📘 Teacher Answer Key — Back to the Future (1985)

🧪 A. Science Connections — Suggested Answers

1. **Energy Conversion:** Electrical → Mechanical → Kinetic → Theoretical "Temporal Energy."
2. Electricity from lightning transfers through the flux capacitor, converting into motion and time displacement energy.
3. Time travel here uses ideas from **relativity** and **energy conservation**, though exaggerated for fiction.
4. Scientists would need insulated equipment, grounding, and safety protocols.

🧠 **Teacher Note:** Use this to differentiate between science fiction and feasible physics concepts.

📊 B. Data & Analysis — Solutions

1. $1.21\ \text{GW} = 1.21 \times 10^9\ \text{W} = 1{,}210{,}000{,}000$ watts.
2. $P = V \times I = 100{,}000{,}000 \times 30{,}000 = 3 \times 10^{12}$ watts (3 terawatts).
3. The lightning provides far more energy than needed — highlighting both **potential** and **danger** in uncontrolled power.

🧠 **Teacher Note:** Discuss how scientists harness large energies safely (hydroelectric dams, nuclear plants, solar systems).

🌎 C. Real-World Connection — Answers

1. Real systems store and convert energy through **batteries, generators, and alternators.**
2. Engineers use **circuit breakers, insulation, grounding, and controlled testing environments.**
3. Ethical responsibility means asking not just "Can we?" but "Should we?" before experimentation.

🧠 **Teacher Note:** Tie to real historical examples (nuclear testing, AI, genetic engineering).

💡 D. Reflection — Sample Responses

- “Science gives us power, but we must use it wisely.”
- “Every discovery creates new questions.”

🧠 **Teacher Note:** Encourage students to connect to personal ethics and innovation in STEM careers.

🌀 Cross-Connection

Connect *Back to the Future* with *Flubber* and *October Sky* — all explore the balance between innovation and responsibility.
Each shows that great scientists don’t just experiment — they **reflect** on their impact.