

USN



Internal Assessment Test 1 – March. 2018

Sub:	INDUSTRIAL SAFETY				Sub Code:	15ME662	Branch:	MECHANICAL	
Date:	13/03/2018	Duration:	90 min's	Max Marks:	50	Sem/Sec:	6 th Sem A & B		OBE
<u>Answer any FIVE FULL Questions</u>							MARKS	CO	RBT
1.	Define the following with examples: (i) Safety (ii) Accident (iii) Caution (iv) Appliance (v) Precaution						[10]	CO1	L1
2.	Explain the reasons of accident.						[10]	CO1	L2
3.	Briefly explain MSDS.						[10]	CO1	L2
4.	(a) What is fire? What are the types of fire? Explain.						[05]	CO1	L1
	(b) Explain fire tetrahedron.						[05]	CO1	L2
5.	Explain prevention of fire.						[10]	CO1	L2
6.	State the safety precautions that have to be taken in workshop, machine shop, forging and foundry lab.						[10]	CO1	L1

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Solution of 1st IAT

1.

- i. Safety:** Condition of being safe undergoing or causing hurt, injury or loss.
Example: Using mask while welding, wearing gloves
- ii. Accident:** An unfortunate incident that happens unexpectedly and unintentionally, resulting in damage or injury
Example: Collapsing of building, Vehicle collision
- iii. Precaution:** An action that is done to prevent something unpleasant, inconvenient or dangerous happening,
Example: Wearing seat belts while riding vehicle
- iv. Caution:** A warning against danger or evil. Careful forethought to avoid danger or harm.
Example: Speed breakers, railway crossing
- v. Appliance:** A device or piece of equipment designed to perform a specific task
Example: Refrigerator, Welding rod

2.

- Operating equipment without qualification or authorization
- Lack of/or improper use of PPE
- Operation equipment at unsafe speeds
- Failure to warn
- Bypass or removal of safety devices
- Using defective equipment
- **Taking shortcuts:** Every day we make decisions we hope will make the job faster and more efficient. But time savers ever risk your own safety or that of other workers. Shortcuts that reduce your safety on the job are not shortcuts, but an increased chance for injury.
- **Being over confident:** Confidence is a good thing. Overconfidence is too much of a good thing. “It’ll never happen to me” is an attitude that can lead to improper procedures, tools or methods in your work. Any of these can lead to an injury.
- **Starting a task with incomplete instructions:** To do the job safely and correctly the first time, you need complete information. Have you ever seen

a worker sent to do a job having been given only a part of the job's instructions? Don't be shy about asking for explanations regarding work procedures and safety precautions. It isn't dumb to ask questions, it's dumb not to.

- **Poor housekeeping:** When clients, managers or safety professionals walk through your work site, housekeeping is an accurate indicator of everyone's attitude about quality, production and safety. Poor housekeeping creates hazards of all types. A well-maintained area sets a standard for others to follow. Good housekeeping involves both pride and safety.
- **Ignoring safety procedures:** Purposely failing to observe safety procedures can endanger you and your coworkers. You are being paid to follow safety policies – not to make your own rules. Being “casual” about safety can lead to a casualty
- **Mental distractions from work:** Having a bad day at home and worrying about it at work is a hazardous combination. Dropping your “mental guard” can pull your focus away from safe work procedures. You can also be distracted when you're busy working and a friend comes by to talk while you are trying to work. Don't become a statistic because you took your eyes off the machine “just for a minute.”
- **Failure to Pre-Plan the Work:** There is a lot of talk today about job hazard analysis. JHAs are an effective way to figure out the smartest ways to work safely and effectively. Being hasty in starting a task or not thinking through the process can put you in harms way. Instead, plan your work and then work your plan.

3.

a. Chemical Product and Company Identification

Product identifier used on the label and any other common names or synonyms by which the substance is known. Name, address, phone number of the manufacturer, importer, or other responsible party, and emergency phone number. Recommended use of the chemical

b. Hazardous identification

The hazard classification of the chemical (e.g., flammable liquid, category), Hazard statement, Pictograms, Precautionary statement(s). Description of any hazards not otherwise classified. For a mixture that contains an ingredient with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity.

c. Composition or information of the ingredient

Chemical name.

Common name and synonyms.

Chemical Abstracts Service (CAS) number and other unique identifiers.

