

Competition Corner: Composition Claims g10_u01_w02 | audit the assumptions

Safe challenge: Analyze only supplied paper data. No heating, dissolution, collection, or chemical procedure is requested. Frozen values: H 1.008, O 15.999, Mg 24.305, S 32.060, Ca 40.078, C 12.011.

1. A 15.00 g hydrate record leaves 7.50 g anhydrous MgSO_4 after a model-assigned water loss. Determine x in $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$, then state why one mass-loss card alone cannot prove chemical identity.

2. A 20.0 g mineral model is a mixture of CaCO_3 and inert material. Two analysts report 3.52 g and 3.80 g CO_2 from comparable cards. Calculate each inferred percent CaCO_3 and give two reasons the difference does not automatically mean one analyst created or destroyed matter.

3. A purity card assigns 4.50 g MgO to a 5.00 g powder. A second card says the Mg signal corresponds to 4.40 g MgO . Which purity estimate is larger? Quantify the difference and propose a calibration or interference check.

4. A student says, “36% water means every hydrate has 36 waters.” Correct the statement with a mass-percent versus mole-ratio explanation using $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.
