UNIVERSITY OF TECHNOLOGY, JAMAICA

SCHOOL OF PHARMACY AND HEALTH SCIENCE

SEMESTER II FINAL EXAMINATION

GROUP: **BPHARM 1 (CHY1007)** **DATE:** APRIL/MAY, 2008

SUBJECT: **BIOCHEMISTRY** **DURATION: 2 HOURS**

INSTRUCTIONS: ANSWER ANY TWO QUESTIONS

QUESTION NO. 1

(a) Draw the structure of a named Nucleotide **[2 marks]**

(b) Draw the structure of a named Nucleoside **[2 marks]**

(c) Explain how inherited enzymatic defects of the Urea Cycle cause hyperammonemia and describe the symptoms of this disease. **[4 Marks]**

(d) (i) Why are the livers of persons suffering from Jamaican Vomiting Sickness usually depleted of glycogen? **[5 marks]**

(ii) Explain the biochemical basis for the treatment of Jamaican Vomiting Sickness **[4 marks]**

(e) Give a detailed explanation of the mechanism by which nuclear DNA directs the synthesis of protein in the cytosol, starting with the synthesis of messenger RNA in the cell nucleus. **[8 marks]**

QUESTION NO. 2

(a) Calculate the **net** production of ATP in Glycolysis via the metabolism of **one** molecule of glucose **[2 marks]**

(b) Illustrate the Glycolytic pathway in detail **[5 marks]**

(c) In which part of the cell do the reactions of Glycolysis occur? **[1 marks]**

(d) Cystic Fibrosis is a genetic disorder caused by mutations of one gene. The normal gene contains the sequence of bases TAGAAA but in some abnormal genes the bases GAA are missing from the sequence. Genetic screening can be used early in pregnancy to find out if the fetus has inherited the disorder.

(i) What is a gene? **[2 Marks]**

(ii) How does a faulty gene affect the resultant protein? **[6 Marks]**

(iii) Will a child definitely develop the disease if one of its parents has it? **(Explain your answer)** **[5 Marks]**

QUESTION NO. 3

(a) (i) Write short notes on the overall reactions and biochemical relevance of Fatty Acid Synthesis. **[6 marks]**

(ii) How does hypercholesterolemia increase the risk of heart disease? **[4 marks]**

(b) Discuss the importance of Brown Adipose Tissue and explain the role that the enzyme thermogenin plays in its mode of action **[4 marks]**

(c) Give a detailed illustration of The Citric Acid Cycle and include in your answer the enzymes and points in the pathway where NADH, $FADH_2$ and GTP are generated. State the significance of these three molecules . **[5 marks]**

(d) One day you visit your old friend Boopsi in the country and you find that he has a strong odour of acetone on his breath. What specific medical test would you suggest for him and why? **[6 marks]**

QUESTION NO. 4

(a) The following data were obtained from an enzyme catalyzed hydrolysis in the presence and absence of inhibitor. Plot these results using the Lineweaver-Burk method and determine:

(i) Whether the inhibitor of this reaction is competitive or noncompetitive.

(ii) Values for K_m and V_{max} in the presence and absence of inhibitor.

Substrate conc. (mM)	V, no inhibitor (mM sec^{-1})	Vi, inhibitor present (mM sec^{-1})
0.0292	0.182	0.083
0.0584	0.265	0.119
0.0876	0.311	0.154
0.117	0.330	0.167
0.175	0.372	0.192

[5+2+2+2 marks]

(b) Discuss the relevance of stem cell research. **[5 marks]**

(c) During one of Mr. Williams' laboratory sessions a pharmacy student attempts to isolate a gene from a cDNA library which contains chimeric bacterial plasmids. The student uses a blotting procedure and a DNA probe to determine which colonies contains the gene of interest. **However a number of mistakes are made in the procedure. Indicate the mistakes and specify how each of these steps should be corrected so that this pharmacy student will accomplish the goal.** The procedure is outlined below.

A piece of nitrocellulose filter paper is placed over a lawn of individually separated bacteria in a Petri dish. At least two distinct marks are made on the nitrocellulose and the bacterial lawn so that the location of the clone of interest can be identified after the procedure. After enough time for the bacteria to grow on the nitrocellulose, it is removed for probing and the Petri dish is thrown in the garbage.

The colonies on the nitrocellulose are then lysed and the DNA denatured. This is then probed with a double stranded DNA which contains the complementary sequence to the gene of interest. The nitrocellulose is then removed after sufficient time for hybridization to occur. The excess solution is removed and then the nitrocellulose filter is placed on the bench-top overnight so that a color change in the colony will develop at the correct clone. The next morning, the nitrocellulose remained the same as the day before and no spots are detectable.

[9 marks]

******END OF PAPER******