Electron Transfer in Cells

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Oxidation releases electrons. Reduction consumes electrons. In the cell model, electrons move through an external wire and ions can move through a salt bridge.

1 Which half reaction releases electrons to the wire?

(1) $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

(2) $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

(3) $Ag^+(aq) + e^- \rightarrow Ag(s)$

(4) $Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$

2 Explain why an external wire and a salt bridge play different roles in a cell. [1]

Answer and work

3 Which quantity must match when two half reactions are combined?

(1) Electrons released and electrons consumed

(2) Number of different metals in each equation

(3) Number of solid products in each equation

(4) Color of the two solutions

4 In the half reaction $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$, explain what happens to the copper ions. [1]

Answer and work

Model Zinc–Copper Cell

Use the information below to answer the questions.

The model runs the two half reactions shown in the table. A wire connects the metal electrodes. A salt bridge allows ions to move between the two solutions.

Side	Half reaction
Zinc	$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$
Copper	$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

5 In which direction do electrons travel through the wire?

(1) From the zinc side to the copper side

(2) From the copper side to the zinc side

(3) From the salt bridge to both metals

(4) From the water to the salt bridge

6 How many Cu^{2+} ions can be reduced when three Zn atoms are oxidized? Show the electron balance. [1]

Answer and work

7 Which movement helps offset the extra positive charge that appears in the zinc solution?

(1) Anions move toward the zinc solution.

(2) Cations move toward the zinc solution.

(3) Electrons leave the external wire and enter the salt bridge.

(4) Zinc nuclei move through the copper metal.

8 Which metal electrode tends to gain mass as the cell runs? Explain using its half reaction. [1]

Answer and work