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Internal Assessment Test II – March. 2018

Sub:	INDUSTRIAL SAFETY					Sub Code:	15ME662	Branch:	MECHANICAL	
Date:	19/04/2018	Duration:	90 min's	Max Marks:	50	Sem/Sec:	6th Sem A &B		OBE	

	Answer any FIVE FULL Questions	MARKS	CO	RBT
1.	Explain labeling of chemicals.	[10]	CO1	L2
2.	Explain Eye washers and showers.	[10]	CO1	L2
3.	Explain fire detection system.	[10]	CO1	L2
4.	Write a note on (a) Fire hazard analysis.	[05]	CO1	L1
	(b) Step occurrence after fire.	[05]	CO1	L1
5.	State types of fire extinguisher and explain any two.	[10]	CO1	L1
6.	Write safety precaution while using CNG and lathe machine.	[10]	CO1	L1

Solution of IAT-2

1.

The Hazard Communication System now requires the following elements on labels of hazardous chemicals:

- **Name, Address and Telephone Number** of the chemical manufacturer, importer or other responsible party.
- **Product Identifier** is how the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be on the label.
- **Signal Words** are used to indicate the relative level of severity of the hazard and alert the reader to a potential hazard on the label. There are only two words used as signal words, "Danger" and "Warning." Within a specific hazard class, "Danger" is used for the more severe hazards and "Warning" is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a "Danger" signal word and another warrants the signal word "Warning," then only "Danger" should appear on the label.
- **Hazard Statements** describe the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard. For example: "Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin." All of the applicable hazard statements

must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards no matter what the chemical is or who produces it.

• **Precautionary Statements** describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to the hazardous chemical or improper storage or handling. There are four types of precautionary statements: prevention (to minimize exposure); response (in case of accidental spillage or exposure emergency response, and first-aid); storage; and disposal. For example, a chemical presenting a specific target organ toxicity (repeated exposure) hazard would include the following on the label: "Do not breathe dust/fume/gas/mist/vapors/spray. Get medical advice/attention if you feel unwell. Dispose of contents/container in accordance with local/regional/ national and international regulations."

In most cases, the precautionary statements are independent. However, OSHA does allow flexibility for applying precautionary statements to the label, such as combining statements, using an order of precedence or eliminating an inappropriate statement.

Precautionary statements may be combined on the label to save on space and improve readability. For example, "Keep away from heat, spark and open flames," "Store in a well-ventilated place," and "Keep cool" may be combined to read: "Keep away from heat, sparks and open flames and store in a cool, well-ventilated place." Where a chemical is classified for a number of hazards and the precautionary statements are similar, the most stringent statements must be included on the label. In this case, the chemical manufacturer, importer, or distributor may impose an order of precedence where phrases concerning response require rapid action to ensure the health and safety of the exposed person. In the self-reactive hazard category Types C, D, E or F, three of the four precautionary statements for prevention are:

- "Keep away from heat/sparks/open flame/hot surfaces. - No Smoking.";
- "Keep/Store away from clothing/…/ combustible materials";

These three precautionary statements could be combined to read: "Keep in original container and away from heat, open flames, combustible materials and hot surfaces. - No Smoking."

Finally, a manufacturer or importer may eliminate a precautionary statement ifit can demonstrate that the statement is inappropriate.

• **Supplementary Information.** The label producer may provide additional instructions or information that it deems helpful. It may also list any hazards not otherwise classified under this portion of the label. This section must also identify the percentage of ingredient(s) of unknown acute toxicity when it is present in a concentration of ≥1% (and the classification is not based on testing the mixture as a whole). If an employer decides to include additional information regarding the chemical that is above and beyond what the standard requires, it may list this information under what is considered "supplementary information." There is also no required format for how a workplace label must look and no particular format an employer has to use; however, it cannot contradict or detract from the required information.

Pictograms are graphic symbols used to communicate specific information about the hazards of a chemical. On hazardous chemicals being shipped or transported from a manufacturer, importer or distributor, the required pictograms consist of a red square frame set at a point with a black hazard symbol on a white background, sufficiently wide to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label.

