



CLASS 9 | CHEMISTRY | CHAPTER 13

Laboratory and Practical Skills

Complete Exercise Solutions
MCQs with Answers & Explanations

1. Tick (✓) the correct answer.

(i) Safety in the chemistry laboratory is:

- (a) the responsibility of the students only
- (b) the responsibility of the professor only
- (c) the responsibility of the lab. incharge only

✓ (d) a shared responsibility

✓ Correct Answer: (d) a shared responsibility

Explanation: Laboratory safety is a collective effort. Students, teachers, and lab technicians must all follow safety protocols to prevent accidents. It is not solely the duty of one person.

(ii) Accidents often result from:

- (a) making mistakes
- (b) failure to use common sense
- (c) failure to follow instructions

✓ (d) all of the above

✓ Correct Answer: (d) all of the above

Explanation: Accidents in the lab are rarely due to a single factor. They usually happen when someone makes a careless mistake, ignores basic common sense, or fails to follow the standard operating procedures and instructions provided by the teacher.

(iii) The label "Warning" on a chemical bottle signifies:

✓ (a) that the chemical can cause less serious injury

(b) that the chemical can cause serious injury

(c) that user should be careful when using chemical

(d) that user should open it only in the presence of a teacher

✓ **Correct Answer: (a) that the chemical can cause less serious injury**

Explanation: In standard chemical hazard labeling (GHS), "Warning" indicates a less severe hazard (like skin irritation or minor toxicity), whereas "Danger" is used for severe hazards. Both require the user to be careful, but "Warning" specifically denotes a lower level of risk.

(iv) The label "Corrosive" on a chemical bottle indicates:

(a) that the material is an oxidizing agent

(b) that the material can degrade rapidly upon exposure

✓ (c) that its contact destroys living tissue

(d) that the chemical can explode

✓ **Correct Answer: (c) that its contact destroys living tissue**

Explanation: Corrosive substances (like strong acids or bases) chemically destroy or eat away materials they come into contact with. When they touch living tissue (like skin or eyes), they cause severe chemical burns and tissue destruction.

(v) Example of highly toxic chemical:

- (a) Ethanol
- (b) Acetic acid
- ✓ (c) Potassium cyanide
- (d) Potassium permanganate

✓ Correct Answer: (c) Potassium cyanide

Explanation: Potassium cyanide is a highly toxic chemical. Even a very small amount can interfere with the body's ability to use oxygen, leading to rapid poisoning and death. Ethanol and acetic acid are relatively safe in dilute forms, and potassium permanganate is an oxidizer but not highly toxic.

(vi) Example of self-reactive chemical:

- (a) Potassium
- (b) Phenol
- ✓ (c) Picric acid
- (d) n-Hexane

✓ Correct Answer: (c) Picric acid

Explanation: Picric acid is a classic example of a self-reactive chemical. If it dries out, it becomes highly unstable and can explode spontaneously due to shock, friction, or heat. Potassium reacts with water, but is not self-reactive in the same way.

(vii) When diluting an acid with water:

- (a) do it quickly
- (b) do not stir the container
- ✓ (c) always add acid to water
- (d) always add water to acid

✓ Correct Answer: (c) always add acid to water

Explanation: The dilution of concentrated acid is highly exothermic (releases heat). If you add water to acid, the heat generated can cause the water to boil instantly, splashing concentrated acid out of the container. Always add acid slowly to water to allow the heat to dissipate safely ("Do as you oughta, add acid to wata").

(viii) What should you do in case of a fire drill in the lab.?

- (a) run to safety shower
- (b) climb into the fume cupboard
- ✓ (c) close gas valves and turn off all equipments
- (d) carry chemicals out of the lab.

✓ Correct Answer: (c) close gas valves and turn off all equipments

Explanation: During a fire drill or actual fire, the first step before evacuating is to turn off all gas valves and electrical equipment. This prevents the fire from spreading or causing explosions. You should never run, hide in a fume cupboard, or try to carry chemicals out during an emergency.

2. Questions for Short Answers

i. Name some corrosive chemicals.

