Tracking Oxygen in a Copper Pigment Model

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

A ceramics class studies a model of copper oxide pigment. An initial solid contains copper(I) oxide, Cu_2O. When the solid takes up oxygen from the air, it can become copper(II) oxide, CuO. The model assumes that no copper leaves and that no other reaction changes the mass.

___ $Cu_2O(s)$ + ___ $O_2(g)$ → ___ $CuO(s)$

1 Give the smallest whole-number coefficients that balance the equation in the order shown. Explain how the oxygen atoms balance. [1]

Answer and work

2 How does the oxidation number of copper change as Cu_2O becomes CuO?

(1) It decreases from +2 to +1.

(2) It increases from +1 to +2.

(3) It stays at +1.

(4) It changes from 0 to +2.

The class models an initial 7.15 g sample of Cu_2O. If all of it changed to CuO, the product would have a mass of 7.95 g. A second model run starting with the same mass gives 7.55 g of solid.

3 Calculate the mass of oxygen that entered the solid in the second run. Show how the sample masses support the answer. [1]

Answer and work

4 Under the model, what fraction of the starting Cu_2O reacted in the second run? Use the complete-conversion mass for comparison. [1]

Answer and work