Green Chemistry Metrics Equations

- **E Factor** = \( \frac{\text{Total waste (kg)}}{\text{kg product}} \)

- **Effective mass yield (%)** = \( \frac{\text{Mass of products} \times 100}{\text{Mass of non–benign reagents}} \)

- **Atom economy** = \( \left( \frac{\text{m.w. of product C}}{\text{m.w. of A + m.w. of B}} \right) \times 100 \)

- **Atom economy** = \( \left( \frac{\text{m.w. of product G}}{\text{m.w. of A + m.w. of B + m.w. of D + m.w. of F}} \right) \times 100 \)

- **Mass Intensity (MI)** = \( \frac{\text{Total mass used in the process (kg)}}{\text{Mass of product (kg)}} \)

- **E Factor = MI – 1** = \( \frac{\text{Total mass used in process – mass of product}}{\text{Mass of product}} \)

- **Mass productivity** = \( \frac{1}{\text{MI}} \times 100 \)

  \[ = \frac{\text{Mass product}}{\text{Total mass in process}} \times 100 \]

- **% Carbon efficiency** = \( \frac{\text{Amount of carbon in product} \times 100}{\text{Total carbon present in reactants}} \)

- **Carbon efficiency** = \( \frac{\text{no.of moles of product} \times \text{no.of carbons in product} \times 100}{(\text{moles of A} \times \text{carbons in A}) + (\text{moles of B} \times \text{carbons in B})} \)

- **RME** = \( \frac{\text{mass of product C}}{\text{mass of A + mass of B}} \)