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Q 1.1

Asphyxiants – these are chemicals or gasses that can cause difficulty in breathing, unconsciousness, or death by suffocation.

Corrosives – these are chemicals that can cause severe skin burns and damages in tissue once contacted with.

Irritants – these chemicals usually cause redness, rashes, or inflammation of the affected area. Although the presence of symptoms are normally short-term, there are still instances where they create long-lasting effects on others.

Sensitizers – people or animals that are exposed to this type of chemical develop allergic reactions after a significant amount of time or repeated exposure to the specific chemical.

Reactive – these are substances that, under certain conditions or exposure to other chemicals or elements, can cause severe physical hazards such as fires or explosions.

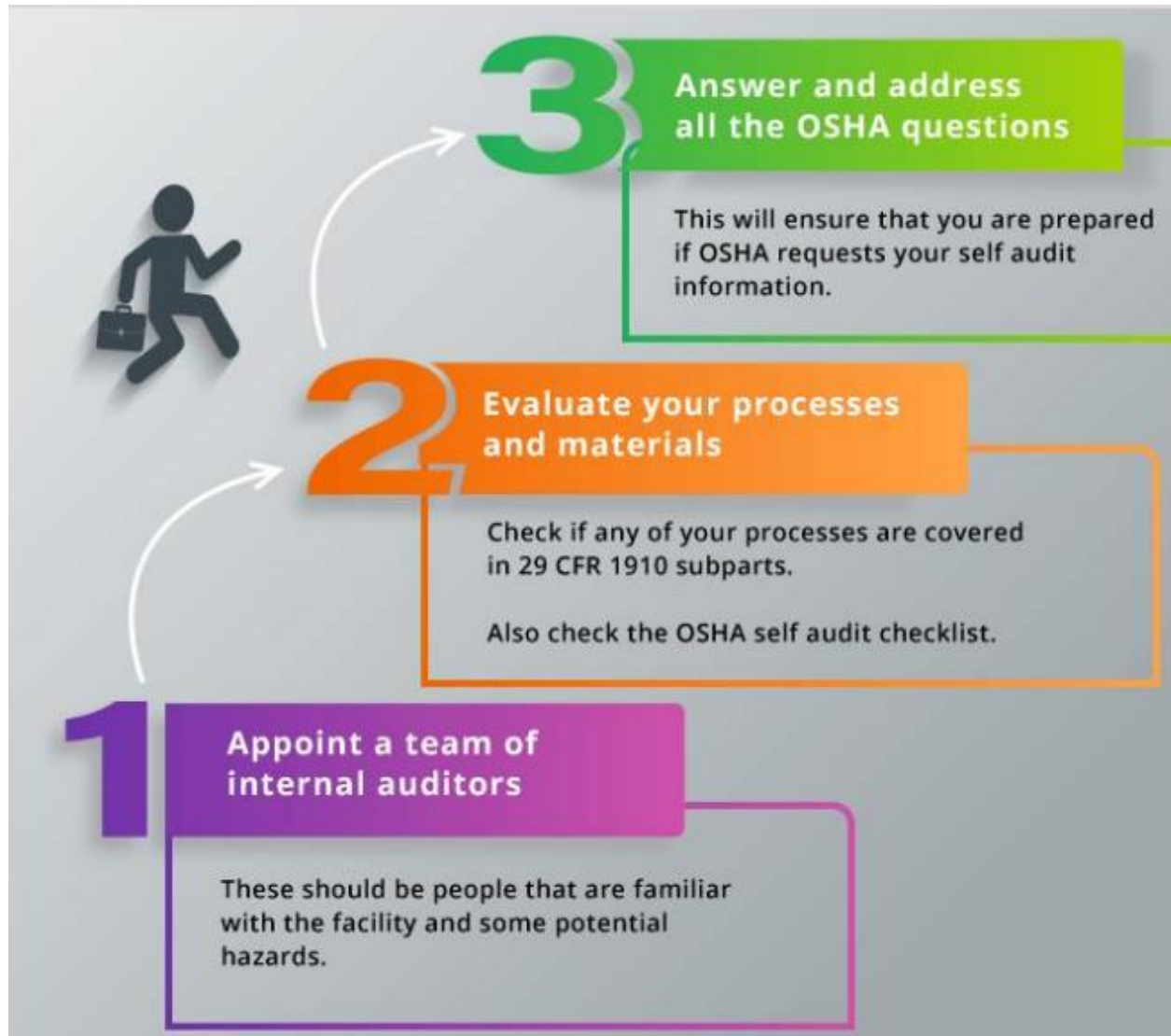
Flammable – these are chemical substances or materials that can ignite once exposed to air and other elements.

