



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKWE**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF ENVIRONMENTAL SCIENCE**  
**2025\_2 EXAMINATIONS.**

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**COURSE CODE: ESM 341**

**COURSE TITLE: Introduction to Instrumentation Measurements and Field Methods in Environmental Science**

**CREDIT: 2 Units**

**TIME ALLOWED: 2 Hours**

**Instruction:** Attempt question number ONE (1) and any other TWO (2) questions. *Question number one (1) carries 30 marks, while the other questions carry 20 marks each.*

- 1a). Identify two causes of sampling error and explain each one of them. (7 marks)
- 1b). List three (3) types of solar radiation measurement. (3 marks)
- 1c). Mention three (3) types of solar radiation that can be measured. (3 marks)
- 1d). Explain how to measure dissolved oxygen. (5 marks)
- 1e). Explain the use of a lysimeter? (6 marks)
- 1f). Explain how electrical conductivity can be measured. (6 marks)
  
- 2a). State three (3) important reasons for using integrated sampling procedure for air borne gaseous agents. (6 marks)
- 2b). List four (4) uses of gas chromatography (4 marks)
- 2c). State four (4) environmental factors that affect pH and electrical conductivity (4 marks)
- 2d). Explain how a stratified sample can be obtained. (6 marks)
  
- 3a). Discuss briefly Time Domain Reflectometry (TDR) (7marks)
- 3b). Identify any six (6) essential parts of a colorimeter. (6 marks)
- 3c). Briefly explain Electrical Conductivity (EC) and preponderance Hydrogen (pH) (3 marks)
- 3d). Differentiate between specialized and universal laboratory techniques. (4 marks)
  
- 4a). Which factors must be taken into consideration when choosing an instrumentation technique for laboratory analyses? (5 marks)
- 4b). Define Atomic Absorption Spectrophotometer (AAS)? (2 marks)
- 4c). Describe the operation of a Global Positioning System (GPS) receiver. (8 marks)
- 4d). Mention five instruments that are needed for field survey (5 marks)
  
- 5a). What is a total station? (4 marks)
- 5b). List two (2) instruments suitable for both in situ and universal measurements. (2 marks)
- 5c). Differentiate between ecology and the environment. (4 marks)
- 5d). Briefly describe the following (10 marks)
  - i. Microphone
  - ii. Pyranometer
  - iii. Black-glove thermometer
  - iv. Microlysimeters
  - v. Spectrometer