Class: 9th

Subject: Chemistry

Chapter 13: Laboratory and Practical Skills

Exercise MCQs:

(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 ✅

(ii) Accidents often result from:

(a) making mistakes

(b) failure to use common sense

(c) failure to follow instructions

(d) all of the above ✅

(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

(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

(v) Example of highly toxic chemical:

(a) Ethanol

(b) Acetic acid

(c) Potassium cyanide ✅

(d) Potassium permanganate

(vi) Example of self-reactive chemical:

(a) Potassium

(b) Phenol

(c) Picric acid ✅

(d) n-Hexane

(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

(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

Important MCQs:

1. Which of the following is an explosive chemical?

(a) Acetone

(**b**) Benzoyl peroxide ✅

(c) Ammonia

(d) Methanol

2. Flammable chemicals have a flashpoint around:

(a) Boiling point

(b) Freezing point

(**c**) Room temperature ✅

(d) Melting point

3. Which one is a flammable compound?

(a) Sodium chloride

(**b**) Benzene ✅

(c) Hydrochloric acid

(d) Calcium carbonate

4. What should you do if you suspect a chemical might explode?

(a) Shake it carefully

(b) Move it to another shelf

(c) Leave it undisturbed and inform others ✅

(d) Pour water on it

5. Which of the following is not a safety precaution while using flammable chemicals?

(a) Pour liquid carefully

(b) Store in refrigerator ✅

(c) Wear safety gear

(d) Use smallest quantity

6. Corrosive chemicals can damage:

(a) Plastic only

(b) Glassware only

(c) Living tissues ✅

(d) Metal only

7. Which one is an example of a corrosive

chemical?