Carcinogens – carcinogens are substances that are known to be cancer-causing chemicals. They are categorized as either natural or manmade, but it is crucial to note that even a small amount of this type of chemical can severely damage human health.

Teratogens – these are chemicals that can cause physiological development abnormalities or birth defects

Q 1.2

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Q 1.3

Risk Estimation

- Risk estimation (also referred to as risk characterization) is the final step in risk assessment.
- Risk assessment is the identification of hazards that could negatively impact an organization's ability to conduct business.
- Its goal is to produce measures of the health, safety, and environmental risks that are being assessed.
- These assessments help identify these inherent business risks and provide measures, processes and controls to reduce the impact of these risks to business operations.

Risk Estimation Methods

All risk estimation methods are based on the general equation of the risk:

$$R = f \times p \times c$$

Where:

R = Risk Assessment

f = Human Error or Equipment Failure

p = Safety Barriers

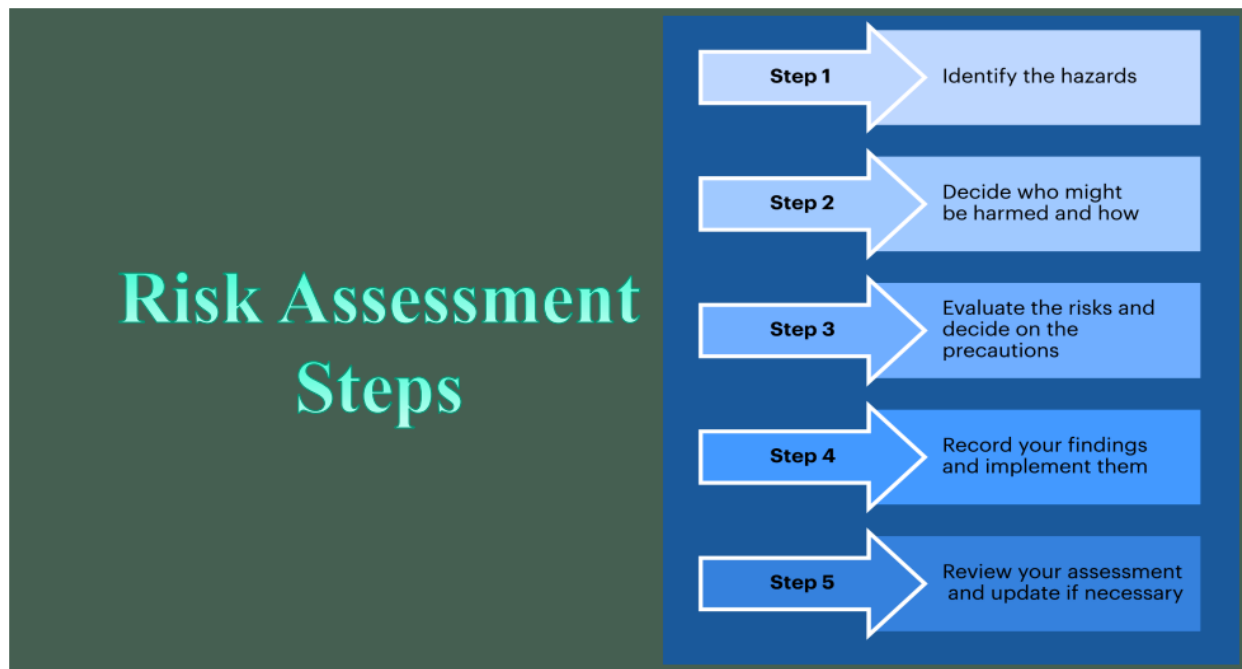
c = Consequences

Q 1.4

④ Last Assignment case study (10 Marks)

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Q 2.1



Q 2.2

Risk Analysis

- Risk analysis is defined as:
"The process of identifying and analyzing potential issues that could negatively impact key business initiatives or projects".

OR

- "The assessment process that identifies the potential for any adverse events that may negatively affect organizations and the environment".*

- Risk analysis is commonly performed by corporations (banks, construction groups, health care, etc.), governments, and nonprofits.
- Conducting a risk analysis can help organizations determine whether they should undertake a project or approve a financial application, and what actions they may need to take to protect their interests. This type of analysis facilitates a balance between risks and risk reduction.
- Risk analysts often work in with forecasting professionals to minimize future negative unforeseen effects.

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Q.2.3



5 Levels of Hierarchy in Eliminating Hazards and Risks

The control measures in the hierarchy are placed in order of their effectiveness. These stages can be considered as lines of defense.

