Name: _____ **Date:** _____

Answer Key: The Invisible Hazard: 11th Grade Advanced Lab Safety Forensics Quiz

Apply OSHA-level safety synthesis to 10 complex scenarios, moving beyond basic rules to professional risk mitigation and chemical interactions.

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1. When neutralizing a concentrated sulfuric acid spill on a stone benchtop, which protocol demonstrates the highest level of risk mitigation?

Answer: B) Encircling the spill with an inert absorbent before adding sodium bicarbonate slowly.

Neutralization of strong acids is exothermic; sodium bicarbonate is a weak base that prevents a violent reaction, while encirclement prevents the spread of the hazardous material.

2. Nitric acid may be safely stored in the same secondary containment tray as glacial acetic acid, provided both are labeled as 'Acids'.

Answer: B) False

Nitric acid is a strong oxidizing agent and can react violently with organic acids like acetic acid, potentially causing fire or explosion; they must be physically separated.

3. A student is synthesizing an organometallic compound that is highly pyrophoric. The most critical safety infrastructure required for this procedure is a/an ___.

Answer: B) Inert atmosphere glove box

Pyrophoric substances ignite spontaneously in air; an inert atmosphere glove box (filled with nitrogen or argon) is necessary to exclude oxygen and moisture.

4. You are reviewing a Safety Data Sheet (SDS) for a new reagent. Section 10 indicates the substance is 'incompatible with halogenated hydrocarbons'. Which solvent must be avoided during the reaction?

Answer: A) Dichloromethane

Dichloromethane (CH_2Cl_2) is a halogenated hydrocarbon; knowledge of functional groups is essential for interpreting chemical compatibility in advanced labs.

5. During a vacuum distillation, a technician notices a small 'star crack' in the boiling flask. According to advanced glass safety standards, what is the immediate risk?

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Answer: B) An implosion due to the pressure differential.

Glassware under vacuum is subject to atmospheric pressure; structural flaws like cracks can cause the flask to implode violently, scattering glass and chemicals.

6. In the event of a large alkali metal fire (e.g., Sodium), a standard pressurized water extinguisher is the most effective tool for suppression.

Answer: B) False

Alkali metals react explosively with water to produce flammable hydrogen gas; a Class D dry powder extinguisher or dry sand must be used instead.

7. When scaling up a reaction from 1.0 gram to 100 grams, the primary safety concern regarding thermodynamics is the ____.

Answer: C) Surface area to volume ratio for heat dissipation

As volume increases, the surface area available to dissipate heat does not increase proportionally, leading to potential runaway exothermic reactions.

8. Which of the following is a symptom of chronic, low-level exposure to a neurotoxic solvent rather than an acute exposure incident?

Answer: C) Gradual decline in cognitive function and motor coordination.

Chronic exposure refers to long-term, repeated contact which often targets the nervous system or organs, whereas acute exposure results in immediate symptoms.

9. A scientist is working with an isotope that emits high-energy beta particles. To provide the most effective shielding while minimizing 'Bremsstrahlung' x-ray production, the container should be made of ____.

Answer: B) Thick Plexiglas or plastic

High-Z materials like lead can cause beta particles to emit secondary X-rays (Bremsstrahlung); low-Z materials like plastic are safer for beta shielding.

10. The GHS pictogram showing a 'Gas Cylinder' indicates that the contents are both under high pressure and necessarily flammable.

Answer: B) False

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The gas cylinder pictogram indicates gases under pressure; flammability is indicated by a separate 'Flame' pictogram.