	34
Physical State	solid
Density	4.81 g/cm^3
Conductivity	semi-
Melting Point	221 ^{o}C
Color	gray/red/black
Ionization energy	9.752

N

Atomic number	7
Physical State	gas
Density	0.00125 g/cm^3
Conductivity	poor
Melting Point	-210^{o}C
Color	colorless
Ionization energy	14.534

He

Atomic number	2
Physical State	gas
Density	0.00018 g/cm^3
Conductivity	very poor
Melting Point	-272^{o}C
Color	colorless
Reactivity	almost none
Ionization energy	24.587

Na

Atomic number	11
Physical State	solid
Density	0.971 g/cm^3
Conductivity	good
Melting Point	98^{o}C
Color	silver
Reactivity	very reactive
Ionization energy	5.139

C

Atomic number	6
Physical State	solid
Density	2.10 g/cm^3
Conductivity	good
Melting Point	3550^{o}C
Color	black
Ionization energy	11.26

Ca

Atomic number	20
Physical State	solid
Density	1.57 g/cm^3
Conductivity	good
Melting Point	845^{o}C
Color	silvery white
Reactivity	reactive
Ionization energy	6.113

Be

Atomic number	4
Physical State	solid
Density	1.85 g/cm^3
Conductivity	excellent
Melting Point	1287^{o}C
Color	gray
Reactivity	reactive
Ionization energy	9.322

Ne

Atomic number	10
Physical State	gas
Density	0.00090 g/cm^3
Conductivity	very poor
Melting Point	-249^{o}C
Color	colorless
Reactivity	almost none
Ionization energy	21.564

Br

Atomic number	35
Physical State	gas
Density	3.12 g/cm^3
Conductivity	very poor
Melting Point	-7.2^{o}C
Color	reddish brown
Reactivity	very reactive
Ionization energy	11.814

Sn

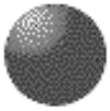
Atomic number	50
Physical State	solid
Density	7.31 g/cm^3
Conductivity	good
Melting Point	232^{o}C
Color	silver
Ionization energy	7.344

In

Atomic number	49
Physical State	solid
Density	7.31 g/cm^3
Conductivity	medium
Melting Point	157^{o}C
Color	silvery white
Ionization energy	5.786

Ba

Atomic number	56
Physical State	solid
Density	3.6 g/cm^3
Conductivity	good
Melting Point	710^{o}C
Color	silvery white
Reactivity	reactive



K

Atomic number	19
Physical State	solid
Density	0.86 g/cm^3
Conductivity	good
Melting Point	63^{o}C
Color	silver
Reactivity	very reactive
Ionization energy	4.341

Ar

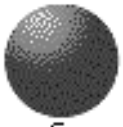
Atomic number	18
Physical State	gas
Density	0.00178 g/cm^3
Conductivity	very poor
Melting Point	-189.2^{o}C
Color	colorless
Reactivity	almost none
Ionization energy	15.759

Ga

Atomic number	31
Physical State	solid
Density	5.904 g/cm^3
Conductivity	medium
Melting Point	30^{o}C
Color	silvery
Ionization energy	5.999

Cs

Atomic number	55
Physical State	solid
Density	1.87 g/cm^3
Conductivity	good
Melting Point	29^{o}C
Color	silvery white
Reactivity	very reactive



O

Atomic number	8
Physical State	gas
Density	0.0013 g/cm^3
Conductivity	poor
Melting Point	-219^{o}C
Color	colorless
Reactivity	reactive
Ionization energy	13.618

P

Atomic number	15
Physical State	solid
Density	1.823 g/cm^3
Conductivity	poor
Melting Point	44.2 ^{o}C
Color	white
Ionization energy	10.486

As

Atomic number	33
Physical State	solid
Density	5.776 g/cm^3
Conductivity	poor
Melting Point	817 ^{o}C
Color	gray
Ionization energy	9.81

Xe

Atomic number	54
Physical State	gas
Density	0.00585 g/cm^3
Conductivity	very poor
Melting Point	-119.9^{o}C
Color	colorless
Reactivity	almost none
Ionization energy	12.13

B

Atomic number	5
Physical State	solid
Density	2.34 g/cm^3
Conductivity	poor at r.t.
Melting Point	2076^{o}C
Color	brown
Ionization energy	8.298

I

Atomic number	53
Physical State	solid
Density	4.93 g/cm^3
Conductivity	very poor
Melting Point	113.5^{o}C
Color	blue-black
Reactivity	very reactive
Ionization energy	10.451

Si

Atomic number	14
Physical State	solid
Density	2.33 g/cm^3
Conductivity	intermediate
Melting Point	1410^{o}C
Color	gray
Ionization energy	8.151

Unknown #2

Atomic number	?
Physical State	gas
Density	0.00170 g/cm^3
Conductivity	very poor
Melting Point	-219.6^{o}C
Color	pale yellow
Reactivity	very reactive
Ionization energy	17.422

Unknown #3

Atomic number	?
Physical State	solid
Density	1.53 g/cm^3
Conductivity	good
Melting Point	39^{o}C
Color	silvery white
Reactivity	very reactive
Ionization energy	4.177

Unknown #4

Atomic number	?
Physical State	gas
Density	0.00374 g/cm^3
Conductivity	very poor
Melting Point	-156.6^{o}C
Color	colorless
Reactivity	almost none
Ionization energy	13.999

Unknown #5

Atomic number	?
Physical State	solid
Density	1.96 g/cm^3
Conductivity	poor
Melting Point	115 ^{o}C
Color	yellow
Reactivity	reactive
Ionization energy	10.36

Sr

Atomic number	38
Physical State	solid
Density	2.54 g/cm^3
Conductivity	good
Melting Point	769^{o}C
Color	silvery white
Reactivity	reactive
Ionization energy	5.695

Unknown #7

Atomic number	?
Physical State	solid
Density	5.32 g/cm^3
Conductivity	fair to poor
Melting Point	937^{o}C
Color	gray
Ionization energy	7.899

Al

Atomic number	13
Physical State	solid
Density	2.7 g/cm^3
Conductivity	medium
Melting Point	303^{o}C
Color	silvery white
Ionization energy	5.986

Unknown #1

Atomic number	?
Physical State	solid
Density	1.74 g/cm^3
Conductivity	good
Melting Point	651^{o}C
Color	silvery white
Reactivity	reactive
Ionization energy	7.646

Unknown #6

Atomic number	?
Physical State	solid
Density	6.69 g/cm^3
Conductivity	poor
Melting Point	631 ^{o}C
Color	bluish-white
Ionization energy	8.641

Tellurium

Atomic number	52
Physical State	solid
Density	6.24 g/cm^3
Conductivity	varies
Melting Point	450^{o}C
Color	silvery gray
Ionization energy	9.009

Teacher’s Instructions

Answers for Unknowns

1. Magnesium (Mg)
2. Fluorine (F)
3. Rubidium (Rb)
4. Krypton (Kr)
5. Sulfur (S)
6. Antimony (Sb)
7. Germanium (Ge)