

Name \_\_\_\_\_

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

1) What are two designs of NiMH batteries?

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2) What are the advantages and disadvantages of NiMH batteries?

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3) What are two types of high-voltage batteries used in hybrid electric vehicles?

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4) What are the advantages and disadvantages of lithium-ion batteries?

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5) Why are NiMH batteries are known as alkaline batteries?

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## Answer Key

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- 1) • Cylindrical type  
• Prismatic type

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- 2) ADVANTAGES: Nickel-based alkaline batteries have a number of advantages over other battery designs, including the following:

- High specific energy
- The nickel electrode can be manufactured with large surface areas, which increase the overall battery capacity
- The electrolyte does not react with steel, so NiMH batteries can be housed in sealed steel containers that transfer heat reasonably well
- The materials used in NiMH batteries are environmentally friendly and can be recycled.
- Excellent cycle life
- Durable and safe

DISADVANTAGES: Disadvantages of the NiMH battery include the following:

- High rate of self-discharge, especially at elevated temperatures
- Moderate levels of memory effect, although this seems to be less prominent in newer designs
- Moderate to high cost

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- 3) • Most current production HEVs use nickel-metal hydride (NiMH) battery technology for the high-voltage battery.

- A battery design that shows a great deal of promise for EVs and HEVs applications is lithiumion (Li-ion) technology

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- 4) ADVANTAGES: Lithium-ion batteries have the following advantages:

- High specific energy
- Good high-temperature performance
- Low self-discharge
- Minimal memory effect
- High nominal cell voltage. The nominal voltage of a lithium-ion cell is 3.6 volts, which is three times that of nickel-based alkaline batteries. This allows for fewer battery cells being required to produce high voltage from an HV battery.

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- 5) NiMH batteries are known as alkaline batteries due to the alkaline (pH greater than 7) nature of the electrolyte

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