Impurities and stabilizing additives,

d. First aid measure

Necessary first-aid instructions by relevant routes of exposure. Description of the most important symptoms or effects, and any symptoms that are acute or delayed. Recommendations for immediate medical care and special treatment needed, when necessary.

f. Fire fighting measure

Recommendations of suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation. Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns. Recommendations on special protective equipment or precautions for firefighters.

g. Accidental release measure

Use of personal precautions and protective equipment to prevent the contamination of skin, eyes, and clothing. Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing. Methods and materials used for containment (e.g., covering the drains and capping procedures).

h. Handling and storage

Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment, and providing advice on general hygiene practices. Recommendations on the conditions for safe storage, including any incompatibilities.

i. Personal protection

Provide advice on specific storage requirements Personal protection. Appropriate engineering control. Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as personal protective equipment (PPE) (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure). Any special requirements for PPE, protective clothing or respirators

j. Physical and chemical properties

- Appearance (physical state, color, etc.);
- Upper/lower flammability or explosive limits;
- Odor;

- Vapor pressure;
- Odor threshold;
- Vapor density;
- pH;
- Relative density;
- Melting point/freezing point;
- Solubility(ies);
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);

k. Stability and reactivity

Reactivity

Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

Indication of whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled. Description of any stabilizers that may be needed to maintain chemical stability.

l. Toxicological information

Description of the delayed, immediate, or chronic effects from short- and long-term exposure. Description of the symptoms

m. Ecological information

Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available. Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis. The potential for a substance to move from the soil to the groundwater

n. Disposal consideration

Description of appropriate disposal containers to use. Recommendations of appropriate disposal methods to employ. Description of the physical and chemical properties that may affect disposal

o. Transport information

This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea

p. Regulatory information

Any national and/or regional regulatory information of the chemical should be added in this.

4.

(a). Fire is a rapid chemical reaction of oxidant with fuel accompanied by the release of energy, indicated by incandescence or flame

- Class A Fires involving solid combustible materials of organic nature such as wood, paper, rubber and plastics where the cooling effect of water is essential.
- Class B Fires involving flammable liquids or liquefiable solids or the like where a blanketing effect is essential.
- Class C Fires involving flammable gases under pressure including liquefied gases, where it is necessary to inhibit the burning gas at fast rate with an inert gas, powder or vaporising liquid.
- Class D Fires involving combustible metals like magnesium, aluminium, zinc, sodium, and potassium where the burning metals are reactive to water containing agents and in certain cases carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.
- Class E Fire risks involving electrical apparatus/equipment.
- Class F/K Fires involving cooking oils, trans-fats or fats in cooking appliances. These typically occur in restaurant and cafeteria kitchens

(b). The fire triangle is a model for conveying the components of a fire. The fire triangle's three sides illustrate the three elements of fire, which are heat, fuel and oxidization.

The three elements must be combined in the right proportions for a fire to occur. If any of the three elements are removed, the fire is extinguished.

The first element in the fire triangle is heat, which is perhaps the most essential of fire elements. A fire cannot ignite unless it has a certain amount of heat, and it cannot grow without heat either.

One of the first things firefighters do to extinguish a fire is to apply a cooling agent — usually water. Another cooling agent is a chemical fire retardant, such as the ones used in fire extinguishers.

Another method of diffusing heat from a fire is to scrape the embers from the fire source, such as wood embers on a burning building. Firefighters will also turn off the electricity in a burning building to remove a source of heat.

The second element in the fire triangle is fuel. A fire needs a fuel source in order to burn. The fuel source can be anything that is flammable, such as wood, paper, fabric, or chemicals. Once the fuel element of the fire triangle is removed, the fire will go out.

If a fire is allowed to burn without any attempt to extinguish it, as in the case of a controlled burn conducted by the Forest Service, it will extinguish on its own when it is consumed all of the fuel.

The final element of the fire triangle is oxygen, which is also an essential component of fire. A fire needs oxygen to start and continue. That is why one recommendation for extinguishing a small fire is to smother it with a non-flammable blanket, sand or dirt.

A decrease in the concentration of oxygen retards the combustion process. In large fires where firefighters are called in, decreasing the amount of oxygen is not usually an option because there is no effective way to make that happen in an extended area.

An alternative to the fire triangle model is the fire tetrahedron. The fire tetrahedron adds another element to the fire, which is chemical reaction. Fires involving metals such as titanium, lithium and magnesium have a chemical reaction that requires a different approach for firefighters.

