

**MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES**

**FACULTY OF ENGINEERING**

**Chemical and Processing Engineering Department**

**HEALTHY AND SAFETY IN INDUSTRIAL PLANTS**

**CODE: HCHE 326**

**SESSIONAL EXAMINATIONS**

**JANUAURY 2021**

**DURATION: 3 HOURS**

**EXAMINER: K. NYENYAYI (MR)**

**INSTRUCTIONS**

1. Answer *all questions* in Section A and *any three* from Section B.
2. Each question carries 20 marks.
3. Total marks 100

This question paper consists of 5 printed pages

## **SECTION A**

### **QUESTION ONE**

- a)** With reference to toxic chemicals, define the terms;
- i. Control banding
  - ii. Acute exposure
  - iii. Systemic effect [4]
- b)** Outline steps carried out in risk assessment. [4]
- c)** Using examples, briefly explain any four common sources of job stress in industrial work places. [8]
- d)** List the major components of emotional intelligence in an industrial work place. [4]

### **QUESTION TWO**

- a)** Define shift work. [2]
- b)** What are the financial benefits of reducing shift related problems in chemical companies? [6]
- c)** Outline the operation principles and applications of following ventilation systems as methods of chemical hazard control;
- i. Dilution ventilation
  - ii. Local exhaust ventilation
  - iii. Fumes [6]
- d)** Identify uses of epidemiology in occupational health and hygiene in industrial plants. [6]

## SECTION B

### QUESTION THREE

- a) What is meant by *hazard*, *risk perception* and *risk management* in the context of OHS? [4]
- b) Identify **four** different categories of workplace hazards citing **four** specific examples under each category. [12]
- c) How do chemical industries properly store and manage hazardous waste? [4]

### QUESTION FOUR

- a) Briefly discuss effects of shift work on different groups of vulnerable people. [8]
- b) List three effective ways of minimising risks associated with shift work. [3]
- c) State two ways of regularly checking and reviewing the effectiveness of shift work. [2]
- d) Using relevant examples, briefly outline an emergency response for chemical spills within a chemical processing industry. [7]

### QUESTION FIVE

- a) The picture below shows one of the sections from a material safety data sheet (MSDS) of a chemical raw material in soap and detergents manufacturing.

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### 3. Hazards Identification

#### Emergency Overview

**POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.**

SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;  
PROPER GLOVES

Storage Color Code: White Stripe (Store Separately)

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#### Potential Health Effects

##### Inhalation:

Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.

##### Ingestion:

Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appear days after exposure.

##### Skin Contact:

Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.

##### Eye Contact:

Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.

##### Chronic Exposure:

Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.

##### Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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Develop a basic standard handling and storage procedure for the raw material.[14]

- b) What information can be derived from material safety data sheets (MSDS) of a chemical? [6]

### QUESTION SIX

- a) Define the terms *dose* and  $LD_{10}$ . [2]
- b) Briefly describe the **four** different toxicity tests carried out on animals exposed

to chemicals.

[6]

**c)** Cite the limitations of epidemiology studies.

[6]

**d)** What factors should to be considered to make an effective epidemiology study?

[6]

THE END