(a) Glacial acetic acid ✅

(b) Ethanol

(c) Benzene

(d) Petrol

8. What is the correct method to dilute concentrated acid?

(a) Add water to acid

(b) Add acid to water slowly ✅

(c) Mix both rapidly

(d) Heat the acid before mixing

9. Which of the following is a toxic chemical?

(a) Sodium chloride

(b) Hydrogen cyanide ✅

(c) Water vapor

(d) Oxygen

10. What is the immediate step if exposed to a toxic substance?

(a) Go home and rest

(b) Wash hands and wait

(c) Seek immediate medical help ✅

(d) Ignore and continue working

11. Which of the following is a reactive chemical?

(a) Sodium ✅

(b) Water

(c) Ethanol

(d) Oxygen

12. What may happen if reactive chemicals are not handled properly?

(a) Rusting only

(b) Colour change only

(c) Fires and explosions ✅

(d) Cooling of the area

13. What safety equipment should be used when working with reactive chemicals?

(a) Sunglasses and sandals

(b) Shield and heavy gloves ✅

(c) Metal containers

(d) Electric heater

14. Which of the following is a radiation hazard effect?

(a) Eye infection

(b) Vomiting and hair loss ✅

(c) Skin tan

(d) Muscle cramps

15. Which radiation type causes external injuries?

(a) Alpha

(b) Beta

(c) Gamma ✅

(d) X-rays

16. Which of the following is not a safety precaution for radiation exposure?

(a) Shield radioactive sources

(b) Avoid prolonged exposure

(c) Use open containers ✅

(d) Wear protective clothing

17. Asphyxiation is caused by:

(a) Lack of sleep

(b) Inhalation of toxic gases

(c) Oxygen level dropping too low ✅

(d) Excessive sunlight

18. Which gas can cause asphyxiation?

(a) Oxygen

(b) Nitrogen ✅

(c) Ozone

(d) Fluorine

19. What should be done if someone inhales an asphyxiant gas?

(a) Give water to drink

(b) Let them sleep

(c) Remove from contaminated area and call trained help ✅

(d) Wait and observe

20. What is the purpose of hazard signs in the laboratory?

(a) Decoration

(b) Temperature control

(c) Safety awareness and precautions ✅

(d) Colour coding only

21. Which of the following is not part of Personal Protective Equipment (PPE)?

(a) Lab coat

(b) Face shield

(c) Hearing protection

(d) Notebook ✅

22. What is the main purpose of a fire extinguisher in a chemical laboratory?

(a) To clean the lab

(b) To decorate the wall

(c) To control small fires ✅

(d) To boil chemicals

23. What should be the first action during an emergency in the laboratory?

(a) Run away quickly

(b) Stay calm and do not panic ✅

(c) Call friends

(d) Hide under the table

24. What is the importance of emergency drills in laboratories?

(a) To punish students

(b) For fun activities

(c) To train students practically to handle emergencies ✅

(d) To waste time

25. In case of a fire, what should a student do?

(a) Pour water immediately

(b) Open all doors

(c) Close doors to confine fire and use extinguisher

✅

(d) Call classmates to watch

Exercise Short Questions:

i. Name some corrosive chemicals.

Answer: Sulfuric acid, nitric acid, hydrochloric acid, and sodium hydroxide are corrosive chemicals.

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

Answer: Explosive chemicals should be handled in small quantities, stored separately, shielded with safety equipment, and disposed of carefully after use.

iii. What type of damages can reactive chemicals cause?

Answer: Reactive chemicals can cause fires, explosions, and release dangerous gases that can damage life and property.

iv. Indicate two such safety instructions which are

required to avoid radiation.

Answer:

1. Keep radioactive sources shielded.

2. Avoid prolonged exposure and wear protective clothing.

v. Which chemicals can cause suffocation?

Answer: Hydrogen cyanide, carbon monoxide, nitrogen, helium, methane, and carbon dioxide can cause suffocation.

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

Answer: To alert and guide users about hazards, and ensure that proper precautions are taken to maintain safety.

vii. How fire caused by chemicals should be handled?

Answer: By using a fire extinguisher properly, closing doors to confine the fire, and following emergency safety procedures.

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

Answer: Drills train students to act calmly and appropriately during emergencies, ensuring everyone's safety and checking if safety equipment is functional.

Important Short Questions:

1. What are flammable chemicals? Give two examples.

Flammable chemicals are those that can easily catch fire at or near room temperature.

Examples: Ether and acetone.

2. What are explosive chemicals?

Explosive chemicals are substances that release pressure, gas, and heat suddenly when subjected to shock or friction.

Examples: Picric acid and benzoyl peroxide.

3. What safety precautions should be taken while

handling flammable liquids?

- Keep them away from heat sources.
- Use them in small quantities.
- Conduct experiments in a fume hood.
- Wear safety goggles and gloves.

4. How do corrosive chemicals affect human body tissues?

Corrosive chemicals attack living tissues such as skin, eyes, and respiratory tract, causing burns and serious injuries.

5. Mention any two safety precautions while working with corrosive chemicals.

- Always add acid to water slowly while mixing.
- Use splash goggles and face shield.

6. Give any three examples of toxic chemicals.

Mercury, chlorine, and hydrogen cyanide.

7. What are reactive chemicals? Mention two examples.

Reactive chemicals can cause fires or explosions by

releasing heat or gas if not handled properly.

Examples: Sodium and calcium hydride.

8. What safety measures should be taken while working with reactive chemicals?

- Use shielding and heavy gloves.
- Store them separately from other chemicals.
- Work with small quantities only.

9. What are radiation hazards and how can they affect the human body?

Radiation hazards occur when a person is exposed to radioactive materials, which can damage tissues, cause burns, vomiting, hair loss, and even radiation sickness.

10. Mention any two safety instructions to avoid radiation exposure.

- Keep radioactive materials shielded.
- Wear protective clothing and face masks.

11. Define asphyxiation hazard and give two examples of chemicals causing it.

Asphyxiation hazard occurs when gases or vapours reduce oxygen levels causing suffocation, unconsciousness, or death. Examples: carbon monoxide, hydrogen cyanide.