This is called a class D fire and the application of water will exacerbate the combustion. Because of the chain reaction caused by the metals in class D fires, firefighters must use a different approach involving the introduction of inert agents like sand to smother it.



5.

Heat Safe guards

- Ensure employees are aware of their responsibility to report dangers
- Control sources of ignition
- Have chimneys inspected and cleaned regularly
- Treat independent building uses, such as an office over a shop as separate purpose groups and therefore compartmentalize from each other
- Ensure cooking food is always attended
- Use the Electricity Supply Board's Safety webpage
- Have regard to relevant Authority Safety Alerts, e.g. Mobile Phone Filling LPG Cylinders

Smoking

- Provide no-smoking signs at appropriate locations
- Ensure smoking area(s) are away from flammable materials
- Arrange for cigarettes and matches to be disposed of safely and away from other combustible rubbish

Plant and Equipment

- Ensure all work equipment protects against catching fire or overheating
- Ensure proper housekeeping, such as preventing ventilation points on machinery becoming clogged with dust or other materials - causing overheating
- Have electrical equipment serviced regularly by a competent person to prevent sparks and fires
- Properly clean and maintain heat producing equipment such as burners, heat exchangers, boilers (inspected and tested yearly), ovens, stoves, and fryers. Require storage of flammables away from this equipment.

Portable Heaters

- Do not use portable heaters unnecessarily.

- They should have emergency tip-over switches, and thermostatic limiting controls.
- Turn them off if people leave the room or are going to sleep
- Ensure they are 1M away from anything that can burn
- Do not use them to dry clothes

Hot work often arises from construction and/ or maintenance activities. Hot work is work that might generate sufficient heat, sparks or flame to cause a fire. Hot work includes welding, flame cutting, soldering, brazing, grinding and other equipment incorporating a flame, e.g. tar boilers, etc.

- Identify all hot work
- Only allow hot work if no satisfactory alternative
- Ensure relevant contractors are aware of hot work procedures and controls
- Use a **hot work permit system** including
- leave workplace clean and safe

Electrical safety

- All electrical equipment and installations designed, constructed, installed, maintained, protected, and used to prevent danger
- Get a qualified electrical contractor to carry out installation and repairs to electrical equipment and fittings
- Check electrical equipment and remove defective equipment
- Ensure electrical cords are in good condition
- Plug appliances and lights into separate electrical outlets

Arson

Deliberately started fires pose very significant risks to all types of workplace. The majority of deliberately started fires occur in areas with a known history of vandalism (Action involving deliberate destruction of or damage to public or private property.) or fire-setting. Typically, local youths light the fires outside the premises as an act of vandalism, using materials found nearby. Appropriate security measures, including the protection of stored materials and the efficient and prompt removal of rubbish, can therefore do much to alleviate this particular problem.

Oxygen Safeguards

- Prevent oxygen enrichment by ensuring that equipment is leak-tight and in good working order
- follow safety advice from the supplier
- follow the safeguards on the safety data sheet
- Check that ventilation is adequate
- Always use oxygen cylinders and equipment carefully and correctly
- Always open oxygen cylinder valves slowly
- Do not smoke where oxygen is being used

- Never use replacement parts which have not been specifically approved for oxygen service

Fuel

- Workplaces in which large amounts of flammable materials are displayed, stored or used can present a greater hazard than those where the amount kept is small.

Fuel Safeguards

- Follow the Authority's advice on LPG
- Follow the Authority's advice on explosive atmospheres and use the Guide to the Safety, Health and Welfare at Work
- Where there is a possibility of the presence of flammable gas/ vapour, conduct a full risk assessment and consider the need for gas detection equipment

Flammable materials

- Identify all flammable materials so that proper controls can be put in place
- Identify use of substances with flammable vapors (e.g. some adhesives)
- Reduce quantities of flammable materials to the smallest amount necessary for running the business and keep away from escape routes
- Replace highly flammable materials with less flammable ones
- Store remaining stocks of highly flammable materials properly outside, in a separate building, or separated from the main workplace

