Teacher Answer Key

Case Study

1. The pH of 11.3 showed the dust was caustic enough to chemically burn airways; the asbestos fiber count established a long-latency cancer risk; and the benzo[a]pyrene detection showed a DNA-binding carcinogen present on inhalable soot. Each instrument translated a property into a predictable harm.
2. Official reassurance rested largely on outdoor air readings, but Sample 47 proved contaminated dust persisted where people slept and children played. Indoor data showed exposure continuing long after outdoor air cleared — the gap that made early 'safe to breathe' claims misleading.

Multiple Choice

1. B
2. D
3. A

Matching

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

Fill-in-the-Blank

1) 10,000, 2) lye, 3) PM2.5

Short Answer (Sample Responses)

Q1: Combustion chemistry depends on oxygen supply: with ample oxygen, hydrocarbons burn to carbon dioxide and water; starved of oxygen, they yield CO, soot, VOCs, and PAHs. The towers' fires were smothered by debris and poor airflow, forcing incomplete combustion and its toxic products.
Q2: CO acts instantly by outcompeting oxygen for hemoglobin, suffocating tissues while exposure lasts. Dioxins act slowly: fat-soluble and nearly unbreakable, they accumulate in tissue with each exposure and disrupt cells over decades — immediate asphyxiant versus persistent bioaccumulating carcinogen.

Q3: Answers will vary. Strong responses note that measured exposures let the WTC Health Program certify conditions scientifically (e.g., caustic dust explaining airway disease, asbestos and PAH findings supporting cancer coverage), and that the indoor contamination data drove testing and cleanup standards for later disasters.