Name: _____ **Date:** _____

Answer Key: OSHA-Whoops! High-Stakes Lab Liability Quiz for 11th Grade

Analyze complex chemical interactions and evaluate emergency response protocols through high-level synthesis of safety data sheets and industrial standards.

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1. A student is synthesizing an organic compound using a reflux apparatus. They notice a hairline fracture in the boiling flask as the solution reaches its boiling point. What is the most rigorous analytical response?

Answer: B) Immediately cut the heat source and wait for cooling before transferring contents.

Thermal stress on compromised glassware can lead to catastrophic implosion or fire; removing the energy source is the primary step in stabilization before handling.

2. True or False: According to the Globally Harmonized System (GHS), a 'Signal Word' indicates the relative degree of severity of a hazard, with 'Danger' representing a more severe hazard than 'Warning.'

Answer: A) True

In GHS labeling, 'Danger' is reserved for more severe hazard categories, while 'Warning' is used for less severe ones, which is critical for rapid risk assessment.

3. When neutralizing a concentrated Bench Acid spill (such as 6M H_2SO_4), the most chemically sound approach involves applying _____ to ensure safety and control.

Answer: C) A weak solid base such as Sodium Bicarbonate

Sodium bicarbonate (a weak base) neutralizes the acid without the violent exothermic reaction triggered by strong bases, and the bubbling CO_2 provides a visual indicator of completion.

4. A technician is working with an alkali metal (e.g., Sodium) and a small fire ignites. Which fire suppression method is required by NFPA standards?

Answer: D) Class D: Dry powder such as Met-L-X to smother the metal.

Alkali metals react violently with water and can continue to burn in CO_2 environments; only Class D dry powders are rated for combustible metal fires.

5. In the context of the 'Hierarchy of Controls,' which method is considered the most effective for mitigating lab risks before relying on PPE?

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Answer: B) Elimination

Elimination physically removes the hazard from the environment entirely, making it the most effective tier in safety management systems.

6. Evaluate the following scenario: A student spills 10mL of 12M Hydrochloric Acid on their lab coat. Why must they utilize the safety shower rather than just rinsing the area in a sink?

Answer: B) The sink cannot provide the 15-minute continuous volume needed to prevent deep tissue necrosis.

Safety showers are designed to deliver at least 20 gallons of water per minute to dilute and wash away corrosive chemicals that might otherwise linger in clothing or skin creases.

7. True or False: When diluting a concentrated acid, you should always add the water to the acid slowly to prevent the mixture from splashing.

Answer: B) False

You must always add Acid to Water ('AA'). Adding water to concentrated acid can cause a vigorous exothermic reaction at the interface, causing the acid to boil and splash.

8. Review the NFPA 704 'fire diamond.' If a substance has a '4' in the blue quadrant and a 'W' with a line through it in the white quadrant, what is the primary risk?

Answer: B) The substance is lethally toxic and reacts violently with water.

Blue quadrant '4' indicates the highest level of health hazard (lethal), and the 'W' with a line denotes a specific hazard of unusual reactivity with water.

9. When centrifuging biological samples, the most critical safety step to prevent mechanical failure and aerosolization is _____.

Answer: C) Ensuring the load is precisely balanced by mass and position

An unbalanced centrifuge can create massive centrifugal forces that lead to rotor failure, potentially causing the machine to disintegrate or release hazardous aerosols.

10. True or False: Laboratory fume hoods are designed to protect the user from volatile vapors, but they are not effective for containing high-velocity projectiles from pressurized explosions.

Answer: A) True

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Fume hoods are engineering controls for inhalation hazards; while the sash provides some physical barrier, they are not blast-rated for significant explosive events.