1. (5 points) Barium is a soft, silvery metal. It reacts rapidly with air, water, and acids but not at all with bases. The melting point of barium is 1000 K and the boiling point is 2170 K. Its density is 3.62 g/cm³.

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft</td>
<td>Reacts rapidly with air</td>
</tr>
<tr>
<td>Silver</td>
<td>Do not react with base</td>
</tr>
<tr>
<td>M.P. 15 1000 K</td>
<td></td>
</tr>
<tr>
<td>B.P. 2170 K</td>
<td></td>
</tr>
<tr>
<td>Density 3.62 g/cm³</td>
<td></td>
</tr>
</tbody>
</table>

2. (4 points) A match is lit and held under a cold piece of metal. Identify each of the following observations as being due either to a physical change or a chemical change.

   a. Soot (carbon) is deposited on the metal  **Chemical - Formation of soot**
   b. The metal gets warmer  **Physical**
   c. The match burns  **Chemical**
   d. Water condenses on the metal  **Physical - Condensation**

3. (10 points) Identify each of the following as a pure substance or a mixture. Further, if it is a pure substance, identify it as an element or a compound. If it is a mixture, identify it as homogeneous or heterogeneous.

   a. A very clean sample of sodium chloride  **Pure Substance - Compound**
   b. Gold bar from Fort Knox  **Pure Substance - Element**
   c. Ocean water with algae floating in it  **Mixture - Heterogeneous**
   d. A slice of bacon  **Mixture - Heterogeneous**
   e. Water from the tap  **Mixture - Homogeneous**
4. (10 points) Make the following conversions. Show your work where applicable. I realize you may do metric conversions in your head in which case you won’t have any work to show.

a. \[ 12.25 \text{ cm} = \frac{122.5}{12.25} \text{ mm} \]

b. \[ 3.75 \times 10^{-12} \text{ kg} = \frac{3.75 \times 10^{-6}}{6} \text{ mg} \]

   6 places right

c. \[ 9.45 \text{ cm}^3 = \frac{9.45}{1} \text{ ml} \]

d. \[ 5.05 \times 10^{-1} \text{ m}^2 = \frac{5.05 \times 10^3}{1} \text{ cm}^2 \]

   (Remember you have to square the conversion)

e. \[ 0.00657 \text{ g} = \frac{6.57}{1} \text{ mg} \]

f. \[ 7.5 \text{ cm} = \frac{0.075}{1} \text{ m} \]

g. \[ 1.3 \text{ m}^3 = \frac{1.3 \times 10^3}{1} \text{ L} \]

   \( 1 \text{ m}^3 = 1000 \text{ ml} \)

h. \[ 175 \text{ ms} = \frac{0.175}{1} \text{ s} \]

i. \[ 81.5 \text{ g H}_2\text{SO}_4 = \frac{5.03 \times 10^3}{1} \text{ atoms S} \]

   \( 98 \text{ g H}_2\text{SO}_4 = 6.022 \times 10^{23} \text{ atoms S} \)

   \( ? \text{ Atoms} = \frac{87.5 \text{ g H}_2\text{SO}_4 \times \frac{23 \text{ Atoms S}}{98 \text{ g H}_2\text{SO}_4}}{1} \)

j. \[ 50 \text{ cm}^3 = \frac{3}{(1 \text{ inch} = 2.54 \text{ cm})} \]

5. (4 points) The density of molybdenum is 10.28 g/cm\(^3\). What volume of molybdenum is required to obtain a mass of 250.0-g? Show your work and report your answer to the proper number of significant figures and with appropriate units.

\[ \frac{250 \text{ g}}{10.28 \text{ g/cm}^3} = 24.32 \text{ cm}^3 \]

6. (4 points) The density of palladium (Pd) is 11.99 g/cm\(^3\) and that of iridium (Ir) is 22.61 g/cm\(^3\). Which would occupy a greater volume – 20.0-g of Pd or 20.0-g of Ir. Explain your reasoning.

Pd: \[ \frac{20.0 \text{ g Pd}}{1} \times \frac{1 \text{ cm}^3}{11.99 \text{ g Pd}} = 1.67 \text{ cm}^3 \text{ Pd} \]

greater volume

Ir: \[ \frac{20.0 \text{ g Ir}}{1} \times \frac{1 \text{ cm}^3}{22.61 \text{ g Ir}} = 0.885 \text{ cm}^3 \text{ Ir} \]
7. (5 points) Check all of the following statements that are true.

✓ The number of protons in the nucleus is given by the atomic number.

___ The atomic weight minus the number of protons gives the number of neutrons in the nucleus.

✓ An ion has a negative charge when it has more electrons than protons.

___ Isotopes are atoms of the same element that differ in the number of protons in the nucleus.

✓ The element $^{79}_{35}Br$ contains 35 protons, 44 neutrons, and 35 electrons.

8. (5 points) Boron has two naturally occurring isotopes – Boron-10 with an atomic mass of 10.013 amu and an abundance of 19.9% and Boron-11 with an atomic mass of 11.009 and an abundance of 80.1%. Calculate the atomic mass of boron – show your work.

$$0.199 \times 10.013 + 0.801 \times 11.009 = 10.8$$

9. (6 points) For each of the following pairs of elements, indicate whether you would expect them to form a molecular compound or an ionic compound.

S and F **Molecular**

Cr and O **Ionic**

Sr and P **Ionic**

C and I **Molecular**

K and Br **Ionic**

F and I **Molecular**

10. (6 points) Write the formula for and name the compound formed from each of the following pairings of elements.

<table>
<thead>
<tr>
<th>Pairing</th>
<th>Formula</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ba and N</td>
<td>$\text{Ba}_2\text{N}_2$</td>
<td>Barium Nitride</td>
</tr>
<tr>
<td>Al and S</td>
<td>$\text{Al}_2\text{S}_3$</td>
<td>Aluminum Sulfide</td>
</tr>
<tr>
<td>Sr and Br</td>
<td>$\text{SrBr}_2$</td>
<td>Strontium Bromide</td>
</tr>
</tbody>
</table>