Chemistry 11 - UNIT 3
Measurement Unit Review Package

1. Give the standard base unit name and symbol to complete the chart below

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Length</th>
<th>Mass</th>
<th>Time</th>
<th>Temperature</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>meters</td>
<td>grams</td>
<td>seconds</td>
<td>celsius</td>
<td>moles</td>
</tr>
<tr>
<td>Symbol</td>
<td>m</td>
<td>g</td>
<td>s</td>
<td>c</td>
<td>mol</td>
</tr>
</tbody>
</table>

2. Fill in the blanks below to complete the metric prefix table

<table>
<thead>
<tr>
<th>Prefix Name</th>
<th>Prefix Symbol</th>
<th>Exponential Equivalent</th>
<th>Prefix Name</th>
<th>Prefix Symbol</th>
<th>Exponential Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>giga</td>
<td>g</td>
<td>$10^9$</td>
<td>deci</td>
<td>d</td>
<td>$10^{-1}$</td>
</tr>
<tr>
<td>mega</td>
<td>M</td>
<td>$10^6$</td>
<td>centi</td>
<td>c</td>
<td>$10^{-2}$</td>
</tr>
<tr>
<td>kilo</td>
<td>k</td>
<td>$10^3$</td>
<td>milli</td>
<td>m</td>
<td>$10^{-3}$</td>
</tr>
<tr>
<td>hecta</td>
<td>h</td>
<td>$10^2$</td>
<td>micro</td>
<td>µ</td>
<td>$10^{-6}$</td>
</tr>
<tr>
<td>deka</td>
<td>da</td>
<td>$10^1$</td>
<td>nano</td>
<td>n</td>
<td>$10^{-9}$</td>
</tr>
</tbody>
</table>

3. Common conversion factors in chemistry: (.5 mark each)
   - How many kilograms equal 1 ton? $10^3$ kg
   - How many milliliters equal 1 cubic centimeter? 1 mL
   - How many liters equal 1 cubic meter? $10^3$ L

4. Write chemistry's general formula for density: $d = \frac{m}{V}$

5. Density is **independent** of amount

6. Label the... written prefix, written unit, exponential equivalent, prefix symbol, unit symbol(s)
   (WP) (WU) (EE) (PS) (US)
   
   $13 \text{ gigatons} = 13 \text{ Gt} = 13 \times 10^6 \text{ t}$
7. Re-write the following using *prefix* and *unit symbols*
   a. 2.5 centigrams \[ 2.5 \text{ cg} \]
   b. 5.17 deciseconds \[ 5.17 \text{ ds} \]
   c. 6.5 millimoles \[ 6.5 \text{ mmol} \]

8. Re-write the following using *written prefixes* and *units*
   a. \( 4.3 \times 10^{-9} \text{ g} \) \[ 4.3 \text{ nanograms} \]
   b. \( 8.68 \times 10^{-1} \text{ L} \) \[ 8.68 \text{ decalitres} \]
   c. \( 1.94 \times 10^{-2} \text{ m} \) \[ 1.94 \text{ hectometers} \]

9. Re-write the following using *exponential equivalents*
   a. 3.2 Mt \[ 3.2 \times 10^{6} \text{ t} \]
   b. 7.68 µL \[ 7.68 \times 10^{-6} \text{ L} \]
   c. 8.7 Gs \[ 8.7 \times 10^{9} \text{ s} \]

10. Convert to base units using proper conversion factors
    a. 3.271 Gt \[ 3.271 \text{ Gt} \left( \frac{10^{9} \text{ t}}{1 \text{ Gt}} \right) = 3.271 \times 10^{9} \text{ t} \]
    b. 9.64 µm \[ 9.64 \text{ µm} \left( \frac{10^{-6} \text{ m}}{1 \text{ µm}} \right) = 9.64 \times 10^{-6} \text{ m} \]
    c. 8.05 das \[ 8.05 \text{ das} \left( \frac{10^{8} \text{ s}}{1 \text{ das}} \right) = 80.5 \text{ s} \]
11. Explain the following terms. Use diagrams if needed (1 mark each)
   • **Accuracy**: how close a measurement is to the true (or accepted) value
   • **Precision**: how close repeated measurements can agree with each other

12. A "calibration weight" has a mass of exactly 1.000 000 g. A student uses 4 different balances to check the mass of the weight. The results of weighings are shown below.