The pictograms are adopted to improve worker safety and health, The environmental pictogram is not mandatory but may be used to provide additional information. Figure shows the symbol for each pictogram, the written name for each pictogram, and the hazards associated with each of the pictograms. Most of the symbols are already used for transportation and many chemical users may be familiar with them.

Employer Responsibilities

Employers are responsible for maintaining the labels on the containers, including, but not limited to, tanks, totes, and drums. This means that labels must be maintained on chemicals in a manner which continues to be legible and the pertinent information (such as the hazards and directions for use) does not get defaced (i.e., fade, get washed off) or removed in any way. The employer is not responsible for updating labels on shipped containers, even if the shipped containers are labelled under HazCom 1994. The employer must relabel items if the labels are removed or defaced. However, if the employer is aware of newly-identified hazards that are not disclosed on the label, the employer must ensure that the workers are aware of the hazards as discussed below under workplace labels.

2.

Eye washers and showers

Eye washers: A unit that flushes water specifically to the eyes. It provides minimum performance requirements for eye wash and shower equipment for the emergency treatment of the eyes or body of an employee, student, and volunteer who has been exposed to injurious materials. It covers the following types of equipment: emergency showers, combination showers and eyewashes or eye/face washes. 2.1 Plumbed eyewash unit shall be provided for all work areas or classroom settings where, during normal operations or foreseeable emergencies, the eyes of an employee, student or visitor may come into contact with any substance which can cause corrosion, severe irritation, or permanent tissue damage or which is toxic by absorption. Drench and water hoses; sink faucets, or showers are not acceptable eyewash facilities. If there is any possibility that an individual's eyes may be splashed with cryogenic materials such as liquid nitrogen or solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eyewash facilities within the immediate work area for emergency use. 2.2 Emergency shower shall be provided for all work areas or classroom settings where, during normal operations or foreseeable emergencies, areas of the body may come into contact with any substance which can cause corrosion, severe irritation, or permanent tissue damage or which is toxic by absorption

GENERAL REQUIREMENTS

• Emergency units shall be located in immediately accessible locations that require no more than 10 seconds (approximately 25 feet) for the injured person to reach along unobstructed pathways within the laboratory or work area and where the user shall not have to pass through a door to reach the unit.

• Emergency unit shall be identified with a highly visible sign in well lighted area.

• The area around the emergency units shall be clear, unobstructed and have no items hanging on them.
• There shall be no sharp projections anywhere in the operating area of the unit.
• The valve actuator shall be designed so that the water flow remains in the on position without the use of the operator's hands and must remain open until manually shut off. The valve shall be large enough to be easily located and operated by the user.
• Any electrical apparatus, telephone and thermostats should not be located within 18 inches of the units. Where electrical outlets are necessary, they must be protected by ground fault interrupters.
• The eyewash and eyewash/face equipment shall be located to provide enough room to allow the eyelids to be held open with the hands while the eyes are in the water stream.
• Emergency eyewash equipment shall ensure that a controlled flow of potable tepid water is provided to both eyes simultaneously at a velocity low enough not to be injurious to the user.

OPERATIONS AND PROCEDURES

Emergency Eyewash and Shower Equipment: The affected body part must be flushed immediately and thoroughly for at least 15 minutes using a large supply of clean fluid under low pressure. Water does not neutralize contaminants -- it only dilutes and washes them away. Begin flushing as quickly as possible after the eye comes in contact with a harmful substance as the first 10 seconds are critical. Toxic substances, when coming in contact with the eye, immediately begin to damage sensitive eye tissues. The longer they remain in contact, the greater the damage to the eye. Besides tissue damage, acids and alkali can change the pH in the eye itself. When the pH of the eye begins to get out of the narrow tolerable range, severe eye damage, including blindness, may result. However, other references recommend a minimum 20-minute flushing period if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known.

