Mole & Molar Worksheet

For math problems, show all your work, including correct units and sig figs.

1. What atom is used as the standard in the relative scale for atomic masses?
   
   \[
   \text{carbon-12}
   \]

2. What is the assigned mass of this atom in atomic mass units (amu’s)?
   
   \[12 \text{ amu’s}\]

3. What is the atomic mass of an atom if its mass is approximately equal to the following?
   
   a. \(1/3\) that of carbon-12
   
   \[12 \text{amu} \times \frac{1}{3} = 4 \text{ amu’s}\]

   b. 4.5 times as much as carbon-12
   
   \[12 \text{amu} \times 4.5 = 54 \text{ amu’s}\]

4. What is the definition of a mole?
   
   The number of atoms in exactly 12 grams of carbon-12.

5. What is the abbreviation for mole?
   
   \[\text{mol}\]

6. How many particles are in one mole?
   
   \[6.022 \times 10^{23}\]

7. What is the number of particles in a mole called?
   
   molar quantity or Avogadro's number

8. What is the molar mass of an element?
   
   It is the mass of 1 mole of atoms of that element.
9. To the tenth’s digit, write the molar masses of:
   a. Carbon
      \[12.0\, \text{g}\]
   b. Neon
      \[20.2\, \text{g}\]
   c. Carbon monoxide, CO
      \[12.0\, \text{g} + 16.0\, \text{g} = 28.0\, \text{g}\]
   d. Iron (III) oxide, Fe₂O₃
      \[55.9\, \text{g} + 16.0\, \text{g} = 159.9\, \text{g}\]
   e. Water, H₂O
      \[1.0\, \text{g} + 16.0\, \text{g} = 18.0\, \text{g}\]
   f. Iron
      \[55.9\, \text{g}\]
   g. Aluminium
      \[27.0\, \text{g}\]
   h. Lead(II) nitrate, Pb(NO₃)₂
      \[207.2\, \text{g} + 14.0\, \text{g} + 16.0\, \text{g} = 237.2\, \text{g}\]
   i. Glucose, C₆H₁₂O₆
      \[12.0\, \text{g} + 1.0\, \text{g} + 16.0\, \text{g} = 180.0\, \text{g}\]
   j. Octane, C₈H₁₈
      \[12.0\, \text{g} + 1.0\, \text{g} = 114.0\, \text{g}\]
   k. Tin
      \[118.7\, \text{g}\]
   l. Strontium
      \[87.6\, \text{g}\]
   m. Calcium phosphate, Ca₃(PO₄)₂
      \[40.1\, \text{g} + 31.0\, \text{g} = 71.0\, \text{g}\]
   n. Sodium chloride, NaCl
      \[23.0\, \text{g} + 35.5\, \text{g} = 58.5\, \text{g}\]

10. What is the mass, to the tenth of a gram, of each of the following?
   a. 1.00 mol lithium
      \[6.9\, \text{g}\]
   b. 1.00 molar mass of zinc
      \[65.4\, \text{g}\]
   c. \(6.022 \times 10^{23}\) atoms of beryllium
      \[9.0\, \text{g}\]
   d. 1.00 mol of calcium hydroxide, Ca(OH)₂
      \[40.1\, \text{g} + 16.0\, \text{g} + 1.0\, \text{g} = 77.1\, \text{g}\]
   e. 1.00 molar mass of
   f. \(6.022 \times 10^{23}\) molecules of carbon dioxide
      \[12.0\, \text{g} + 16.0\, \text{g} = 44.0\, \text{g}\]