



Name: _____

Date: _____

Class: _____

John B. Goodenough & the Lithium-Ion Battery

Green Tech Worksheet Series

If you own a smartphone, a laptop, or have ever seen an electric car on the road, you owe a debt of gratitude to John B. Goodenough. An American physicist and Nobel Prize winner, Goodenough played a crucial role in the invention of the lithium-ion battery. His discoveries fundamentally changed how we power our modern world and provided a critical stepping stone in the transition to renewable energy.

In the 1970s and 80s, engineers were trying to create better rechargeable batteries. Early designs were either too heavy, didn't hold enough charge, or were dangerously prone to catching fire. In 1980, while working at the University of Oxford, Goodenough made a massive breakthrough. He discovered that by using a specific material—lithium cobalt oxide—for the battery's cathode (the positive electrode), the battery could store vastly more energy and be recharged safely. This breakthrough made batteries powerful, compact, and lightweight.

Interestingly, the lithium-ion battery was not initially considered a "green" invention. Its first major application was in the 1990s, powering the portable electronics revolution (like early cell phones and camcorders). However, as concerns about climate change grew, Goodenough's lightweight, energy-dense batteries became the missing puzzle piece for green technology. Before these batteries, building a practical electric vehicle (EV) that could travel long distances on a single charge was nearly impossible due to the massive weight of older battery types.

Furthermore, these batteries solve one of the biggest challenges of renewable energy: intermittency. Solar panels only generate electricity when the sun shines, and wind turbines only work when the wind blows. Goodenough's lithium-ion technology provides essential "grid storage"—massive battery banks that can store excess solar and wind energy generated during the day to be used at night or on calm days. For his world-changing work, John B. Goodenough was awarded the 2019 Nobel Prize in Chemistry at the age of 97, making him the oldest person to ever receive a Nobel Prize.

PART 1: MULTIPLE CHOICE

Circle the letter of the best answer.

1. What specific breakthrough did John B. Goodenough make in 1980 regarding battery design?

- A. He discovered how to power batteries using wind energy instead of chemicals.
- B. He found a new material for the cathode that allowed batteries to store more energy safely.
- C. He invented the first electric vehicle engine.
- D. He figured out how to make batteries entirely out of recycled plastics.

2. Why are lithium-ion batteries crucial for renewable energy sources like wind and solar?

- A. They generate wind and solar power internally.
- B. They make solar panels and wind turbines cheaper to manufacture.
- C. They provide essential grid storage to hold energy for when the sun isn't shining or the wind isn't blowing.
- D. They are the only batteries that can be charged outdoors.

3. What was the *first* major real-world application of the lithium-ion battery before it became a tool for green tech?

- A. Electric cars (EVs).
- B. Portable consumer electronics like cell phones and camcorders.
- C. Large-scale wind farms.
- D. Spacecraft propulsion systems.

PART 2: SHORT ANSWER

Write your answers in complete sentences based on the reading passage.

4. Why was it nearly impossible to build a practical, long-distance electric vehicle (EV) before Goodenough's improvements to the battery?

5. Explain the concept of "intermittency" in renewable energy and how lithium-ion batteries help solve this problem.

PART 3: CRITICAL THINKING

6. Goodenough's discovery in 1980 was meant for small electronics, but decades later, it became the foundation for the electric car industry and global renewable energy grids. What does this tell us about how scientific inventions evolve? Can you think of any modern technology today that might be used for a completely different purpose 40 years from now?
