

9 Electrochemistry - cells and electrolysis – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
galvanic cell	原电池	_____
electrolytic cell	电解池	_____
anode	阳极	_____
cathode	阴极	_____
cell potential	电池电势	_____
electrolysis	电解	_____
Faraday's law	法拉第定律	_____

Recall

You have seen electricity and chemistry meet before:

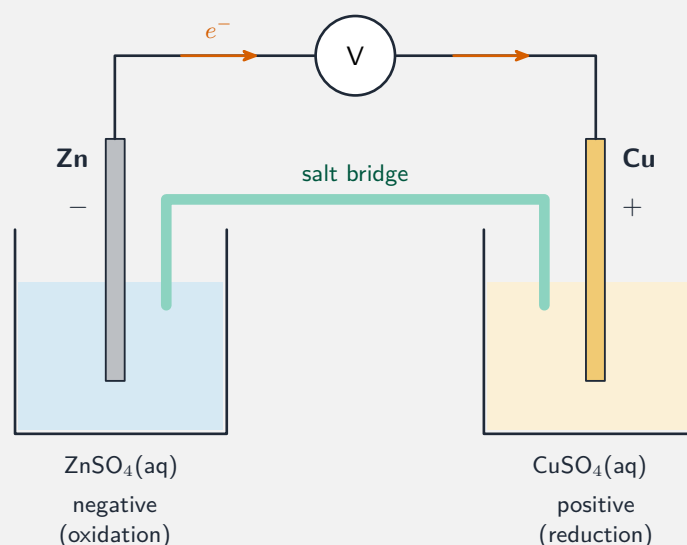
- A battery uses a chemical reaction to push a current.
- Electrolysis uses a current to split compounds (like water or molten salts).
- Redox reactions move electrons.

This sheet lines up how chemical reactions and electricity connect. Each idea has a worked example.

New ideas

■ 1 Two kinds of cell

A redox reaction can push electrons through a wire:



- A **galvanic cell** 原电池 uses a favorable reaction to **produce** electricity (a battery).
- An **electrolytic cell** 电解池 uses electricity to **force** an unfavorable reaction.

■ 2 Anode and cathode

In both, **oxidation** happens at the **anode** 阳极 and **reduction** at the **cathode** 阴极.

■ 3 Cell potential

The **cell potential** 电池电势 E_{cell}° measures the driving force in volts:

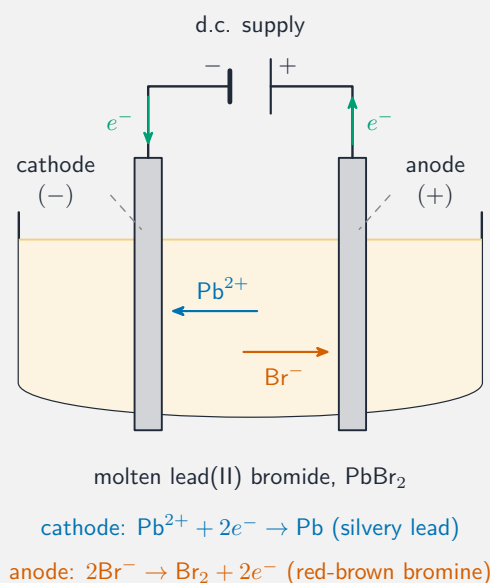
$$E_{\text{cell}}^{\circ} = E_{\text{cathode}}^{\circ} - E_{\text{anode}}^{\circ}.$$

A **positive** value means the reaction runs on its own (a working battery).

Worked example. A copper–zinc cell has $E_{\text{cell}}^{\circ} = E_{\text{cathode}}^{\circ} - E_{\text{anode}}^{\circ} = 0.34 - (-0.76) = 1.10 \text{ V}$ –positive, so it works as a battery.

■ 4 Electrolysis and charge

In **electrolysis** 电解, the amount of product depends on the charge passed (**Faraday's law** 法拉第定律). Charge = current $\times$ time.



Worked example. A current of 2.0 A for 30 min passes charge $Q = It = 2.0 \times 1800 = 3600$ C, which is $\frac{3600}{96485} = 0.037$ mol of electrons.

Watch out: oxidation is always at the **anode** and reduction at the **cathode** – in both galvanic and electrolytic cells. A handy memory: "an ox" (anode = oxidation), "red cat" (cathode = reduction).

Practice

Try these in order. The methods are all above.

2.1 State the difference between a galvanic cell and an electrolytic cell. [2]

2.2 State which electrode (anode or cathode) is where oxidation happens. [1]

2.3 A cell has $E^\circ_{\text{cathode}} = +0.80$ V and $E^\circ_{\text{anode}} = -0.44$ V. Find the cell potential. [2]

2.4 State what a positive cell potential tells you about the reaction. [1]

2.5 A current of 1.5 A flows for 20 minutes. Find the charge passed. [2]