Strong acids (like Hydrochloric acid, Sulfuric acid, Nitric acid), strong bases (like Sodium hydroxide, Potassium hydroxide), and oxidizers like Hydrogen peroxide are common corrosive chemicals.

ii. What type of safety precautions are adopted to avoid damage due to explosive chemicals?

Explosive chemicals should be stored in a cool, dry place away from direct sunlight and heat sources. They must be handled using specialized safety shields, tongs, and gloves. Strictly avoiding friction, shock, or sparks is crucial.

iii. What type of damages can reactive chemicals cause?

Reactive chemicals can cause severe fires, sudden explosions, the release of toxic gases, and violent splattering. They can severely burn skin, damage eyes, destroy lab equipment, and cause structural damage to the laboratory.

iv. Indicate two such safety instructions which are required to avoid radiation.

1. Always wear lead aprons or radiation shielding when working with radioactive materials.
2. Never eat, drink, or apply cosmetics in areas where radioactive materials are handled to avoid internal contamination.

v. Which chemicals can cause suffocation?

Chemicals that displace oxygen in the air or are highly toxic when inhaled can cause suffocation. Examples include Carbon monoxide, Chlorine gas, Hydrogen sulfide, and Nitrogen gas (which displaces oxygen).

vi. Why signs and symbols are posted on lab. and chemical bottles?

Signs and symbols are posted to instantly communicate the specific hazards associated with a chemical or area (e.g., flammable, toxic, corrosive). This ensures that anyone handling the substance is immediately aware of the dangers and knows what precautions to take.

vii. How fire caused by chemicals should be handled?

Chemical fires should be handled using the appropriate fire extinguisher (e.g., dry powder or CO_2 for electrical/chemical fires, never water for reactive metals). The source of the fire should be isolated, and the fire alarm should be raised immediately.

viii. Why emergency drills are important to face emergency situations?

Emergency drills are important because they train students and staff on the exact procedures to follow during a real crisis. They help reduce panic, ensure everyone knows the evacuation routes, and significantly minimize the risk of injury or loss of life.

3. Constructed Response Questions

i. How will you handle an emergency situation caused by fire due to short circuiting?

First, I will immediately turn off the main electrical switch to cut the power supply. I will not use water to extinguish the fire. Instead, I will use a Carbon Dioxide (CO_2) or dry powder fire extinguisher, which is safe for electrical fires. If the fire is too large, I will evacuate the lab immediately, closing the door behind me, and raise the fire alarm.

ii. What type of reactions should be carried out in fume cupboard?

Reactions that produce toxic, harmful, or foul-smelling gases or vapors must be carried out in a fume cupboard. This includes reactions involving volatile acids, ammonia, chlorine gas, sulfur dioxide, and any organic solvents that release hazardous fumes.

iii. Put forward at least two suggestions to improve safety in the lab.

1. Ensure all chemical containers are properly labeled with their names, concentrations, and hazard symbols.
2. Install and regularly maintain safety equipment like fire extinguishers, eyewash stations, and safety showers, and ensure all students know how to use them.

iv. Can you identify warning symbols posted for radiation and asphyxiant chemicals?

Yes. The warning symbol for radiation is a black trefoil (a three-bladed propeller-like symbol) on a yellow background. The warning symbol for asphyxiant chemicals typically features a gas cylinder symbol, or a symbol indicating a lack of oxygen, often accompanied by the word "Asphyxiant" or a skull and crossbones for toxic gases that cause suffocation.

v. Why sudden shock can cause some chemicals to explode?

Sudden shock provides a rapid input of energy (activation energy) to certain unstable, self-reactive chemicals (like picric acid or nitroglycerin). This energy breaks the weak chemical bonds, triggering a rapid, self-sustaining exothermic decomposition or combustion reaction, resulting in an explosion.

4. Descriptive Questions

i. Explain hazards due to explosive and toxic chemicals.

- **Explosive Hazards:** Explosive chemicals can undergo rapid chemical reactions, releasing large amounts of heat, light, sound, and pressure. The primary hazard is the violent blast wave that can cause severe physical injuries, shatter glass, and collapse structures. They are also highly sensitive to heat, friction, or shock.
- **Toxic Hazards:** Toxic chemicals can enter the body through inhalation, ingestion, or skin absorption. Even in small amounts, they can cause severe organ damage, disrupt biological processes, or lead to immediate death (e.g., cyanide poisoning). The hazard is amplified if the chemical is volatile, as it can spread rapidly through the air in the lab.

ii. Write down five such common safety instructions which are used to avoid all types of hazards.

