Comparing Carbon From Equal-Mass Samples

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A classroom model compares two samples: acetic acid, $C_2H_4O_2$, and glucose, $C_6H_{12}O_6$. Each pure sample has mass 18.0 g. In a counting simulation, each carbon atom in a sample becomes part of one carbon dioxide molecule. The simulation provides enough oxygen for that conversion.

Sample	Molecular formula	Molar mass used in model (g/mol)
Acetic acid	$C_2H_4O_2$	60.0
Glucose	$C_6H_{12}O_6$	180.0

1 Which sample contains more moles of molecules before the conversion?

(1) Acetic acid

(2) Glucose

(3) Both contain the same amount.

(4) The formulas give no information about the amounts.

2 Calculate the amount of carbon dioxide predicted for each sample. Show how the carbon subscript enters the calculation. [1]

Answer and work

3 A student sees the same amount of carbon dioxide and concludes that the original samples contained the same number of molecules. Evaluate the claim. [1]

Answer and work

A new unknown is a pure 18.0 g sample of one of the two substances. An independent model measurement reports 0.100 mol of original molecules.

4 Identify the unknown from the independent record and explain why the carbon dioxide measurement alone could not distinguish it. [1]

Answer and work