



CRAWFORD UNIVERSITY
FAITH CITY, IGBESA, OGUN STATE
2012/2013 HARMATTAN EXAMINATIONS

COLLEGE: NATURAL AND APPLIED SCIENCES

DEPARTMENT: BIOLOGICAL SCIENCES

PROGRAMME: B.Sc BIOCHEMISTRY

COURSE CODE: BCH 307 COURSE UNIT: 2 TIME ALLOWED: 2 HOURS

COURSE TITLE: BIOENERGETICS

INSTRUCTION: ANSWER ANY FOUR QUESTIONS

- 1 a) Discuss how exergonic reactions can be coupled to endergonic reactions to enhance spontaneity. Illustrate your answers giving specific biochemical examples.
b) Given that the standard free energy of hydrolysis of phosphoenolpyruvate and creatinine phosphate are -14.8 and -10.3 kcal/mol respectively, what is the direction of each of the following reactions, when the reactants are initially present in equimolar amounts.
 - (i) $\text{ATP} + \text{Creatinine} \rightarrow \text{Creatinine phosphate} + \text{ADP}$
 - (ii) $\text{ATP} + \text{Pyruvate} \rightarrow \text{Phosphoenolpyruvate} + \text{ADP}$
- 2 a) State the equation which Gibbs created by combining the first and second laws of thermodynamics.
b) Define each of the terms in the equation in 2(a) above
c) What deductions can be made from the value of ΔG of a reaction?
- 3 a) Give an account of ATP as a universal currency of free energy in biological systems.
b) For the reaction $A \leftrightarrow B$, $\Delta G^{\circ} = 7.1 \text{ Kcal/mol}$. At 37°C , $-2.303RT = 1.42 \text{ Kcal/mol}$. What is the equilibrium ratio of A/B?
- 4 a) At equilibrium, the ratio of glyceraldehyde-3-phosphate (G3P) to dihydroxyacetone phosphate (DHAP) is 0.0475 at 25°C and pH 7. Determine ΔG° for this reaction.
b) When the initial concentrations of DHAP and G3P are $2 \times 10^{-4} \text{ M}$ and $3 \times 10^{-6} \text{ M}$ respectively, calculate ΔG .

5 Write notes on the following: Illustrate your answer with diagrams.

- (a) Electron transport chain
- (b) Oxidative phosphorylation

6(a) Give an account of ATP biosynthesis from the complete oxidation of glucose

(b) Explain the importance of thermodynamics in the metabolism of biomolecules

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