For example:

- A minimum 5-minute flushing time is recommended for mildly irritating chemicals.
- At least 20 minutes for moderate-to-severe irritants.
- 20 minutes for non-penetrating corrosives.
- At least 60 minutes for penetrating corrosives.

Non-penetrating corrosives are chemicals which react with human tissue to form a protective layer which limits the extent of damage. Most acids are non-penetrating corrosives. Penetrating corrosives, such as most alkalies, hydrofluoric acid and phenol, enter the skin or eyes deeply. Penetrating corrosives require longer water flushing (a minimum of 60 minutes) than nonpenetrating corrosives (a minimum of 20 minutes). In all cases, if irritation persists, repeat the flushing procedure. It is important to get medical attention as soon as possible after first aid has been given. A physician familiar with procedures for treating chemical contamination of the eyes and body should be consulted

General checklist to use for chemical exposures

- In case of chemical exposure, flush skin or eyes with cool water for at least 15 minutes- or more and if possible until medical assistance arrives. DO NOT RUB!
- Contact Public in order to get medical assistance as soon as possible. Provide Materials Safety Data Sheets (MSDSs)/Safety Data Sheets, (SDSs) to medical personnel.
- Know the effects of chemicals with which you are working. Read, ask questions about, and understand MSDSs/SDSs for each chemical with which you work.
- Always wear personal protective equipment to include eye, face, body and foot protection.
- Learn the location and use of all emergency equipment, even if you are working in a new area for only a brief time.
- Know how to help others reach showers or eyewashes and how to help them get medical assistance.
- Hold your eyes open with your hands while using eyewash to be sure water reaches the eyes.
- While assisting injured person provide clean cover for privacy while removing contaminated clothing after the shower has been activated.
- Immediately wash off even small amounts of chemicals.
- Notify supervisor as soon as emergency has subsided.
- Supervisor should immediately notify the Risk Manager.

3.

Detection of fire at an early stage can prevent a catastrophic fire as necessary automatic/manual fire extinguishing action can be initiated without delay. A fire generally develops in three stages namely – incipient, smoldering and flame stage. Fire detectors are also designed to detect all the three stages of a full-grown fire. These fire detectors along with additional systems can perform a number of functions such as actuation of fire doors, smoke dampers, and shut down of power-operated equipments and of course annunciation and activation of fire suppression system. Fire detectors are mainly classified based on

(*i*) Principle of fire detection (smoke/flame/heat)

(*ii*) Area of coverage (spot/line type).

(*a*) **Smoke Detectors :** These detectors detect fire, based on the products of combustion. Smoke detectors are further classified into

(*i*) **Ionization Detector.** This type of detector consists of one or more chambers, which has a radioactive element (Alpha source) to ionize the air inside the chamber. The two charged electrodes inside the chamber conduct a current due to ionisation of air. The detector operates when smoke enters into the chamber and reduces the conductivity of the air inside below a pre-defined level, which in turn reduces the current between the electrodes.

(*ii*) **Photoelectric Detector.** This type of detector employs the light scattering principle of smoke for detection. A light source (pulsed IR LED) and a light sensor (Photo diode) are arranged in a chamber in such a way that major portion of the light does not fall on the sensor. When smoke particles enter the light path inside the chamber, the light is scattered and this scattered light falls on the sensor which converts it into a signal for further action.

(*iii*) **Beam type Detector.** This type of detector operates on the principle of obstruction of light. A light transmitter transmits a pulsed beam of IR light, which is being received by the receiver. When the received beam intensity goes below the preset level due to smoke particle, the detector issues a signal for further action.

(*b*) **Flame Detector:** This kind of detector works on the detection of radiant energy of the flame at different wavelengths. Basic types are Infra Red and Ultra Violet type. IR radiation is produced in all flames during burning of carbonaceous materials such as alcohol, mineral insulated oil, petrol, diesel etc. UV radiation is emitted where hydrogen and certain materials involving sulphur are burnt. IR type flame detectors have an infrared cell (PbS cell) as sensor and UV type flame detectors have a vacuum photo diode GM tube as a sensor.

