



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE HONOURS	
QUALIFICATION CODE: 08BOSH	LEVEL: 8
COURSE CODE: ISP811S	COURSE NAME : INSTRUMENTATION PHYSICS
SESSION: JUNE 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	Prof Dipti R Sahu
MODERATOR:	Dr Zivayi Chiguvare

INSTRUCTIONS
1. Answer all questions. 2. Write clearly and neatly. 3. Number the answers clearly.

PERMISSIBLE MATERIALS

Non-programmable Calculators

THIS QUESTION PAPER CONSISTS OF 2 PAGES (Including this front cover)

- Question 1** [20]
- 1.1 Define process variable, load variable and manipulated variable. (5)
- 1.2 What are the advantages and disadvantages of PID control actions? (5)
- 1.3 Draw block diagram of the elements that make up the feedback path in a process-control loop and explain? (10)
- Question 2** [20]
- 2.1 Write down the difference between transducer and sensor with examples (5)
- 2.2 How does crystallite size of particles cause peak broadening in X-ray diffraction (XRD)? (5)
- 2.3 What is an XRD instrument and What are the components of an x-ray diffraction instrument? Explain the operation of XRD instruments with diagram. (10)
- Question 3** [20]
- 3.1 What are the applications of Atomic Force Microscopy? Can we see individual atoms with the AFM?. (5)
- 3.2 How electron beam is focused on SEM, explain? (5)
- 3.3 Explain the basic operational principle of an Transmission Electron Microscope with the aid of a diagram (10)
- Question 4** [20]
- 4.1 What is the difference between a heat flow and a heat flux DSC? (5)
- 4.2 Describe the principles of infrared spectroscopy? How is it differ from UV-VIS spectroscopy? (5)
- 4.3 Explain how a spectrophotometer works? (10)
In a sample with an absorbance of 1 at a specific wavelength, what is the relative amount of light that was absorbed by the sample.
- Question 5** [20]
- 5.1 What is van der Pauw method for resistivity ? (5)
- 5.2 How does a vibrating sample magnetometer work? Why do we use vibrating sample magnetometer? (5)
- 5.3 Mention five different techniques for measuring dielectric properties of materials? Mention how do each of these works. (10)

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