

# Batteries

## Roshetta

Type of cells	Primary cells “Non-rechargeable”			Secondary cells “Rechargeable”	
Name of cell	Daniel cell	Mercury cell	Fuel cell	Lead-acid battery	Lithium-ion battery
Anode	Zinc	Zinc	H <sub>2</sub> gas “passing through porous carbon layer”	Lead	Lithium graphite “LiC <sub>6</sub> ”
Cathode	Copper	HgO “Mercuric oxide”	O <sub>2</sub> gas “passing through porous carbon layer”	PbO <sub>2</sub> “Lead dioxide”	LiCoO <sub>2</sub> “Lithium cobalt oxide”
Electrolyte	Na <sub>2</sub> SO <sub>4</sub>	KOH solution	KOH solution	Dil. H <sub>2</sub> SO <sub>4</sub>	LiPF <sub>6</sub> “Anhydrous Lithium hexa-floro phosphate”
Oxidation reaction	Zn $\xrightarrow{\text{oxid.}}$ Zn <sup>2+</sup> + 2e <sup>-</sup>	Zn <sup>0</sup> $\xrightarrow{\text{oxid.}}$ Zn <sup>2+</sup> + 2e <sup>-</sup>	2H <sub>2</sub> + 4OH $\xrightarrow{\text{oxid.}}$ 4H <sub>2</sub> O + 4e <sup>-</sup>	Pb + SO <sub>4</sub> <sup>2-</sup> $\xrightarrow{\text{oxid.}}$ PbSO <sub>4</sub> + 2e <sup>-</sup>	LiC <sub>6</sub> $\xrightarrow{\text{oxid.}}$ C <sub>6</sub> + Li + e <sup>-</sup>
Reduction reaction	Cu <sup>2+</sup> + 2e <sup>-</sup> Cu <sup>0</sup> $\xrightarrow{\text{Red.}}$	Hg <sup>2+</sup> + 2e <sup>-</sup> $\xrightarrow{\text{Red.}}$ Hg <sup>0</sup>	O <sub>2</sub> + 2H <sub>2</sub> O + 4e <sup>-</sup> $\xrightarrow{\text{Red.}}$ 4OH <sup>-</sup>	PbO <sub>2</sub> + 4H <sup>+</sup> + SO <sub>4</sub> <sup>2-</sup> + 2e <sup>-</sup> $\xrightarrow{\text{Red.}}$ PbSO <sub>4</sub> + 2H <sub>2</sub> O	CoO <sub>2</sub> + Li <sup>+</sup> + e <sup>-</sup> $\xrightarrow{\text{Red.}}$ LiCoO <sub>2</sub>
Total red-ox reaction	Zn + Cu <sup>2+</sup> $\xrightarrow{\text{Red-ox}}$ Zn <sup>2+</sup> + Cu <sup>0</sup>	Zn <sup>0</sup> + HgO $\xrightarrow{\text{Red-ox}}$ ZnO + Hg <sup>0</sup>	2H <sub>2</sub> + O <sub>2</sub> $\xrightarrow{\text{Red-ox}}$ 2H <sub>2</sub> O	Pb + PbO <sub>2</sub> + 4H <sup>+</sup> + 2SO <sub>4</sub> <sup>2-</sup> $\xrightarrow{\text{discharge}}$ 2PbSO <sub>4</sub> + 2H <sub>2</sub> O	LiC <sub>6</sub> + CoO <sub>2</sub> $\xrightarrow{\text{discharge}}$ C <sub>6</sub> + LiCoO <sub>2</sub>
E.M.F	1.1V	1.35V	1.23V	2V×6cells = 12V	3V
Cell diagram	Zn <sup>0</sup> <sub>(s)</sub> / Zn <sup>2+</sup> <sub>(aq)</sub> // Cu <sup>2+</sup> <sub>(aq)</sub> / Cu <sup>0</sup> <sub>(s)</sub>	Zn <sup>0</sup> / Zn <sup>2+</sup> // Hg <sup>2+</sup> / Hg <sup>0</sup>	2H <sub>2</sub> <sup>0</sup> / 4H <sup>+</sup> // O <sub>2</sub> <sup>0</sup> / 2O <sup>2-</sup>	Pb <sup>0</sup> / Pb <sup>2+</sup> // Pb <sup>4+</sup> / Pb <sup>2+</sup>	Li <sup>0</sup> / Li <sup>+</sup> // Co <sup>4+</sup> / Co <sup>3+</sup>
Uses :		Earphones, clocks and cameras	Space ships	Car batteries	Mobiles, laptops and modern cars.