Practice Unit Conversion

Liquid measurements in the metric system are made in units based on the liter. The following information can be used to calculate metric volume conversions.

\[
\begin{align*}
1 \text{ L (liter)} & = 1000 \text{ ml (milliliters)} = 10^3 \text{ ml} \\
1 \text{ L} & = 1,000,000 \text{ µl (microliters)} = 10^6 \text{ µl}
\end{align*}
\]

\[
\begin{align*}
1 \text{ ml} & = 0.001 \text{ L} = 10^{-3} \text{ L} \\
1 \text{ ml} & = 1,000 \text{ µl} = 10^3 \text{ µl} \\
1 \text{ µl} & = 0.000001 \text{ L} = 10^{-6} \text{ L}
\end{align*}
\]

Sample Metric Conversion

\[
\frac{1 \text{ ml}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ ml}} \times \frac{1,000,000 \text{ µl}}{1 \text{ L}} = 1,000 \text{ µl}
\]

1. **Metric conversion**: Complete the following.
   a. \(1 \text{ ml} = \underline{1,000}\) microliters
   d. \(1 \text{ µl} = \underline{\quad}\) ml
   b. \(0.01 \text{ ml} = \underline{\quad}\) microliters
   e. \(20 \text{ µl} = \underline{\quad}\) ml
   c. \(0.1 \text{ ml} = \underline{\quad}\) microliters
   f. \(2 \text{ ml} = \underline{\quad}\) µl

2. Put the following volumes in order from smallest to largest.
   a. \(2.5 \text{ ml} \quad 250 \text{ µl} \quad 0.025 \text{ ml} \quad 2.5 \text{ µl}\)
   b. \(100 \text{ µl} \quad 0.01 \text{ ml} \quad 250 \text{ µl} \quad 0.015 \text{ ml}\)

3. Explain the reason for each of the following rules:
   a. Always use the micropipet within its designated range:
   b. Always use a disposable tip on a micropipet:
   c. Always hold a loaded micropipet in a vertical position:
   d. Always release the micropipet plunger slowly:
Micropipet Ranges

4. For each micropipet (A, B, C, and D) indicate the size of the micropipet, the range for that micropipet, and the set volume (the first column is filled out as an example).

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<thead>
<tr>
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<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>P-1000</td>
<td>200-20</td>
<td>200-0</td>
<td>0.6-10</td>
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<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
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<tr>
<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
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<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>Size (P-?)</td>
<td>P-1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range:</td>
<td>200 – 1000 µl</td>
<td></td>
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<tr>
<td>Volume:</td>
<td>550 µl</td>
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5. Select the appropriate micropipet and show what the dial should read to measure each of the following volumes: 150 µl, 1.5 µl, 300 µl, and 17.3 µl. Write the amount on the line beneath each drawing.

Microcentrifuge

6. Why is it important to balance a microcentrifuge before turning it on?

7. Show how you would arrange the given number of tubes in each of the microcentrifuges. Indicate any added tubes used to balance the microcentrifuge.

a. 3 tubes  
b. 4 tubes  
c. 5 tubes