



**UNIVERSITY OF SWAZILAND**

**FACULTY OF HEALTH SCIENCES**

**DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE**

**BSc DEGREE IN ENVIRONMENTAL HEALTH SCIENCES**

**MAIN EXAMINATION, AUGUST, 2020**

**TITLE OF PAPER : AIR SAMPLING FUNDAMENTALS FOR WORKPLACES**  
**COURSE CODE : EHS 456**  
**TIME : 2 HOURS**  
**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 risk management.**

- a) There are three types of contaminants according to their physical properties: particulates, vapours and gases
- b) Smoke: Particles resulting from the complete combustion of organic matter consisting predominantly of carbon and oxides of carbon.
- c) Air pollutant sampling are of two types :- air sampling of the particulate pollutants and air sampling of gaseous and vapour pollutants
- d) Thermal precipitation: is based on the principle that the particles move towards the lower temperature region when subjected to a strong temperature gradient.
- e) Column chromatography: Separation technique in which the stationary bed is within a tube.
- f) Concentration of gases, particulates and vapors are expressed in parts per million (PPM) or milligrams per cubic meter of air  $\text{mg/m}^3$  or micrograms per cubic meter ( $\mu\text{g/m}^3$ ).
- g) Gas chromatography: Mobile phase, a carrier gas, usually an inert gas such as helium or a non-reactive gas such as nitrogen.
- h) VOLATILITY:-Substance comprised of molecules that contain unbalanced localized charges (dipoles) is a polar substance.
- i) In chromatography, the polarity of the sample must closely match the polarity of the column stationary phase to increase resolution and separation while reducing runtime.
- j) Workplace Exposure Limits (WELs) 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.
- k) Fixed position samples cannot be used to establish personal exposures or be compared to hygiene standards.

**(22 marks)**

**II. Name the three basic measurements that an air sample requires.**

**(3 marks)**

**QUESTION 2**

- a) Describe the five main types of sampling (15 marks)
- b) Describe workplace monitoring (7 marks)
- c) State three Air sampling techniques for particulate pollutants. (3 marks)

**QUESTION 3**

- a) Describe the sampling of airborne particulates. (8 marks)
- b) Describe the three main elements of a sampling system for the sampling airborne particulates. (10 marks)
- c) State five important considerations about the source of contamination that may need consideration during the design and construction of captor inlets. (7 marks)

**QUESTION 4**

- a) Describe sedimentation and filtration as air sampling techniques for particulate pollutants. i. (12 marks)
- b) Describe Gas chromatography (GC) and its use in air sampling and analysis. (13 marks)

**QUESTION 5**

- a) Describe condensation sampling. (6 marks)
- b) Describe chromatography (7 marks)
- c) Describe “adipole effect” in the context of gas chromatography. (4 marks)
- d) Describe the importance of particle size when carrying out sampling for airborne particulates. (8 marks)