Finding Redox Without a Wire Reading

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

A classroom model allows Fe^{2+} and Ce^{4+} to react. In the model Fe^{2+} loses one electron and becomes Fe^{3+}. Ce^{4+} gains one electron and becomes Ce^{3+}. The display can either mix the ions directly or keep them in two parts where electrons pass through an external wire. Its meter counts only electrons through that wire. In the separated test, other ions keep charge balanced, but the Fe and Ce particles stay in their own parts.

Model test	**Fe^{3+} formed (model units)**	**Ce^{3+} formed (model units)**	**Electrons recorded through wire (model units)**
Two parts connected by wire	4	4	4
Ions mixed directly without wire	4	4	0

1 Which change represents oxidation in this model?

(1) Fe^{2+} becoming Fe^{3+}

(2) Fe^{3+} becoming Fe^{2+}

(3) Ce^{4+} becoming Ce^{3+}

(4) The two product amounts staying equal

2 Use the matched product amounts to explain why the electron losses and gains balance in the direct-mix test. [1]

Answer and work

3 A student says the zero wire reading proves no electron transfer occurred in the mixed test. Evaluate the claim using the two product records. [1]

Answer and work

Another model test puts the ions in separate parts and disconnects the wire. Its only possible electron path between those parts would be through the wire.

4 Predict whether the model can form the same products in this disconnected setup. Explain using the difference from the direct-mix test. [1]

Answer and work