

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF MASTERS OF
SCIENCE IN PHYSICS

PHYS 821: LABORATORY TECHNIQUES I

STREAMS: M.Sc PHYSICS

TIME: 3 HOURS

DAY/DATE: THURSDAY 7/12/2017

11.30 A.M - 2.30 P.M.

INSTRUCTIONS:

- Answer ALL Questions.
- Do not write anything on the question paper
- This is a closed book 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

- (a) What is X-ray Powder Diffraction (XRD)? [1 Mark]
- (b) Explain the basic Principles of X-ray Powder Diffraction (XRD) [4 Marks]
- (c) Outline the working of an X-ray diffractometer. [4 Marks]
- (d) List the advantages and disadvantages of qualitative XRF analysis. [6 Marks]

QUESTION TWO

- (a) With an aid of Jablonski diagram, explain the basic principles of Fluorescence spectroscopy. Discuss the following in your explanation; [12 Marks]
- (i) Absorption, emission and stokes shift
 - (ii) Spectroscopic Transition Strengths and Quantum yields
 - (iii) Lambert-Beer Law and Absorption Spectroscopy
 - (iv) Temperature Effects of Absorption and Emission Spectra.
- (b) Mention how Förster Resonance Energy Transfer Technique (FRET) can be used. What makes FRET useful in *in vivo* experiments? [3 Marks]

PHYS 821

QUESTION THREE

- (a) What do you understand by Hall effect? [2 Marks]
- (b) Derive the Hall Constant relation $R_H = \frac{1}{nq}$. [5 Marks]
- (c) Explain briefly the Basic principle of a Hall Effect Sensor/switch. [2 Marks]
- (d) Discuss applications for Hall Effect IC Switches in portable electronics. Limit your discussion in applications of Unipolar Hall effect IC, Omnipolar Hall Effect IC switches, Bipolar, latching Hall ICs, in Open/close detection, Screen Orientation and Function Selection and Control. [6 Marks]

QUESTION FOUR

- (a) What is Ellipsometry? [2 Marks]
 - (b) What does Ellipsometry tell us about samples? [7Marks]
 - (c) How does Ellipsometers work? [6 Marks]
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