12. Explain why flammable liquids should not be stored in refrigerators.

Because refrigerators can produce sparks or heat that may ignite flammable liquids, causing fire or explosion.

13. List four safety precautions to follow when handling explosive chemicals.

- Obtain teacher's approval before use.
- Use smallest quantity possible.
- Conduct experiments in fume hood.
- Wear safety goggles, gloves, and lab coat.

14. What is the purpose of personal protective equipment (PPE) in the laboratory?

PPE protects students from exposure to hazardous chemicals and emergency situations in the lab.

15. Name five types of PPE commonly used in chemistry laboratories.

Lab coat, safety glasses, face shield, apron, gloves.

16. Where should the fire extinguisher be placed in a chemistry lab, and why?

It should be placed at an accessible location known to all students to quickly control small fires.

17. Describe the importance of training students on how to use a fire extinguisher.

Training ensures students can operate the extinguisher safely and effectively during emergencies, preventing panic and harm.

18. What steps should be taken immediately in case of a fire in the lab?

Stay calm, alert others, close doors to contain fire, use fire extinguisher to put out fire, and call emergency staff.

19. How should acid and alkali waste be disposed of after experiments?

Neutralize acids and alkalis before disposal as per

instructions and never pour them directly into drains.

20. Why are hazard signs and symbols posted in laboratories and on chemical bottles?

To warn people of potential dangers and ensure proper precautions are taken for safety.

21. Why must emergency drills be conducted regularly in a laboratory?

To prepare students to respond effectively during real emergencies, ensuring safety and reducing risks.

22. List the actions to take when dealing with a chemical emergency in the lab.

Stay calm, evacuate area if needed, follow safety procedures, wash exposed area if affected, and seek medical help.

23. How can reactive chemicals cause damage or accidents in the laboratory?

They may cause fires, explosions, or release dangerous gases if not handled properly.

24. Mention three safety instructions when working with toxic chemicals.

- Work in a well-ventilated area or fume hood.
- Wear gloves and masks.
- Keep chemicals in original containers and never work alone.

25. What protective measures should be taken to avoid asphyxiation hazards?

Store chemicals in ventilated areas, wear full protective clothing, and seek medical help immediately if exposed.

Important Long Questions:

Q1: Explain flammable and explosive chemical hazards in the laboratory.

1. Flammable chemicals are substances that can catch fire easily at room temperature because they have a low flashpoint. **Examples** include ethers, methylated spirit, benzene, acetone, and

petrol. If these chemicals are exposed to heat, sparks, or flames, they can ignite and cause fires.

2. **Explosive chemicals** are substances that can suddenly release heat, gas, and pressure when subjected to shock, friction, or heat. This sudden release can cause explosions that are dangerous to people and property. Examples include picric acid, benzoyl peroxide, nitrocellulose, and 2,4-dinitrophenyl hydrazine.

Safety precautions for flammable and explosive chemicals:

- Obtain prior approval before using these chemicals.
- Use the smallest quantity possible.
- Conduct experiments inside a fume hood.
- Keep the workspace clear of other chemicals and apparatus.
- Inform others working nearby.

- Wear safety goggles, gloves, and a lab coat.
- Keep flammable chemicals away from heat sources.
- Pour flammable liquids carefully.
- Dispose of hazardous waste properly.
- Never store flammable liquids in a refrigerator.

Q2: Define toxic chemical hazards and give examples. Explain the safety instructions to be followed when working with toxic chemicals in the laboratory.

- **Toxic chemical hazards** involve chemicals that can cause serious health problems or poisoning when inhaled, ingested, or contacted with skin. These chemicals are harmful even in small quantities.
- **Examples** of toxic chemicals include mercury, benzene, chlorine, pesticides, ammonia, and hydrogen cyanide.

Safety instructions while working with toxic chemicals:

- Always wear gloves, masks, and other protective gear.
- Work in a well-ventilated area or fume hood to avoid inhaling toxic vapors.
- Keep toxic chemicals in their original, labeled containers.
- Never work alone when handling toxic substances.
- Wash hands thoroughly with soap and water after handling.
- Seek immediate medical help if exposed to poisonous substances.

