Name: _____ **Date:** _____

Answer Key: Outsmart the Lab: Your 7th Grade Advanced Safety Challenge

Risk assessment, experimental protocol analysis, and hazard mitigation — essential cognitive skills for managing complex laboratory environments safely.

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1. You are designing a titration experiment involving unknown concentrations of sodium hydroxide. Which specific safety protocol takes precedence when calculating the required depth of your secondary containment?

Answer: B) The maximum volume of the largest primary container

Secondary containment must be sized to hold 100% of the volume of the largest container (or 10% of the total volume) to prevent uncontrolled environmental spread during a spill.

2. When working with volatile organic compounds that emit invisible vapors, the most critical engineering control to utilize is the _____.

Answer: C) Chemical Fume Hood

Chemical fume hoods are specifically designed to provide ventilation that captures and exhausts hazardous vapors away from the user's breathing zone.

3. True or False: If a graduated cylinder breaks during an experiment, the technician should immediately neutralize any spilled liquid before attempting to collect the glass shards.

Answer: B) False

Safety priority is personal protection. Neutralizing first can lead to thermal reactions or aerosolization; the spill should be contained and the area secured before managing the glass with mechanical tools.

4. While heating a solution, you observe a 'bumping' phenomenon where the liquid splashes violently. To synthesize a safer future procedure, which addition is most effective?

Answer: C) Adding porous boiling chips to the cool liquid

Boiling chips provide nucleation sites for bubbles to form evenly, preventing the sudden expansion of vapor that causes dangerous splashing or 'bumping'.

5. In the event of a large-scale chemical splash to the torso, the victim must remain in the safety shower for a minimum of _____ minutes to ensure full decontamination.

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Answer: D) Fifteen

Standard emergency protocols (ANSI) require at least 15 minutes of flushing to wash away chemicals and mitigate deep tissue damage or absorption.

6. True or False: Standard surgical masks provide sufficient respiratory protection against concentrated hydrochloric acid fumes because they create a physical barrier.

Answer: B) False

Surgical masks only filter large particles; they do not protect against chemical gases or vapors. A fume hood or specialized respirator is required for acid fumes.

7. Evaluate the risk: You notice a classmate is using a pH meter with a slightly frayed electrical cord near a sink. Which specific hazard is most likely to cause an immediate acute injury?

Answer: B) Electrocution via a grounding path

Water is a conductor; a frayed cord near a sink creates a high risk of an electrical current passing through the user to reach the ground (the sink/pipes).

8. The 'PASS' acronym is used for fire extinguisher operation. The 'S' in the third position stands for _____.

Answer: B) Squeeze

PASS stands for Pull the pin, Aim at the base, Squeeze the lever, and Sweep from side to side.

9. When diluting a concentrated acid for a reaction, what is the safest analytical procedure to prevent an exothermic reaction from splashing acid?

Answer: B) Add the acid to the water slowly

Adding Acid to Water (AAW: 'Always Add Acid') allows the water's high heat capacity to absorb the heat generated, preventing the mixture from boiling and splashing.

10. True or False: An SDS (Safety Data Sheet) only needs to be consulted after an accident has occurred to determine the proper first aid.

Answer: B) False

SDS must be reviewed *before* starting a lab to understand hazards, required PPE, storage, and reactive incompatibilities as part of a proactive risk assessment.

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