

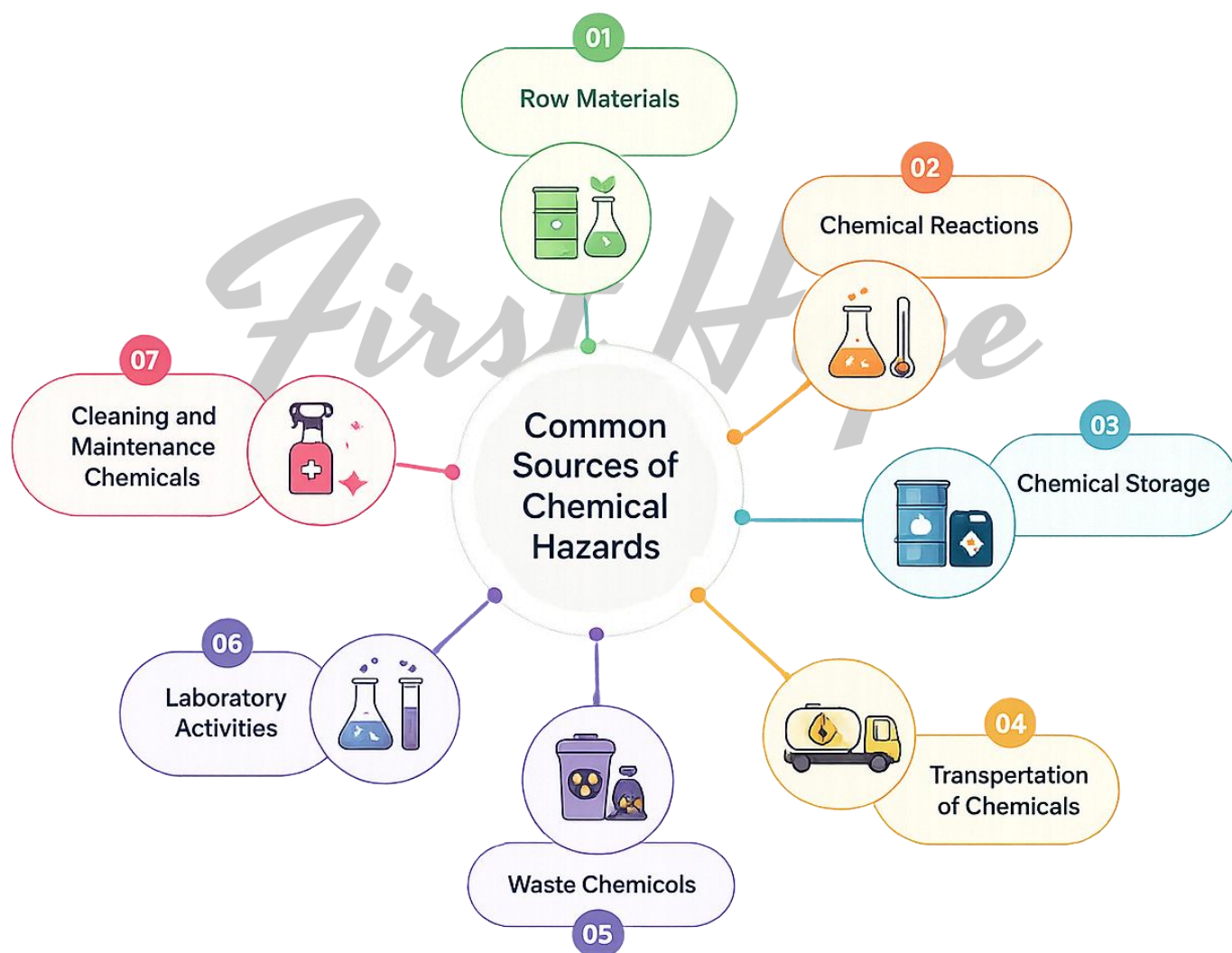
Chemical Based Hazards

Sources of Chemical Hazards

Basic idea

- Chemical hazards originate from substances that have the potential to cause injury, illness, fire, explosion, or environmental pollution.
- These hazards may be present during manufacturing, laboratory work, storage, transportation, or waste disposal.
- Chemical hazards can affect workers through inhalation, skin contact, eye contact, or swallowing.

Common Sources of Chemical Hazards



1. Raw Materials

- Many raw materials used in industries are corrosive, toxic, flammable, or reactive.
- Acids, alkalis, oxidizing agents, and solvents are common examples of hazardous raw materials.

2. Chemical Reactions

- Some chemical reactions produce excessive heat, pressure, toxic gases, or explosive products.
- Improper control of reaction conditions can increase the risk of accidents.

3. Chemical Storage

- Improper storage of chemicals can result in leaks, spills, contamination, fires, or explosions.
- Incompatible chemicals stored together may react dangerously.