(*c*) **Heat Detectors :**

(*i*) **Fixed Temperature Detector.** This type of detector initiates a signal when the air surrounding it goes above a preset temperature. The sensor is usually a bi-metallic strip that closes a contact or a thermistor (whose resistance decreases with temperature) along with associated circuitry.

(*ii*) **Rate of Rise Temperature Detector.** This type of detector operates when the rate of rise of temperature of the air surrounding the detector exceeds the preset rate of rise. This is normally an electronic type of detector, which has two sensing elements (thermistors). One element is exposed to the surrounding while the other is insulated from the surrounding. Both sensor data are compared and checked with preset rate of rise for signal actuation.

(*iii*) **Linear Heat Sensing (LHS) Cables.** These are unique heat sensing cables made of polymer insulating material having a negative

temperature coefficient of electrical resistance. These cables and associated systems can detect heat anywhere along the length of the cable. They are of two types (*a*) analog and (*b*) digital. Temperature change anywhere along the zoned length of the sensor cable produces a corresponding change in the resistance of the insulating material used in the cable. In analog type LHS cables, this data is being used by the associated system for generation of alarm. In digital LHS cables, the temperature change causes an insulation break down (short-circuit) which is used by the associated system for generation of alarm. Analog LHS cables are self-restoring type if not subjected to a temperature of more than 250° C. Digital LHS cables are not self-restoring type. Portions affected are to be cut and replaced by new one.

(*iv*) **Quartzoid Bulb.** This is the most common type of heat-sensing device used in water sprinkler systems. This is basically a quartz bulb that contains a special volatile liquid. The volumetric expansion of the liquid breaks the bulb when its temperature increases beyond a certain temperature. This phenomenon is used for further generation of fire alarm/actuation of fire suppression system.

4. (a)

A detailed fire hazard analysis should be carried out during initial plant design to reflect the proposed construction arrangements, materials and facilities. This analysis should be revised periodically as design and construction progress and before and during major plant modifications.

The fire hazard analysis should be a systematic study of (*a*) all elements of the fire protection programme being proposed to ensure that the plant design has included adequate identification and analysis of potential fire hazards (*b*) the effect of postulated fires relative to maintaining the ability to perform safe shutdown functions and (*c*) suggest remedial measures.

The fire risk can be quantified for the process industries based on the indices like Dow index (Fire and Explosion Index) and Mond index. The indices are comprehensive and give a realistic value to the risk of individual process unit due to potential fires and explosion. Facilities handling and storing flammable liquids are exposed to a potential fire risk. The fires due to flammable liquid may be a Pool Fire, Jet Fire, Flash Fire or Boiling Liquid Expanding Vapour Explosion (BLEVE) depending on the containment, type of release and source of ignition. Computer models are available to simulate the fire conditions and estimate the potential consequences.

The fire hazard analysis should separately identify hazards and provide appropriate protection in locations where safety related losses could occur as a result of :

(*a*) Concentration of combustible materials, including transient fire loads due to combustible expected to be used in normal operations ;

(*b*) Configuration of combustible contents, furnishings, building materials, or combinations thereof conducive to fire spread ;

(*c*) Exposure to fire, heat, smoke, steam that may necessitate evacuation form areas that are required to be attended for safety functions ;

(*d*) Fire in control rooms or other locations having critical safety related functions;

(*e*) Lack of adequate access or of smoke removal facilities that impede fire extinguishment in safety related areas ;

(*f*) Lack of explosion prevention measures ;

(b)

1. Fire Occurs
2. Fire is Detected by Observer or Detection System
3. Alarm is Sounded
4. Electric Power Supply and Other Fuel Supplies are Switched Off
5. Immediate Use of Portable Fire Extinguishers and Water/ Sand for Extinguishing Small Fires then and there
6. Automatic Fire Fighting System Gets Initiated
7. Call Fire Brigade.
8. Persons vacate the place.