Q3: Discuss the importance of using personal protective equipment (PPE) while handling hazardous chemicals in the laboratory. List the common types of PPE.

Personal Protective Equipment (PPE) is essential in the laboratory to protect individuals from harmful exposure to chemicals, physical injuries, and emergencies.

Importance of PPE:

- Reduces the risk of skin contact with corrosive or toxic chemicals.
- Protects eyes from splashes or fumes.
- Prevents inhalation of harmful vapors.
- Minimizes injuries from physical accidents like burns or cuts.
- Ensures safe handling of chemicals during emergency situations.

Common types of PPE in the laboratory:

- **Lab coat**: Protects skin and clothes.
- **Safety goggles or splash goggles**: Protect eyes.
- **Face shields**: Provide extra face protection during hazardous procedures.
- **Gloves**: Protect hands from chemicals and

contaminants.

- **Apron**: Additional protection against spills.
- **Closed-toe shoes or boots**: Protect feet from spills and broken glass.
- Hearing protection (ear plugs or muffs) when necessary.

Q4: What is asphyxiation hazard? What are its symptoms and safety measures?

Asphyxiation hazard occurs when a person is exposed to gases or vapors that reduce oxygen levels in the air, leading to suffocation. A low oxygen level prevents the body from breathing properly, which can cause unconsciousness or death.

Symptoms of asphyxiation:

- Rapid breathing (hyperventilation)
- Rapid heart rate
- Nausea

- Convulsions (seizures)
- Loss of consciousness

Examples of asphyxiants: hydrogen cyanide, carbon monoxide, nitrogen, argon, helium, methane, carbon dioxide.

Safety measures:

- Use and store asphyxiant chemicals in well-ventilated areas.
- Wear full protective clothing: lab coat, gloves, safety glasses, long trousers, and closed shoes.
- Dispose of chemical waste carefully as per instructions.
- If exposed, wash the affected skin immediately with running water.
- Remove the exposed person from the contaminated area quickly.
- Call trained medical professionals for assistance.

Q5: Why is ventilation important in a chemistry lab?

Ventilation is vital in a chemistry lab because it ensures the continuous supply of fresh air and removal of harmful vapors, gases, and dust that are released during experiments.

Reasons why ventilation is important:

- Prevents the build-up of toxic or flammable gases.
- Reduces inhalation risks of harmful chemicals.
- Maintains a safe oxygen level in the lab air.
- Minimizes fire and explosion risks by dispersing flammable vapors.
- Improves comfort and health conditions for people working in the lab.
- Proper ventilation systems, including fume hoods, exhaust fans, and windows, are essential for maintaining a safe laboratory environment.

Q6: What safety rules must be followed during chemical reactions?

When performing chemical reactions in the laboratory, it is important to follow these safety rules:

- Always wear appropriate PPE such as lab coats, goggles, and gloves.
- Conduct reactions inside a fume hood if toxic or harmful gases might be released.
- Use the smallest possible quantity of chemicals.
- Read and understand the chemical properties and hazards before starting.
- Never mix chemicals without proper instructions.
- Keep flammable chemicals away from heat or flame sources.
- Ensure emergency equipment such as fire extinguishers and eyewash stations are nearby.
- Do not eat, drink, or touch your face during experiments.
- Dispose of chemical wastes according to

safety guidelines.

- Inform your teacher or lab supervisor immediately in case of spills, accidents, or injuries.
- Keep your work area clean and uncluttered to avoid accidents.

Q7: Explain the importance of hazard signs in the chemistry laboratory.

Answer:

Hazard signs are special warning symbols used in chemistry laboratories to indicate the presence of dangerous chemicals, equipment, or areas. Their importance is crucial because laboratories contain hazardous materials and delicate instruments that can cause accidents if not handled properly.