   Mass using balance A = 0.901 453 g  
   Mass using balance B = 1.00 g  
   Mass using balance C = 0.999 999 g  
   Mass using balance D = 2.0 g

   a. Which of the balances give precise weighings?  
   b. Which of the balances give accurate weighings?  
   c. Which balance is both accurate and precise?

13. For each value below, decide if it was most likely obtained by measurement (M) or counting (C)

   a. 0.50 grams  
   b. 6 atoms  
   c. 24 students  
   d. 400 cm  
   e. 2.60 liters  
   f. 20 km/hr

14. How many significant figures are in each of the following (1 mark each)

   a. 123.456 g  
   b. 12.0001 µmol  
   c. 12 000 m  
   d. 1.345 x 10⁻⁴ cL  
   e. 0.000234 s  
   f. 123.456000 kt

15. Determine the precise measurement for the following scales.
   Answer must have correct sig figs (including uncertainty) and include units

   ![Temperature Scale](image1)
   ![Pressure Scale](image2)

   - 10.0 cm  
   - 705 kPa  
   - -27.0°C
16. Perform the operation and report the answer with the correct number of sig figs.
   a. \((11.4) \times (0.0218) = 0.249\ \text{3sf}\)
   b. \((11.4) + (0.0218) = 11.4\ \text{1dp}\)
   c. \([[(11.4) + (0.0218)]] = 46.0\ \text{3sf}\)

\([(11.4) \times (0.0218)]

17. A halite (rock salt) crystal has a mass of 43.814 g and a density of 2.56 g/cm\(^3\). Determine the volume of the sample.

\[
v = \frac{m}{d} = \frac{43.814 \text{ g}}{2.56 \text{ g/cm}^3} = 17.115 \text{ cm}^3 = 1.71 \times 10^1 \text{ cm}^3
\]

18. There were 62.0 g of a substance dissolved in 300 mL of a solution. What is the solubility of that substance? Hint: derived quantity = g/mL

\[
\text{solubility} = \frac{62.0 \text{ g}}{300 \text{ mL}} = 2 \times 10^{-1} \text{ g/mL}
\]

19. If 1 L of granite has a mass of 5.50 kg, what is the mass, in grams of 5.00 mL?

\[
\text{mass} = 5.00 \text{ mL} \left( \frac{10^{-3} \text{ L}}{1 \text{ mL}} \right) \left( \frac{5.50 \text{ kg}}{1 \text{ L}} \right) \left( \frac{10^3 \text{ g}}{1 \text{ kg}} \right)
\]

\[
= 5.00 \times 10^{-3} \times 5.50 \times 10^3
\]

\[
= 27.5 \times 10^0 \text{ g}
\]

20. A weather satellite orbits Earth at an altitude of 1,350,000 meters. What is that altitude in kilometers?

\[
\text{altitude} = 1,350,000 \text{ m} \left( \frac{1 \text{ km}}{10^3 \text{ m}} \right)
\]

\[
= 1.35 \times 10^3 \text{ km}
\]

21. One cereal bar has a mass of 37 g. What is the mass of 6 cereal bars? Is that mass of 6 cereal bars, more than or less than 1 kg? Do you like cereal bars?

\[\text{mass} = 37 \text{ g} \times 6 \text{ bars} = 222 \text{ g}
\]

\[\text{mass} = \frac{222 \text{ g}}{10^3 \text{ g}} = 0.222 \text{ kg}
\]

\[= 2.22 \times 10^{-1} \text{ kg} < 1 \text{ kg}
\]

\[\text{No}
\]