Work in groups on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help.

Q1

Complete the following table by writing the formula of the compound formed by the combination of the cation in the top row with the anion in the left column. Then enter the compound name, and finally compute and enter the molar mass of the compound. The first box is completed as an example.

<table>
<thead>
<tr>
<th>ion</th>
<th>Na⁺</th>
<th>Fe²⁺</th>
<th>NH₄⁺</th>
<th>Cr³⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl⁻</td>
<td>NaCl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO₃⁻</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO₄²⁻</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N₃⁻</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₂⁻</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Aniline is an organic compound in a functional class of compounds referred to as amines. It has been an important raw material used to produce dyes and photographic chemicals. The chemical company GAF has its name come from aniline: General Aniline Fineries. The formulas of organic molecules are written in a manner to show the arrangement of atoms that are common to the functional class of compounds; for amines it is -NH₂. The complete molecular formula for aniline is C₆H₅NH₂

1. How many carbon atoms are there in one molecule of aniline? _____
2. How many hydrogen atoms are there in one molecule of aniline? _____
3. How many nitrogen atoms are there in one molecule of aniline? _____
4. What is the molar mass of aniline? ________

3. Glucose (blood sugar) is a carbohydrate. The term carbohydrate comes from the relationship of carbon to
water in the molecular formula. For glucose the formula can be written as \( C_6(H_2O)_6 \).

1. How many carbon atoms are there in one molecule of glucose? _____
2. How many hydrogen atoms are there in one molecule of glucose? _____
3. How many oxygen atoms are there in one molecule of glucose? _____

4. The molecular formulas of organic compounds are formally written as follows: \( C_xH_y \) followed by the remaining atoms in alphabetical order. For aniline this would be \( C_6H_7N \), for glucose it would generically be: \( C_xH_yO_z \).

1. Write the molecular formula for glucose correctly. _________________
2. How many grams of glucose are present in 1 mole of glucose? _________________
3. How many grams of glucose are present in \( 6.02 \times 10^{23} \) molecules of glucose? _________________
4. How many moles of oxygen atoms are present in 1 mole of glucose? _________________
5. How many moles of oxygen are present in 1 mole of glucose? _________________
6. How many moles of hydrogen atoms are present in \( 6.02 \times 10^{23} \) molecules of glucose? _________________
7. How many carbon atoms are present in \( 6.02 \times 10^{23} \) molecules of glucose? _________________

5. Determine the molar mass of each of the following compounds:

1. Acetic acid, \( CH_3COOH \) (present in vinegar) _________________
2. Dimethyl ether, \( CH_3OCH_3 \) (anesthetic) _________________
3. Butane, \( C_4H_{10} \) (lighter fluid) _________________
4. Citric acid, \( H_3C_6H_5O_7 \) (essential for respiration & found in soft drinks) _________________

6. How many moles of ethanol, \( CH_3CH_2OH \), are equal to \( 3.37 \times 10^{25} \) ethanol molecules?

7. How many acetone, \( CH_3COCH_3 \), molecules are in a 0.89 mole sample?

8. What is the mass of 100 billion billion \( (100 \times 10^9 \times 10^9) \) water molecules?