Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	: BIOCHEMISTRY & BIOMOLECULAR TECHNIQUE
COURSE CODE	: BNN 30104
PROGRAMME	: 3 BNN
EXAMINATION DATE	: DECEMBER 2015 / JANUARY 2016
DURATION	: 3 HOURS
INSTRUCTION	: ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSIST OF **FIVE (5)** PAGES

Q1 (a) Elements with unfilled electron shells are reactive. List **THREE (3)** main types of chemical bonds.

(3 marks)

(b) Proteins are very important biological molecules that play crucial roles in virtually all biological processes. Relate **SEVEN (7)** biological functions of proteins.

(7 marks)

(c) Each amino acid has an amino group, a carboxyl group, a hydrogen atom and a specific side chain (R group) and bonded to the α-carbon atom. Sketch the monomer of acid amino.

(5 marks)

(d) Amino acids can be classified according to the metabolic fate of the carbon skeleton in three categories. Briefly explain the metabolic classification stated below and give **ONE (1)** example for each item:

(i) ketogenic

(ii) glucogenic

(iii) ketogenic and glucogenic

(10 marks)

Q2 (a) Metabolism is the sum of all chemical reactions that take place within a cell providing energy for vital processes and for synthesizing new organic material. Differentiate between anabolism and catabolism metabolic processes.

(4 marks)

(b) Different cells performs different functions. Describe **THREE (3)** metabolic pathways that occurred in human's body system.

(3 marks)

(c) Adenosine Triphosphate (ATP) is a high-energy molecule composed of adenine, ribose, and three phosphate molecules. The process that regenerate ATP from ADP (Adenosine Diphosphate) requires inorganic phosphate. Illustrate the process conversion of ADP to ATP to provide a constant supply of energy.

(10 marks)

(d) Glycolysis happens in the cytosol and not within the mitochondria. Pyruvic acid molecules later enter the mitochondria to participate in the next phase of aerobic cell respiration.

i. Identify total ATP molecules are made after glycolysis.

(3 marks)

ii. Describe the overall products of this process.

(5 marks)

Q3 (a) Explain the meaning of spectra used in spectroscopy.

(2 marks)

(b) List **THREE (3)** example of light source used in UV-Visible instrumentation.

(3 marks)

(c) Compare the support material (for both stationary and mobile phase) used in chromatography for techniques list below:

i. Paper
ii. Thin layer
iii. Gas-liquid chromatography

(6 marks)

(d) Electrophoresis separates molecules according to differences in their electrical charge. List **THREE (3)** type of electrophoresis.

(3 marks)

(e) Relate the function of buffer that used in electrophoresis

(3 marks)

(f) Protein stains are necessary for sample preparation, loading and analysis when studying proteins by electrophoresis. Identify **FOUR (4)** common protein stain and differentiate it detection limit in electrophoresis technique.

(8 marks)

Q4 (a) Name **THREE (3)** different building blocks of carbohydrates, i.e the monosaccharides.

(3 marks)

(b) Design a colorimetric assay to measure total carbohydrate.

(6 marks)

(c) Triglycerides are a type of lipid in the blood, serving as an energy source and playing a key role in metabolism. During lipolysis, lipases hydrolyse the triglyceride ester bond, yielding glycerol and free fatty acids (FFA).There are two well-established assays of free fatty acid (colorimetric and fluorometric) and based on one of the methods, determine how to get the FFA concentration in the blood.

(7 marks)

(d) Predict **TWO (2)** technical problems that could possibly happen while performing the assay.

(2 marks)

(e) Define nucleic acid and nucleotide.

(2 marks)

(f) Sketch the diagram of a nucleotide structure.

(3 marks)

(g) Identify **TWO (2)** biochemical molecules that consist of nucleotide.

(2 marks)

Q5 (a) Extract of apple juice contains a mixture of enzyme which will turn the juice red when catechol (substrate) is added. The details of catechol concentrations and the rate of reaction (change in absorbance) are in TABLE 1.

TABLE 1 Substrate concentrations and rate of reaction with or without inhibitor

Substrate concentration (mM)	Rate of reaction (**WITHOUT** inhibitor)	Rate of reaction (**WITH** inhibitor)
0.4	0.02	0.011
0.8	0.035	0.019
1.6	0.048	0.032
6.4	0.081	0.06

(i) Draw a new table and plot the Lineweaver-Burk lines of the substrate-enzyme reaction.

(15 marks)

(ii) Calculate the K_m and V_{max} value of both reactions.

(4 marks)

(iii) From the graph, determine type of enzyme inhibition.

(1 mark)

(iv) Propose chemical similarities or differences between the substrate and the inhibitor.

(1 mark)

(b) Differentiate between competitive and noncompetitive inhibition.

(4 marks)

- END OF QUESTION -