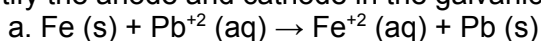


Galvanic Cells

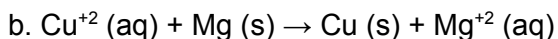
This worksheet will cover [galvanic cells](#) and their components, such as anodes, cathodes, wires, salt bridges, and electrolyte solutions. It will discuss what occurs at these parts and how the galvanic cell converts chemical energy into electrical energy. As you progress through the worksheet, you will develop the skills necessary to determine the reactions occurring at the anode and cathode, how the electrodes change in mass over time, and the placement of the components.

Practice Questions:

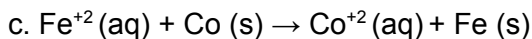
1. Identify the anode and cathode in the galvanic cells represented by the following equations.



- i. Anode:
- ii. Cathode:



- iii. Anode:
- iv. Cathode:



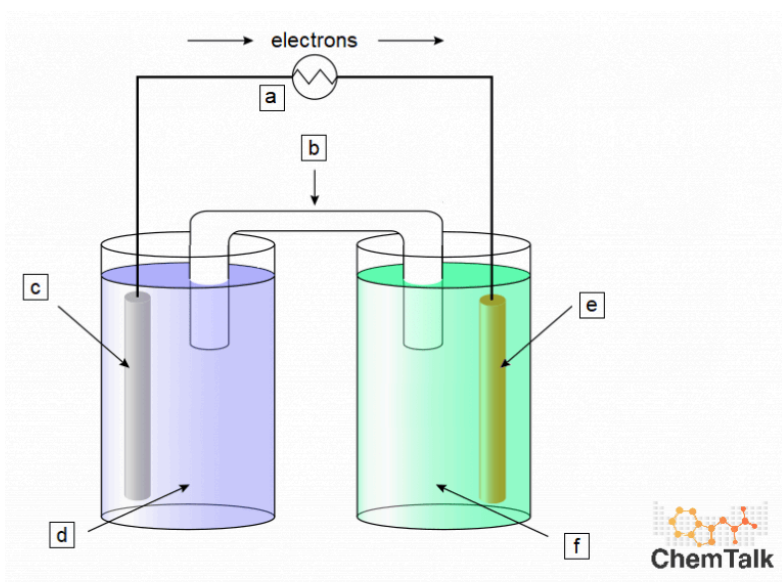
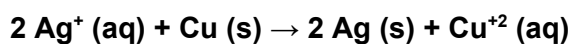
- v. Anode:
- vi. Cathode:

2. What parts must a galvanic cell have to properly function?

3. Does cathode mass decrease or increase? Does anode mass increase or decrease? Why?

4. In what direction do the electrons travel over the wire? (cathode → anode OR anode → cathode)

5. a. The galvanic cell will mediate this reaction:



Using this word box, label the parts of the cell.

Ag cathode	Voltmeter	AgNO ₃ solution
Cu anode	Cu(NO ₃) ₂ solution	salt bridge

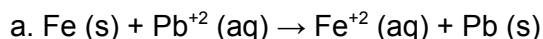
b. What compound could be used in the salt bridge? Why?

ANSWER KEY
Galvanic Cells

Practice Questions:

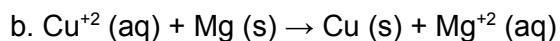
1. Identify the anode and cathode in the galvanic cells represented by the following equations.

Oxidation occurs at the anode (electrons are lost), whereas reduction occurs at the cathode (electrons are gained). Thus, the anode element will lose electrons in the forward reaction, and the cathode element will gain electrons.



