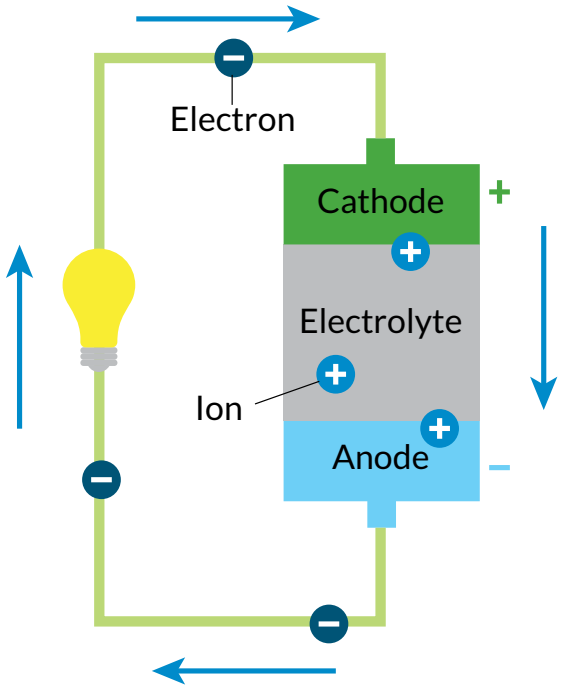
SN IN HIGH SCHOOLS
January 21, 2017

Charging the Future

Cross-Curricular Discussion

Directions: Use the diagram and chart below from "Charging the future" to answer the related discussion questions assigned by your teacher.



Battery	How it works	What it's used for	Advantages	Obstacles
Lithium-sulfur	Lithium ions from the anode react with sulfur held in the cathode to produce electric current	Cars, cell phones, laptops	Sulfur is cheap and very light, good for packing more capacity into a lighter package	Current versions have short lifetimes and the electrolyte needs work — it tends to dissolve the cathode and react with the anode
Magnesium-ion	Similar to lithium-ion batteries, but magnesium ions do the work	Cars, cell phones, laptops	Magnesium, more plentiful than lithium, provides two electrons (vs. lithium's one) so it could provide twice as much juice	Chemistry not well understood yet; batteries have short lives
Flow batteries	Two tanks of liquid, one positively charged and one negative, are separated by a membrane. Where they meet, the ions react, generating electrons	Cars, grid, backup power	Separating the two parts of the battery makes it easier to design batteries with maximum power or lighter weight; some new designs eliminate pumps and use gravity to adjust speed of energy flow	Current versions can't hold as much energy as lithium-ion; when pumps are used, maintenance remains a problem
Lithium-air	Oxygen molecules from the air react with lithium ions in the anode to release energy. Recharging forces out the oxygen atoms, and the lithium is ready to start again	Cars	Could make a very light battery	Finding electrolytes that don't react with other components is a challenge; batteries have very short life span and may need extra safety engineering
Sodium-sulfur	A molten sodium core exchanges ions with sulfur through a solid electrolyte barrier	Large-scale energy storage (holding power generated from wind or solar)	Materials are cheap and abundant; fairly long lifetime	Must operate at high temperatures, so not possible to use in a car