Importance of Hazard Signs:

Alertness and Awareness: These signs alert students and staff about possible dangers like flammable, toxic, or corrosive substances.

- **Preventing Accidents**: When people notice these signs, they become more careful, which helps avoid accidents such as fires, chemical burns, or explosions.
- **Guidance**: Hazard signs guide how to handle chemicals safely or which safety equipment to use in a particular area.
- **Legal and Safety Compliance**: Following hazard signs is part of following standard safety rules required in all laboratories.

Examples of Hazard Signs:

- Skull and crossbones: Poisonous substances
- Flame symbol: Flammable materials
- Corrosive symbol: Substances that damage skin or eyes

Q8: What is Personal Protective Equipment (PPE)? Discuss its types and importance in ensuring laboratory safety.

Definition:

Personal Protective Equipment (PPE) refers to the safety tools and clothing worn to protect the body from exposure to hazardous chemicals and laboratory accidents.

Importance of PPE:

- PPE helps reduce the risk of injury from chemical spills, flames, broken glassware, or harmful vapors.
- It ensures that students and staff can conduct experiments safely without direct contact with dangerous materials.
- PPE is essential in emergency situations like fires, acid spills, or exposure to toxic vapors.

Types of PPE Used in Labs:

1. **Lab Coat/Apron**: Protects skin and clothes from chemical splashes.

2. **Safety Goggles/Face Shield**: Protects eyes from harmful vapors, acid splashes, and flying particles.

3. **Gloves**: Protects hands from corrosive and toxic chemicals.

4. Boots/Closed-Toe Shoes: Protect feet from falling chemicals or glass pieces.

5. Hearing Protection: Used when working with loud equipment.

6. Face Mask/Respirator: Used when working with toxic gases or vapors.

Q8: Describe the proper placement and use of fire extinguisher in a chemistry laboratory.

Answer:

Importance of Fire Extinguisher: A fire extinguisher is an essential safety tool used to control small fires during laboratory accidents involving flammable chemicals.

Proper Placement:

- Fire extinguishers should be placed at easily accessible and visible locations in the lab.
- They should be mounted near exits or areas where flammable materials are used.

- The location should be known to every student and lab worker.

Usage Instructions:

1. **Know the PASS method:**

- P: Pull the pin.
- A: Aim the nozzle at the base of the fire.
- S: Squeeze the handle.
- S: Sweep from side to side until fire is out.

2. Before using, make sure it is the right type of extinguisher for the kind of fire (chemical, electrical, etc.).

3. Fire extinguishers should only be used if the fire is small and manageable.

Training:

- Students must be trained in how to operate a fire extinguisher.
- Regular drills should be conducted.
- Training helps prevent panic during emergencies.

3. Constructed Response Questions:

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

Answer:

If a fire breaks out due to short circuiting in a chemistry lab, I will take the following steps to handle the emergency:

1. Stay Calm and Alert Others: First, I will remain calm and immediately alert all individuals present in the lab to evacuate.

2. Turn Off Electrical Supply: If safe, I will switch off the main power supply to stop the electric current.

3. Use Fire Extinguisher: I will use the appropriate fire extinguisher (such as a CO_2 extinguisher) to control the fire, aiming at the base of the flames.

4. Call Emergency Services: I will call the emergency fire services for help.

5. Assist Affected Individuals: I will assist any injured person without putting myself in danger and ensure they get medical help.

6. Avoid Water Use: I will not use water, as it can worsen an electrical fire.

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

Answer:

- Reactions that produce harmful gases, vapors, or involve volatile, toxic, or flammable substances should be carried out in a fume cupboard. **Examples include:**
- Reactions involving concentrated acids or ammonia
- Experiments producing chlorine or sulfur dioxide gas

Combustion of organic solvents

- **Purpose of Fume Cupboard:** It safely removes harmful vapors from the lab environment by using proper ventilation, protecting students from inhaling dangerous chemicals.

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

Answer:

1. Conduct Regular Safety Drills: Students should regularly practice emergency drills to learn how to act during fires, chemical spills, or other accidents.