4. Transportation of Chemicals

- Chemicals may leak or spill during transportation due to damaged containers or accidents.
- Transportation accidents may expose workers and the public to hazardous substances.

5. Waste Chemicals

- Chemical waste may contain toxic, corrosive, flammable, or reactive substances.
- Improper disposal can contaminate soil, water, and air.

6. Laboratory Activities

- Laboratory experiments involve handling many hazardous chemicals.
- Incorrect handling or mixing of chemicals can cause accidents.

7. Cleaning and Maintenance Chemicals

- Cleaning agents, disinfectants, and maintenance chemicals may be corrosive or toxic.
- Improper use may expose workers to harmful vapors or skin irritation.

Routes of Chemical Exposure

1. Inhalation

- Workers may breathe in chemical vapors, gases, fumes, dust, or aerosols.
- Inhalation is one of the most common methods of chemical exposure.

2. Skin Contact

- Chemicals may enter the body through direct contact with the skin.
- Some chemicals cause burns, irritation, or allergic reactions.

3. Eye Contact

- Chemical splashes can seriously damage the eyes.
- Some chemicals may cause temporary or permanent vision loss.

4. Ingestion

- Chemicals may enter the body through contaminated food, drinks, or hands.

- Good hygiene practices help prevent accidental ingestion.

Effects of Chemical Hazards

- Chemical exposure may cause poisoning, burns, respiratory diseases, allergies, or cancer.
- Long-term exposure may damage organs such as the liver, kidneys, lungs, or nervous system.
- Some chemicals may also harm the environment by polluting air, water, and soil.

Hazards of Organic Synthesis

Basic idea

- Organic synthesis is the process of preparing organic compounds through chemical reactions.
- Many reactions used in organic synthesis involve hazardous chemicals, high temperatures, high pressures, and reactive substances.
- Proper planning and safety measures are necessary to prevent accidents.

Common Hazards



1. Fire Hazard

- Many organic chemicals are highly flammable.
- Heat, sparks, or open flames can easily ignite organic solvents and reaction mixtures.

2. Explosion Hazard

- Some reactions release gases rapidly and increase pressure inside reaction vessels.
- Improper pressure control may result in explosions.

3. Toxic Chemical Exposure

- Organic synthesis often uses toxic reagents and solvents.

- Workers may inhale vapors or come into contact with harmful chemicals.

4. Corrosive Chemicals

- Strong acids and bases used during synthesis can cause severe burns.
- Contact with skin or eyes requires immediate medical attention.

5. Heat Generation

- Some reactions release large amounts of heat.
- Uncontrolled heat generation may lead to thermal runaway reactions.

6. Formation of Hazardous By-products

- Certain reactions produce poisonous gases or unstable compounds.
- These by-products require proper ventilation and safe disposal.

7. Pressure Build-up

- Gas-producing reactions may increase pressure inside closed systems.
- Pressure relief devices help reduce this risk.

Causes of Accidents

- Incorrect reaction conditions.
- Poor temperature control.
- Mixing incompatible chemicals.
- Equipment failure.
- Human error.

Safety Considerations

- Reaction conditions should be carefully monitored.
- Appropriate personal protective equipment should always be worn.
- Emergency procedures should be available before starting hazardous reactions.

Sulphonating Hazards

Basic idea

- Sulphonation is a chemical reaction in which a sulphonic acid group is introduced into an organic compound.
- Sulphonation commonly uses concentrated sulfuric acid, oleum, or sulfur trioxide, which are highly hazardous chemicals.
- These reactions are widely used in the pharmaceutical, detergent, and dye industries.

Hazards of Sulphonation



1. Highly Corrosive Chemicals

- Sulfuric acid and oleum cause severe burns to the skin and eyes.
- Contact with these chemicals requires immediate washing with plenty of water.

2. Exothermic Reaction

- Sulphonation reactions produce a large amount of heat.
- Excessive heat may cause violent reactions if not properly controlled.

3. Toxic Fumes

- Sulfur trioxide and sulfur dioxide gases may be released during the reaction.
- These gases can irritate the eyes and damage the respiratory system.

4. Pressure Build-up

- Heat generation and gas formation may increase pressure inside reaction vessels.
- Pressure should be monitored throughout the process.

5. Equipment Corrosion

- Strong acids may corrode metal equipment if unsuitable materials are used.
- Corrosion increases the risk of leaks and equipment failure.

6. Environmental Pollution

- Acid spills and gas emissions may contaminate the environment.
- Proper waste treatment is necessary before disposal.

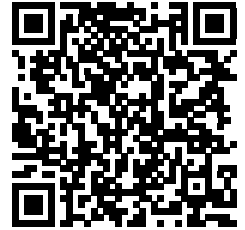


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