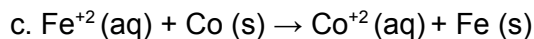
vii. Anode: **Fe**

viii. Cathode: **Pb**



ix. Anode: **Mg**

x. Cathode: **Cu**



xi. Anode: **Co**

xii. Cathode: **Fe**

2. What parts must a galvanic cell have to properly function?

Every galvanic cell must have:

- 1) an oxidation half-cell where electrons will be lost
 - a) anode and solution with corresponding metal ion and counter ion
- 2) a reduction half-cell where electrons will be gained
 - a) cathode and solution with corresponding metal and same counter ion
- 3) a wire connecting the two cells (may have a voltmeter)
- 4) salt bridge to maintain charge balance with inert salt containing same counter ion

3. Does cathode mass decrease or increase? Does anode mass increase or decrease? Why?

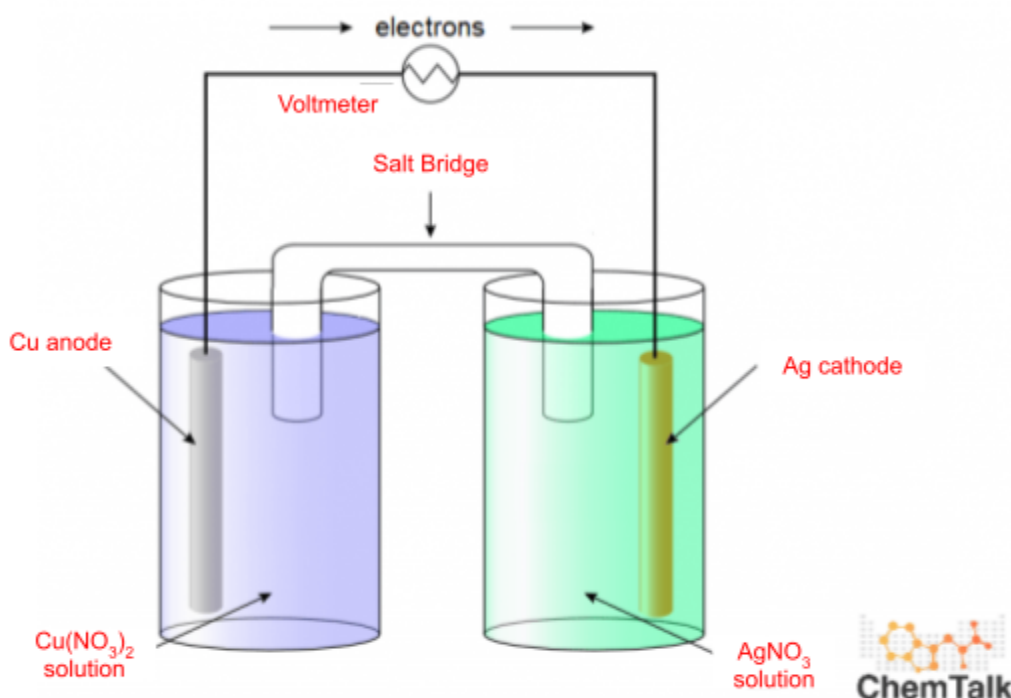
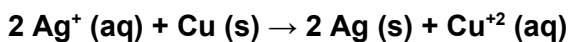
Cathode mass will increase. As electrons travel down the cathode from the oxidation half-cell, the electrons contact the reduction half-cell ion solution. The cations in the reduction half-cell are reduced and deposited on the surface of the cathode, adding to the mass of the solid cathode.

Anode mass will decrease. As electrons leave the anode metal, the metal is oxidized to cations, entering the solution.

4. In what direction do the electrons travel over the wire? (cathode → anode OR anode → cathode)

Electrons travel over the wire from the anode, which loses electrons as the site of oxidation, to the cathode, which gains electrons as the site of reduction.

5.
c. The galvanic cell will mediate this reaction:



Using this word box, label the parts of the cell.

Ag cathode	Voltmeter	AgNO ₃ solution
Cu anode	Cu(NO ₃) ₂ solution	salt bridge

- d. What compound could be used in the salt bridge? Why?

Neutral compounds containing NO₃ could be used, such as KNO₃, NaNO₃, and LiNO₃. NO₃ would be required as it is in the half-cell solutions. The cation of this salt bridge compound would enter the reduction half-cell to balance out the charge and replace

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lost Cu^{+2} ions. The anion of this salt bridge compound would enter the oxidation half-cell to balance out the Ag^+ entering the solution.