Flammable liquids

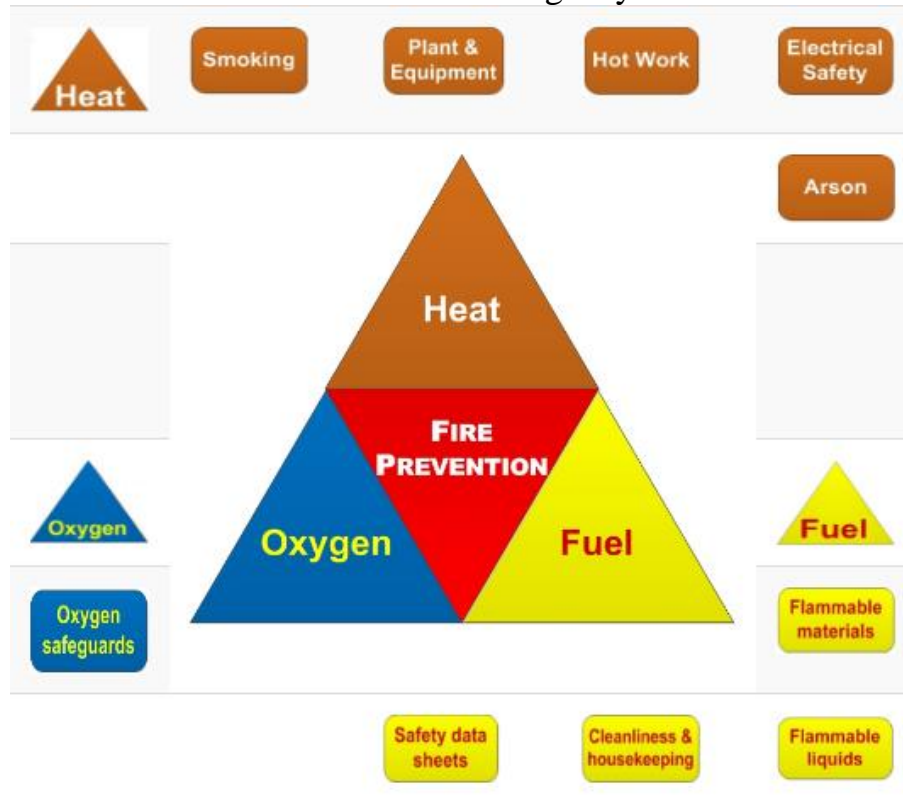
- The quantity of flammable liquids in workrooms should be kept to a minimum, normally no more than a half-day's or half a shifts supply
- Flammable liquids, including empty or part-used containers, should be stored safely. Small quantities (Tens of Litres) of flammable liquids can be stored in the workroom if in closed containers in a fire-resisting (e.g. metal), bin or cabinet fitted with means to contain any leaks
- Container lids should always be replaced after use, and no container should ever be opened in such a way that it cannot be safely resealed

Cleanliness and housekeeping

- Avoid accumulations of combustible rubbish and waste and remove at least daily and store away from the building
- Never store flammable or combustible rubbish, even temporarily, in escape routes, or where it can contact potential sources of heat
- Position skips so that a fire will not put any structure at risk
- Clean cooking surfaces on a regular basis to prevent grease build-up

Safety Data Sheets

- Handle material in accordance with the advice on the safety data sheet
- Keep safety data sheets readily available
- Keep safety data sheets safely available in the event of a fire so that the information is available for emergency services



6.

Machine shop

- Wear personal protective equipment
- Safety Goggles.
- Protective Gloves.
- Respirators.
- Proper Clothing.
- Inspection of machines
- Operating machine at low speed

Foundry and Forging lab

- Always avoid the use of damaged hammer.
- Never try to strike a hardened surface with a hardened tool.
- No person should stand in line with the flying objects.

- Always use the proper tongs tool to grip and lift objects according to the type of work.
- The anvil should always be clean and free from moisture and grease while in use.
- Always wear proper clothes such as apron, foot-wears and goggles.
- Always put out the fire in the forge before leaving the forging shop.
- Always keep the working space clean and tidy.

Workshop

- Safety glasses, cover goggles, or face shields are required when in any shop area, whether working or not.
- Shoes must be worn in any shop area. No one wearing sandals will be allowed to enter any shop area.
- The minimum footwear must cover the entire foot.
- Do not operate any item of equipment unless you are familiar with its operation and have been authorized to operate it.
- If you have any questions regarding the use of equipment, ask the area supervisor.
- No work may be performed using power tools unless at least two people are in the shop area and can see each other. .
- In case of injury, no matter how slight, report it to the shop supervisor
- Do not wear ties, loose clothing, jewelry, gloves
- Do not work in the shop if tired, or in a hurry.