Please show your work for all calculations, and report answers to the proper number of significant digits and with the correct units to receive full credit. For calculations, circle your final answer. Use a separate piece of paper to answer these questions.

1. Copy down the following table and fill in the blank cells appropriately. (Or fill in this table and attach to your assignment.) In the symbol column, be sure every entry has an element symbol and a superscript and subscript.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Element Name</th>
<th>Atomic Number</th>
<th>Number of Protons</th>
<th>Number of Neutrons</th>
<th>Number of Electrons</th>
<th>Mass Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Vanadium</td>
<td>23</td>
<td>23</td>
<td>28</td>
<td>23</td>
<td>51</td>
</tr>
<tr>
<td>Pb</td>
<td>Lead</td>
<td>82</td>
<td>82</td>
<td>126</td>
<td>82</td>
<td>208</td>
</tr>
<tr>
<td>Ca</td>
<td>Calcium</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Ar</td>
<td>Argon</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>40</td>
</tr>
</tbody>
</table>

2. Question 2.91 in MSJ

Sulfuric acid \( D = 1.295 \ \text{g/cm}^3 \) \( 38.08\% \) acid by mass

Need 125 g acid

Conversion:

\[
\begin{align*}
\text{38.08 g acid} & \quad 100 \text{ g soln.} \\
\text{1.295 g soln.} & \quad 1 \text{ cm}^3 \text{ soln.} \\
\text{1 mL} & \quad 1 \text{ cm}^3
\end{align*}
\]

\[
\begin{align*}
\frac{125 \text{ g acid}}{38.08 \text{ g acid}} \times \frac{1 \text{ cm}^3 \text{ soln.}}{1 \text{ cm}^3 \text{ soln.}} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} = 255.45 \text{ mL}
\end{align*}
\]

3.5 \text{ mL} \quad 4 \text{ mL} \quad 4.5 \text{ mL} \quad \text{exact} \quad \text{exact} \quad 3.5 \text{ mL} \quad \text{soln. needed}
3. The Vehicle Assembly Building at the Kennedy Space Center has a volume of $3.6665 \times 10^6$ m$^3$.
(a) Convert this volume to liters and express it in scientific notation.

\[
1 \text{ m}^3 = 1000 \text{ L} \]

\[
3.6665 \times 10^6 \text{ m}^3 \times \frac{1000 \text{ L}}{1 \text{ m}^3} = 3.6665 \times 10^9 \text{ L} \]

(b) Convert this volume to a number that can be expressed without exponential notation by using an appropriate SI prefix. (For example $3.1 \times 10^2$ L could be expressed as 31 mL.)

\[
1 \text{ GL} = 1 \times 10^9 \text{ L} \quad (\text{G} = \text{giga})
\]

\[
3.6665 \times 10^9 \text{ L} \times \frac{1 \text{ GL}}{1 \times 10^9 \text{ L}} = \frac{3.6665 \text{ GL}}{5.56} \]

4. Question 2.56 in MSJ

\[ ^{69}\text{Ga} = 68.9257 \text{ amu} \quad ^{71}\text{Ga} = 70.9249 \text{ amu} \]

atomic weight = \( \frac{(\frac{68.9257}{100}) \times (68.9257 \text{ amu}) + (1 - \frac{68.9257}{100}) \times (70.9249 \text{ amu})}{100} \)

(atomic weight from periodic table)

total must be 100% and whatever % is not 69Ga must be 71Ga.

\[ ^{69}\text{Ga} = 69.723 \text{ amu} = X(68.9257 \text{ amu}) + (1 - X)(70.9249 \text{ amu}) \] (divided through by 100)

\[ ^{69}\text{Ga} = x(68.9257 \text{ amu}) + 70.9249 \text{ amu} - X(70.9249 \text{ amu}) \]

\[ -1.202 \text{ amu} = X(-1.9992 \text{ amu}) \]

3 dp: 4.55

\[ x = \frac{-1.202 \text{ amu}}{-1.9992 \text{ amu}} = 0.6011 \]

\[ \frac{0.6011}{100} = 0.06011 \quad [60.1\% \text{ } ^{69}\text{Ga}] \]

\[ 100 - 60.1\% = 39.9\% \quad [71\% \text{ } ^{71}\text{Ga}] \]