CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN BIOCHEMISTRY

BIOC 241: INTEGRATED LABORATORY TECHNIQUES I

STREAMS: BSC (BIOC) **TIME: 2 HOURS**

DAY/DATE: TUESDAY 14/04/2020 **2.30 PM – 4.30 PM**

INSTRUCTIONS:

Answer Question One and any other Two Questions

Question 1 (Compulsory) (30 marks)

(a) Define affinity chromatography, and give the criteria used in selecting the matrix to be used in affinity chromatography. [5 marks]

(b) A researcher wants to separate two peptides by ion exchange chromatography. At the pH of the mobile phase to be used on the column, one peptide (A) has a net charge of -3, due to the presence of more Glu and Asp residues than Arg, Lys, and his residues while Peptide B has a net charge of -1.

(i) Define ion-exchange chromatography [1 mark]

(ii) Which peptide would elute first from a cation-exchange resin? Justify your answer [2 marks]

(iii) Which peptide would elute first from an anion-exchange resin? Justify your answers. [2 marks]

(c) Explain the principle behind spectrophotometry technique. [5 marks]

(d) During a laboratory practical session, students were given a mixture of volatile lipids to separate. Describe a suitable technique they used and the principle behind it. [5 marks]

(e) Describe a step-wise procedure of how you would measure pH in the laboratory using a pH meter. [5 marks]

(f) Highlight five advantages of using High Performance Liquid Chromatography as a separation technique. [5 marks]

Question 2 (20 marks)

(a) Explain any 5 applications of flow cytometry. [10 marks]

(b) A student wants to separate a hypothetical mixture of proteins X, Y and Z using size-exclusion chromatography. The respective molecular weights of individual proteins are: Protein X=245g, Protein Y=5000g and Protein Z=500g

(i) Show in what order the proteins will elute from the column. [3 marks]

(ii) Justify your answer in 2(i) above and explain in details the principle behind the separation. [7 marks]

Question 3 (20 marks)

(a) Describe the different conditions associated with acid-base imbalance in the body. [10 marks]

(b) Briefly describe the protein buffer system. [5 marks]

(c) Describe any five characteristics of a cuvette used in spectrophotometry. [5 marks]

Question 4 (20 marks)

(a) Describe the role of the kidney in maintaining acid-base balance. [10 marks]

(b) and Explain in details any 5 major applications of radioisotopes techniques in biochemistry biotechnology. [10 marks]
