



**UNIVERSITY OF SWAZILAND**

**FACULTY OF HEALTH SCIENCES**

**DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE**

**BSc DEGREE IN ENVIRONMENTAL HEALTH SCIENCES**

**MAIN EXAMINATION, MAY, 2019**

**TITLE OF PAPER : AIR SAMPLING AND ANALYSIS**

**COURSE CODE : EHS 456**

**TIME : 2HOURS**

**TOTAL MARKS : 100**

**INSTRUCTIONS:**

- 1. QUESTION 1 IS COMPULSORY**
- 2. ANSWER ANY OTHER THREE QUESTIONS**
- 3. ALL QUESTIONS ARE WORTH 25 MARKS EACH**
- 4. BEGIN THE ANSWER TO EACH QUESTION IN A SEPARATE SHEET OF PAPER.**

**DO NO OPEN THIS EXAMINATION PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.**

**QUESTION 1**

**I. Multiple choices: Write True or False against each letter corresponding to the following statements as they apply to air sampling and analysis.**

- a) Airborne hazards from gases, vapours, dusts and fibres can all cause potentially life threatening illnesses affecting the lungs, kidneys and liver.
- b) Heat stress increases productivity and can lead to accidents, illness and even death.
- c) The Personal Environmental Monitor (PEM) is a lightweight, personal sampling device for collecting particulates of either 2.5 or 10  $\mu\text{m}$ .
- d) Most airborne contaminants, whether they come in the form of dusts and particulates or gases and vapours, will also have a recommended method of sampling.
- e) A Primary standard is an instrument that bases measurements on direct, measurable linear dimensions that will change over time, or be altered by temperature or atmospheric pressure, such as the soap bubble flow meter range.
- f) Workplace Exposure Limits (WELs) and they are defined as the maximum concentration of a hazardous airborne substance that a worker may be exposed to over a defined period such as an 8-hour shift.
- g) Most hazardous materials fall into three main categories: dusts and particulates, gases and vapours, or bio-aerosols. Most hazardous materials fall into three main categories: dusts and particulates, gases and vapours, or bio-aerosols.
- h) The fundamental requirement of any measurement technique is that it should be appropriate for the purpose of the measurement
- i) In sampling of airborne contaminants monitoring involves the periodic or continuous sampling of the atmosphere at the workplace and will not usually require sampling in the breathing zone of the operative by means of personal sampling equipment.
- j) Fixed position/static monitoring can offer limited information as to an individual's exposure.

**(20 marks)**

**II.**

The operator works for 6h 20 min on a process in which he is exposed to a substance hazardous to health. The average exposure during that period is measured as  $0.15 \text{ mg.m}^{-3}$ . Calculate the 8-hour TWA for the exposure.

**(5 marks)**

**QUESTION 2**

- a) Describe Air Sampling. (7 marks)
- b) Describe the four types of airborne contaminants and give an example of each. (12 marks)
- c) Describe the procedure for sampling of inhalable dust. (6 marks)

**QUESTION 3.**

- a) Describe how the different aerosols of interest to occupational hygiene are produced and give an example of a disease associated with each. (20 marks)
- b) Describe how airborne contaminants exert their toxic effects on a worker. (5 marks)

**QUESTION 4**

- a) Describe aerosol morphology and give two examples of aerosols in your answer. (10 marks)
- b) What is Air Sampling? (5 marks)
- c) Describe the following types of Sampling:
- i. Grab (4 marks)
  - ii. Continuous (6 marks)

**QUESTION 5**

- a) Describe environmental sampling and give examples of sampling equipment that could be used and state the purpose for its use. (15 marks)
- b) Describe air sampling calibration and how it is achieved (10 marks)