1. (4 points) Show your work for each of the following.
   a. How many grams of MgBr\(_2\) are contained in 85.00 mL of 0.275 M MgBr\(_2\)?
   b. How many mL of 0.176 M CsBr could be prepared from 25.6 g of CsBr?

2. (6 points) Show your work on each of the following.
   a. The specific heat of liquid mercury is 0.14 J/g-K (or 0.14 J/g-°C, the same thing). How much heat would be required to raise the temperature of 75.0 g of mercury from 25 °C to 40 °C?
   b. The same quantity of heat is added to two blocks. One is 15.0 g of Al and the other 35.0 g of Fe. Which block will experience the largest change in temperature? The specific heat capacity of Al is 0.90 J/g-K and that of Fe is 0.45 J/g-K.
3. (8 points) When a 3.88-g of solid ammonium nitrate dissolves in 60.0-g of water in a coffee-cup calorimeter, the temperature of the water drops from 24.0 °C to 19.4 °C.

a. How much heat does the water lose during the dissolving process?

b. Calculate the enthalpy change (in kJ/mol ammonium nitrate) for the process:

\[
\text{NH}_4\text{NO}_3 (s) \rightarrow \text{NH}_4^+ (aq) + \text{NO}_3^- (aq)
\]

c. Is the dissolving of ammonium nitrate an endothermic or an exothermic process?
4. (4 points) Meals-ready-to-eat (MREs) are military meals that can be heated on a flameless heater. The heat is produced by the following reaction:

\[ \text{Mg(s)} + 2 \text{H}_2\text{O(ℓ)} \rightarrow \text{Mg(OH)}_2 (s) + \text{H}_2 (g) \]

Using the information below, find \( \Delta H^\circ \) for this reaction.

<table>
<thead>
<tr>
<th>Substance</th>
<th>( \Delta H^\circ ) (kJ/mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg (s)</td>
<td>0</td>
</tr>
<tr>
<td>H(_2)O (ℓ)</td>
<td>-285.83</td>
</tr>
<tr>
<td>Mg(OH)(_2) (s)</td>
<td>-924.7</td>
</tr>
<tr>
<td>H(_2) (g)</td>
<td>0</td>
</tr>
</tbody>
</table>

5. (4 points) Given the information below find the enthalpy of formation of acetone, C\(_3\)H\(_6\)O(ℓ). Show your work.

\[ \text{C}_3\text{H}_6\text{O(ℓ)} + 4 \text{O}_2(\text{g}) \rightarrow 3 \text{CO}_2 (\text{g}) + 3 \text{H}_2\text{O (ℓ)} \quad \Delta H^\circ = -1790 \text{ kJ} \]

<table>
<thead>
<tr>
<th>Substance</th>
<th>( \Delta H^\circ ) (kJ/mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_2) (g)</td>
<td>0</td>
</tr>
<tr>
<td>CO(_2) (g)</td>
<td>-393.5</td>
</tr>
<tr>
<td>H(_2)O (ℓ)</td>
<td>-285.83</td>
</tr>
</tbody>
</table>
6. (4 points) Show your work.
   
a. KCCU’s frequency is 89.3 MHz. What is its wavelength?

b. A typical He-Ne laser, like you see in checkout stands and laser pointers, has a wavelength of 632.8 nm. What is the frequency of this laser’s radiation?

7. (5 points) Circle the letter corresponding to each set of quantum numbers that is a possible set.
   
a. $n = 0, \ell = 0, m_\ell = 0, m_s = \frac{1}{2}$

   b. $n = 4, \ell = 2, m_\ell = -1, m_s = -\frac{1}{2}$

   c. $n = -2, \ell = -1, m_\ell = 0, m_s = \frac{1}{2}$

   d. $n = 6, \ell = 5, m_\ell = -3, m_s = \frac{1}{2}$

   e. $n = 2, \ell = 2, m_\ell = 1, m_s = \frac{1}{2}$

8. (5 points) Write the expected electron configuration for each of the following species. You may use the condensed format ([noble gas]) if you wish.
   
a. Sr

   b. As$^{3+}$

   c. Hg

   d. I

   e. P$^{3-}$