2. Proper Labelling and Hazard Signs: All chemicals and hazardous areas must be clearly labeled with proper warning signs to avoid mishandling or accidents.

Optional Third Suggestion: 3. Availability of PPE: Ensure that personal protective equipment (PPE) such as gloves, lab coats, and goggles are available and worn during experiments.

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

Answer:

Yes, I can identify the warning symbols:

Radiation Symbol: It is a trefoil symbol with three black blades around a central circle on a yellow background. It warns about the presence of radioactive materials or radiation.

Asphyxiant Symbol: Although not standardized, it may include a gas cylinder symbol or a danger sign indicating that the area may have gases that displace oxygen (e.g., nitrogen or carbon dioxide) and cause suffocation.

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

Answer:

- Some **chemicals** are highly sensitive to physical shock, friction, or sudden movement. These are called shock-sensitive or explosive chemicals (e.g., nitroglycerin, picric acid).
- When these **chemicals** are **subjected** to a **sudden** shock (like dropping a container or striking it), it can quickly provide enough activation energy to start a rapid chemical reaction.
- This **reaction releases** a large **amount** of energy instantly, resulting in an explosion.

4. Descriptive Questions:

i. Explain hazards due to explosive and toxic chemicals.

Answer:

Explosive Chemical Hazards: Explosive chemicals are highly reactive and can cause sudden explosions when exposed to heat, flame, shock, or friction. The explosion can damage lab equipment, injure students, and even lead to fire.

Examples: Ammonium nitrate, nitroglycerin.

Toxic Chemical Hazards: Toxic chemicals are substances that can cause harm if inhaled, swallowed, or come into contact with skin. These can lead to poisoning, breathing problems, skin irritation, or even organ damage.

Examples: Chlorine gas, mercury, lead compounds.

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

Answer:

1. Always wear personal protective equipment (PPE) like gloves, lab coats, and safety goggles.

2. Never smell or taste any chemical directly.

3. Know the location and use of fire extinguisher and emergency shower.

4. Read warning signs and labels before handling chemicals.

5. Do not work alone in the lab and follow the teacher's instructions strictly.

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

Answer:

Warning signs and symbols play a vital role in laboratory safety. They provide important information about potential hazards such as flammable, toxic, radioactive, or corrosive substances.

Importance:

- **Alert Students:** Warns students before entering a risky area.
- **Prevent Accidents**: Helps in avoiding mishandling of chemicals.
- **Quick Identification**: Makes it easy to recognize dangerous chemicals or equipment.
- Compliance with Safety Laws: Ensures standard safety procedures are followed.
- Examples of signs: Skull & crossbones (toxic), flame (flammable), radiation symbol.

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

Answer:

Toxic Chemicals Examples:

- Chlorine gas
- Carbon monoxide
- Ammonia
- Hydrogen sulfide

Effects of Spreading Toxic Gas in the Lab:

- **Breathing Difficulty**: Inhalation can irritate lungs and cause suffocation.
- **Eye and Skin Irritation**: May cause burning, rashes, or redness.
- **Dizziness and Headache**: Toxic gases can affect the nervous system.
- **Long-term Health Damage**: Prolonged exposure can damage internal organs.
- Proper ventilation and working in a fume cupboard can prevent such incidents.

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.

Answer:

In such an emergency, I would follow these steps:

1. **Stay Calm and Alert Others**: Inform the teacher and students immediately.

2. **Evacuate the Area**: Make sure others move away to avoid exposure.

3. **Use Emergency Shower (if on body)**: Wash the affected skin with plenty of water.

4. **Use Fire Extinguisher (if fire occurs):** If there's a fire, use the correct extinguisher.

5. **Ventilate the Room:** Open windows or use exhaust system.

6. **Wear PPE**: Wear gloves, goggles, and lab coat before cleaning.

7. **Report and Record:** Inform lab authorities and document the incident.

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further

exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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