Name: _____

Date: _____ Class: _____

TECHSHEETS.DEV

GREEN TECH SERIES

Shuji Nakamura

Illuminating a Greener World

Have you ever accidentally touched an old-fashioned lightbulb while it was turned on? If you did, you probably burned your fingers! For over a century, the world relied on incandescent bulbs to light our homes. These bulbs worked by heating a wire until it glowed. The problem? They wasted 90% of their energy creating *heat* instead of light.

Scientists knew that **LEDs (Light-Emitting Diodes)** were a much better, cooler alternative. By the 1960s, scientists had invented red and green LEDs. However, there was a massive roadblock: to create pure white light for homes, flashlights, and computer screens, you need to mix red, green, and **blue** light. For three decades, the world's smartest scientists tried and failed to invent the blue LED. Many declared it impossible.

Enter **Shuji Nakamura**, an electronic engineer working in Japan. Nakamura refused to give up. After years of relentless experimenting with a difficult crystal material called gallium nitride, he finally succeeded in creating the world's first high-brightness blue LED in the 1990s. This single invention changed the world.

Because of Nakamura's breakthrough, we now have bright, white LED bulbs. Why is this considered "Green Technology"? Lighting accounts for a massive portion of the world's electricity use. A modern LED bulb uses up to **90% less energy** than an old incandescent bulb and lasts up to 25 times longer! By drastically lowering the amount of electricity we need to light our planet, Nakamura's blue LED has reduced greenhouse gas emissions and saved billions of tons of coal from being burned. In 2014, he was awarded the Nobel Prize in Physics for his world-changing invention.

Part 1: Reading Comprehension

1. Why were old-fashioned incandescent lightbulbs considered so inefficient?

2. What specific color of LED did Shuji Nakamura invent, and why was it so important to the lighting industry?

3. Name two major advantages that modern LED bulbs have over older lightbulbs.

4. How does Nakamura's invention help protect the environment?

Part 2: Critical Thinking

5. Think about the devices you use every day, like smartphones, tablets, and flat-screen TVs. All of their screens rely on white LED backlights. If the blue LED had never been invented, how would these technologies be different today?

Part 3: The Energy Efficiency Challenge 💡

A local middle school has 100 old incandescent lightbulbs in its hallways. The principal wants to switch them all to modern LED bulbs to save electricity and help the environment. Let's do the math to see how much energy they will save!

Old Incandescent Bulb
Uses 60 Watts per hour

New LED Bulb
Uses 10 Watts per hour

Step A: Calculate energy for ONE bulb over a 10-hour school day.

Old Bulb: 60 Watts × 10 hours = _____ Watt-hours

LED Bulb: 10 Watts × 10 hours = _____ Watt-hours

Step B: Find the difference.

How much energy is saved by switching just **one** bulb for a single day?

_____ Watt-hours saved

Step C: The Big Picture!

If the school replaces all **100 bulbs** in the hallway, how much total energy do they save in one day? *(Multiply your answer from Step B by 100)*

_____ Total Watt-hours saved!