1. Elimination: Removing the hazard or risk entirely
2. Substitution: Replacing a hazard with safer alternative.
3. Engineering Controls: Replacing equipment, including a mechanical device, or process, or changing the work environment to separate workers from a hazard.
4. Administrative Controls: Developing procedures and processes for working safely under anticipated conditions.
5. Personal Protective Equipment's: Equipping workers with protective gears designed to reduce risk and severity of injuries.]

Q.2.4

Types of Fires

CLASSIFICATION		RISK
	CLASS A	These are fires that involve solid materials like paper, wood or textiles.
	CLASS B	These are fires that involve liquids, like oils, petrol or diesel.
	CLASS C	These are fires that involve flammable gases, such as propane, butane or methane.
	CLASS D	These are fires that involve metals, like aluminium, magnesium, titanium or swarf.
	CLASS E	These are fires that involve live electrical equipment, like computers or phone chargers.
	CLASS F	These are fires that involve cooking oils and fats, such as in deep-fat fryers.

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Q.2.5

Steps for Emergency Drills and Exercises

➤ An organization should follow these six steps to successfully conduct emergency drills and exercises:

1. Develop emergency plans
2. Train employees
3. Conduct tabletop exercises
4. Conduct drills
5. Conduct functional exercises
6. Conduct full-scale exercises

Q.2.6

(2 Points each).

The Role of the First Aider

A first aid officer is an essential part of any organization. Its primary role is to provide immediate lifesaving care before the arrival of further medical care. This could include performing basic first aid procedures, including:

- Placing an unconscious casualty into the recovery position
- Incident Management and Casualty Safety
- Perform cardiopulmonary resuscitation (CPR)
- Use of automated external defibrillators (AED)
- Stopping the bleeding using pressure and elevation
- Keeping a fractured limb still

Responsibilities of a First Aider

As the person responsible for taking actions to keep everyone involved safe, it is crucial to follow the actions and guidelines based on the responsibilities of a first aider. We outline seven of them below:

1. Assess the situation in a timely manner
2. Stay calm, reassure, and take charge
3. Protect yourself or any casualties from danger
4. Prevention infection
5. Assess the casualty
6. Provide First Aid Treatment
7. Arrange for appropriate help

Q.2.7

Managing Workplace Chemical Hazards

The Occupational Safety and Health Administration (OSHA) guides employers to protect employees in the workplace from chemical hazards. Using the strategy of the Hierarchy of Controls, developed by the National Institute for Occupational Safety and Health (NIOSH), the recommendations from the most effective to the least effective ways to control chemical hazards are as follows:

Elimination/Substitution – where the need for hazardous chemical usage is completely removed or an alternate less or non-hazardous chemical is used.

Engineering Controls – where employers must implement changes that are physical to the workplace that helps to reduce exposure to the chemical hazard on the workers using or handling hazardous chemical substances.

Administrative and Work Practice Controls – changing how a work task is performed or establishing efficient workplace policies, protocols, processes, and control and monitoring mechanisms.

Personal Protective Equipment (PPE) – using PPE such as respirators, gloves, protective full-body suits, etc., can help in reducing the workers' direct contact with the hazardous chemical.

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Qualitative Vs. Quantitative Risk Analysis

Basics	Qualitative Risk Analysis	Quantitative Risk Analysis
Concept	It is a subjective approach and primary objective is to identify severity of risks.	It is objective approach that uses verified data and statistical tools to analyse risk and impact
How it is performed?	Ranks the risk on a scale of 0 to 1	Considers risks closer to 1 to calculate risk
What it does?	Assesses likeliness of risk to inform team about which is to be addressed first	Uses numerical calculations to determine risk and its impact
Complexity	More complex as no tools to assist	Less complex as tools are available to assist
Time Consuming	More time consuming	Less time consuming
When to perform?	At start of every new project	When there is loads of data on the risk
Suitability	All kinds of projects	Complex projects
Volume of Risk	Considers all the risks	Considers important risk marked by qualitative risk analysis

Elimination

Elimination is the removal of the hazard completely and is the highest level of protection and the most effective control measure.

How to use: The source of hazard can be taken out of the environment or workplace entirely.

Example: Remove chemicals that could cause a severe irritation to the skin.

Substitution

Substitution is the replacement of hazards with safer alternatives.

How to use: If eliminating the source of the hazard is not possible, the next level of defense is to substitute or replace it with a less hazardous source—thus minimizing the level of injuries or adverse effects on a person's health.

Example: Replace solvent-based paint with water-based paint.