Teacher Answer Key

Case Study

1. Evidence: hottest shells produced strong green but no blue; cooler burns improved blue but weakened green; explanation that copper compounds decomposed at higher temperatures while barium salts needed more heat.

2. They separated blue and green into different layers and adjusted fuel–oxidizer ratios so each layer burned at a temperature suited to its metal salts, allowing both colors to appear clearly in one shell.

Multiple Choice

1. D

2. B

3. A

Matching

1-C, 2-E, 3-B, 4-A, 5-D

Fill-in-the-Blank

1) blackbody radiation, 2) band, 3) red

Short Answer (Sample Responses)

Q1: Incandescent: heats a filament to high temperature, producing a broad spectrum (blackbody radiation). LED: uses electron transitions across a band gap in a semiconductor to emit specific wavelengths with less wasted heat.

Q2: In both flame tests and fireworks, metal ions are excited by heat; when electrons relax back to lower levels, they emit light at characteristic wavelengths, giving element-specific colors.

Q3: Different metal compounds are stable and brightly colored only within certain temperature ranges; too low and they don't emit well, too high and they decompose or wash out. Controlling temperature through composition and design is essential for safe, vivid colors.