

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF PHYSICAL SCIENCE
DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY
STC 520: CHEMISTRY LABORATORY TECHNIQUES AND PRACTICE III
RAIN SEMESTER EXAMINATION 2014 / 2015 ACADEMIC SESSION

Instructions: Answer all questions.

Time allowed: 2 Hours 30 Minutes

- 1a. (i) What is a buffer solution?
(ii) What do you understand by the term buffer capacity?
- b. How will you prepare a named buffer solution?
- c. Describe two uses of buffer solution.
- d. Calculate the pH of a solution prepared by mixing 45mL of acetic acid with 15mL of sodium hydroxide, both solutions 0.1 -molar (The K_a of acetic acid is 1.86×10^{-5})
- 2a. What range of wavelengths corresponds to the following regions of electromagnetic spectrum: (i)ultraviolet (ii) visible (iii) infra red?
- b. State (i) Bouguert-Lambert law
(ii) Beer's law
- c. What conditions can lead to deviation from Beer's law?
- d. What type of monochromators and detectors are suitable for use in a UV spectrophotometer?
- 3a. What is plane-polarized light?
- b. Explain with the relevant equation what you understand by the term specific rotation.
- c. The following readings were obtained in a polarimetric measurement with D-glucose solution using a 1dm polarimeter tube. The observed rotations are in degrees.

Concentration	Observed Rotation
1.30% (1.30g /100mL)	+0.7 ^o
2.50% (2.50g /100mL)	+1.3 ^o
4.00% (4.00 / 100mL)	+2.1 ^o
5.60% (5.60g /100mL)	+3.0 ^o
8.00% (8.00g /100mL)	+4.2 ^o

Plot a graph of observed rotation against concentration and hence obtain the specific rotation of the D-glucose.

- d. Of what use is specific rotation of sugars in the pharmaceutical industry?
- 4a. Distinguish between single beam and double beam spectrophotometer.
- b. A compound having a concentration of 0.395 g / dm^3 has an absorbance of 0.545. What is the molar absorptivity of the compound?
(Molar mass of compound = 158, path length of cell = 1cm).
- c. What precaution do you take during polarimetric measurement while using a polarimetric tube (cell)?