1. Always wear appropriate Personal Protective Equipment (PPE), including safety goggles, lab coats, and gloves.
2. Never eat, drink, or chew gum in the laboratory.
3. Read the labels on chemical bottles carefully before using them.
4. Tie back long hair and avoid wearing loose clothing or dangling jewelry.
5. Know the location and proper use of emergency equipment (fire extinguishers, eyewash stations, and first aid kits).

iii. Explain the importance of warning signs and symbols to avoid any accident in the lab.

Warning signs and symbols serve as a universal, visual language of safety. They immediately alert individuals to the specific hazards present in a container or area, such as flammability, toxicity, corrosiveness, or radioactivity. By providing this instant recognition, they allow students and researchers to take the necessary precautions before handling the substance, thereby preventing accidental exposure, fires, or explosions. Without these symbols, handling unknown chemicals would be extremely dangerous.

iv. Name some toxic chemicals. Describe the effects of spreading toxic gas in the lab.

- **Toxic Chemicals:** Potassium cyanide, Mercury, Lead salts, Chlorine gas, Carbon monoxide, and Arsenic compounds.
- **Effects of Spreading Toxic Gas:** If a toxic gas spreads in the lab, it can rapidly fill the enclosed space. Inhalation of these gases can cause immediate respiratory distress, coughing, choking, and dizziness. Depending on the gas, it can lead to pulmonary edema (fluid in the lungs), damage to the central nervous system, or asphyxiation. Panic can also ensue, leading to further accidents during evacuation.

v. A student has spilled over a corrosive and explosive chemical due to an accident. Which emergency measures you will take to tackle the situation.

- **Alert & Evacuate:** Immediately alert everyone in the lab and evacuate the area to prevent others from coming into contact with the chemical or potential explosion.
- **Neutralize/Contain (If safe to do so):** If the chemical is a liquid acid/base, use a spill neutralizer kit if trained. *However*, since it is also explosive, absolutely avoid using any tools that might cause friction or shock. Do not try to wipe it up with regular paper towels.
- **Ventilation:** Ensure fume hoods or exhaust fans are turned on to clear any toxic vapors, but do not operate electrical switches if there is a risk of an explosive atmosphere.
- **First Aid:** If the chemical touched the student's skin, immediately flush the affected area with copious amounts of water using the safety shower for at least 15 minutes. Remove contaminated clothing.
- **Seek Help:** Call for emergency medical help and notify the lab incharge or teacher immediately.

5. Investigative Question

i. A few decades ago, a tanker carrying poisonous chlorine gas leaked and the gas spread over a large area in Lahore. The accident killed a few persons as well as animals. Give some concrete proposals to avoid such an accident in future.

Concrete Proposals:

- 1. Strict Transport Regulations:** Enforce strict routes for vehicles carrying hazardous materials, ensuring they bypass highly populated areas and take designated safe highways.
- 2. Regular Maintenance & Inspections:** Mandate frequent, rigorous safety inspections of tankers and their valves to prevent leaks due to mechanical failure or corrosion.
- 3. Emergency Response Teams:** Establish specialized, well-equipped Hazmat (Hazardous Materials) response teams stationed at strategic points along transport routes, trained to handle chemical spills immediately.
- 4. Advanced Safety Technology:** Equip tankers with automatic shut-off valves, GPS tracking, and real-time pressure/temperature sensors that alert authorities to abnormalities before a leak occurs.
- 5. Public Awareness & Evacuation Plans:** Develop and regularly practice community evacuation plans in

high-risk areas. Educate the public on basic safety measures (like staying indoors and sealing windows) in case of a gas leak.

- 6. Use of Safer Alternatives:** Encourage the industrial use of safer alternatives to chlorine gas (such as sodium hypochlorite) wherever feasible.



Thank You!

Stay safe in the lab. Think before you act.
Safety is everyone's responsibility.

More notes & solutions at

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