

Chapter 19

NAME _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

1. How is hydrogen produced?

2. How does a fuel cell work?

3. How does an ultracapacitor work?

4. What are the advantages and disadvantages of fuel cells?

5. What are the advantages and disadvantages of using hydrogen?

Answer Key

Testname: EV1SHORT19

1. Hydrogen is a low-carbon, nontoxic fuel that can be produced from water (H₂O). Hydrogen is also found in many other compounds, such as natural gas or crude oil.
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2. The chemical reaction in a fuel cell is the opposite of electrolysis. Electrolysis is the process in which electrical current is passed through water in order to break it into its components, hydrogen and oxygen. While energy is required to bring about electrolysis, this same energy can be retrieved by allowing hydrogen and oxygen to reunite in a fuel cell.
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3. Ultracapacitors can charge and discharge quickly and efficiently, making them especially suited for electric-assist applications in fuel-cell hybrid vehicles. Ultracapacitors that are used in fuel-cell hybrid vehicles are made up of multiple cylindrical cells connected in parallel.
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4. Fuel cells by themselves do not generate carbon emissions, such as CO₂. Instead, their only emissions are water vapor and heat, and this makes the fuel cell an ideal candidate for a ZEV (zero-emission vehicle). A fuel cell is also much more energy-efficient than a typical internal combustion engine (ICE). Fuel cells have very few moving parts and have the potential to be very reliable. There are a number of disadvantages of fuel cells, including:
 - High cost
 - Lack of refueling infrastructure
 - Safety perception
 - Insufficient vehicle range
 - Lack of durability
 - Cold weather starting problems
 - Insufficient power density[Page Ref: 270](#)
5. One kilogram (kg) of hydrogen has three times the energy content as one kilogram of gasoline. Hydrogen is the most common element on earth, but it does not exist by itself in nature so it has to be produced from water by electrolysis or refining from crude oil.
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