



## UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE AND  
BACHELOR OF EDUCATION (SCIENCE)

## CHEM 101: CHEMICAL LABORATORY SAFETY AND SECURITY

STREAMS: BED(SCI), CHE, INDU CHEM, BIOC &amp; BMET

TIME: 2 HOURS

DAY/DATE: THURSDAY 19/12/2024

11.30 A.M – 1.30 P.M

## INSTRUCTIONS:

- ❖ Answer question **ONE (COMPULSORY)** and **TWO** other questions.
- ❖ Sketch maps and diagrams may be used whenever they help to illustrate your answer.
- ❖ **DO NOT** write on the question paper.
- ❖ This is a closed exam; **NO** reference materials are allowed in the examination room.
- ❖ There will be **NO** use of mobile phones or any other unauthorized materials.
- ❖ Write your answers legibly and use your time wisely.

**QUESTION ONE (COMPULSOLY) (30 MARKS)**

- (a) Differentiate between chronic and acute exposure of chemicals. (2 marks)
- (b) Regardless of the type of lab, there are general rules on safety that needs to be observed. State **ten** main general rules. (5 marks)
- (c) Distinguish between lower and upper flammability limits. (2 marks)
- (d) Discuss three major methods of waste disposal in the laboratory. (6 marks)
- (e) Describe the procedure(s) used to operate a fire extinguisher. (2 marks)
- (f) Discuss five essential Protective Equipment and Apparel for Laboratory Personnel for safety and security against exposure and injuries. (5 marks)
- (g) Explain the following terms as used in classification of flammable chemicals. (2 marks)
- (i) Flash point
  - (ii) Ignition temperature
- (h) State the conditions necessary for a fire to occur. (3 marks)

- (i) Explain the dose response curve with the aid of a diagram. (3 marks)

**QUESTION TWO (20 MARKS)**

- (a) Briefly discuss the properties of hazardous wastes. (8 marks)
- (b) There are four general classes of fires, which are likely to pose a genuine threat to laboratory safety. List each of the classes of fires and the type (s) of extinguisher required to put out the fire. (8 marks)
- (c) State four general practices to follow when working with flammable chemicals. (4 marks)

**QUESTION THREE (20 MARKS)**

- a) Electrically powered equipment such as vacuum pumps, lasers, hot plates, stirrers, electrochemical apparatus and heating mantles are essential elements of many laboratories. Elaborate four safety precautions that should be observed when using electrically powered equipment in the lab. (4 marks)
- b) Discuss the four major routes by which a chemical may enter the body while working in the laboratory. (8 marks)
- c) Discuss four major phases to managing a large-scale emergency. (4 marks)
- d) Explain the guidelines of cleaning up the following types of spills. (4 marks)
- (i) Materials of low flammability that are not volatile or that have low toxicity (e.g inorganic acids and caustic bases)
  - (ii) Flammable solvents

**QUESTION FOUR (20 MARKS)**

- a) Describe any **four** principles of green chemistry that can be applied in a laboratory. (8 marks)
- b) To analyze the hazards of a planned experiment, first identify potentially hazardous compounds to be employed. Discuss the four most prevalent classes of hazardous chemicals encountered in laboratories, including an example from each. (8 marks)
- c) The two most common cryogenics used in the lab are liquid nitrogen and liquid helium. State four safety precautions that should be followed when using cryogenic liquids. (4 marks)
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