Following Iron Ions Through a Color Cycle

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

A simulation represents a closed solution containing Fe^{2+} and Fe^{3+}. Its indicator reading increases when the amount of Fe^{3+} increases. Students track the iron ions during two steps. The total iron stays dissolved and the only iron change is between these two ions.

Stage	**Fe^{2+} amount (mmol)**	**Fe^{3+} amount (mmol)**
Start	8.0	2.0
After step 1	3.0	7.0
After step 2	6.0	4.0

1 Which description fits the iron change during step 1?

(1) Fe^{3+} gains electrons and becomes Fe^{2+}.

(2) Fe^{2+} loses electrons and becomes Fe^{3+}.

(3) Fe^{2+} gains protons and becomes Fe^{3+}.

(4) Fe^{3+} loses protons and becomes Fe^{2+}.

2 Calculate the amount of electrons accepted by the iron ions during step 2. Show how the ion count changes enter the result. [1]

Answer and work

The indicator reading remains above its starting value after step 2. A student claims that more iron entered the solution.

3 Use the table to explain why the indicator can stay above its starting value while the total iron amount stays the same. [1]

Answer and work

4 What change to the remaining Fe^{3+} would restore both original amounts? State the direction of electron transfer and how much iron must change. [1]

Answer and work