5. Types of extinguisher

Water type, Foam, Dry powder, Carbon di-oxide, Halons.

Water expelling fire extinguishers has water as an extinguishing agent which is released in the form of a jet by means of gas pressure in the upper part of the container. The gas pressure may be induced by chemical reaction or by mechanical means.

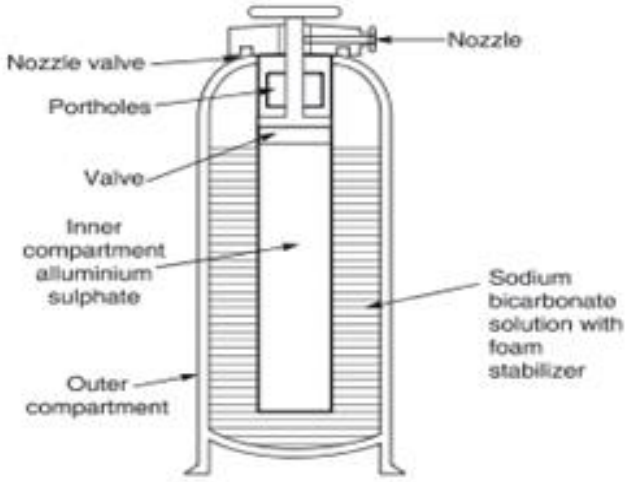
Water expelling fire extinguishers are used mainly in Class "A" fires (IS : 2190-1979) involving ordinary combustible materials like wood, paper, textiles, etc. which are put out by the cooling action of water. Besides, water when applied to burning material is converted to steam which reduces the percentage of available oxygen.

Water expelling type extinguishers should not be used on fire as involving electrical equipment without de-energising them.

The various types of water expelling extinguishers are :

1. Soda acid type IS : 934-1976
2. Gas Pressure actuated type IS : 940-1976
3. Constant Air Pressure Type IS : 6234-1971

Portable extinguishers expelling foam are recommended for class B fires involving flammable liquids like oils, solvents, petroleum products, varnishes, paints, etc. The foam expelled by actuating the extinguishers forms a blanket over the surface.



6. CNG

Safety issues in CNG filling stations

When CNG buses are filled at filling stations, normal precautionary measures are implemented according to Indian and international standards. But there is scope for improving the layout of the existing gas filling stations to ensure better approachability and safety. In a number of gas filling stations catering to non-DTC vehicles in Delhi, there is a minor risk of damaging the gas pump. This is because there is too tight radius for a bus to approach the pump easily. The lay-out of filling stations should give the privately operated buses plenty of room for a safe approach. If there is not enough room, the "island" either where the pump is located could be made larger or a steel barrier could be anchored in a suitable way for protection of the pump.

Nozzles and safety: These are prone to frequent o-ring failures – an item in nozzles. We are informed that they occur on an average about once every 20 fills. This failure not only interrupts fueling and requires replacement of the o-ring, it also creates a fire hazard due to the release of a significant amount of high-pressure gas.

Safety of CNG cylinders

As of today, the cylinders meet the common standards set for all high pressure gas cylinders from oxygen to hydrogen by the Bureau of Indian Standards and approved by the Chief of Comptroller of Explosives. However, these standards do not take into account on-board high-pressure gas cylinders mounted on moving vehicles. International standards have been specially set for on-board cylinders. There is a need for enforcement of these safety regulations as well.

Need for more stringent emissions standards for future

MRTH may be asked to notify Euro IV equivalent standards for new CNG buses from 2005 and simultaneously provide fiscal incentives for achieving European Environmentally Enhanced Vehicles standards.

LATHE MACHINE

- All materials shall be properly secured in chucks and collets before machines are started.
- Keep hands off chuck rims when lathe in motion
- Don't leave chuck wrench in chuck after removing work from lathe.
- Safety type lathe dogs shall be used when turning work on centers.
- See the tail stock, tool holder and work are properly clamped before turning on power.
- Don't attempt to adjust a tool while the lathe is running.