Benha University
Faculty of Science
Department of Zoology

Biochemistry 1 (303 Z)

Semester: First Term
Level: Third level
Sepc: Biotechnology
Date: 3/1/2017
Exam time: 2:00 hours

Answer the following questions:-

1- Write on the following:- (18 marks)

a) Function and regulation of glycolysis. (4 marks)

GLYCOLYSIS FUNCTION

Aerobic: To convert *glucose* to pyruvate and ATP. Pyruvate can be burned for energy (TCA) or converted to fat (fatty acid synthesis).

Anaerobic: ATP production. Recycle NADH by making lactate.

GLYCOLYSIS REGULATION

Primary signals:	*Insulin* turns *on*. *Glucagon* turns *off*. *Epinephrine* turns *on* in *muscle*, *off* in *liver*. *Phosphorylation* turns *off* in *liver*, *on* in *muscle*.
Secondary signals:	Glucose signals activate (fructose 2,6-bisphosphate activates phosphofructokinase). Low-glucose signals inhibit. High-energy signals inhibit. Low-energy signals activate.

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b) Gluconeogenesis location, function and its regulation. (5 marks)

GLUCONEOGENESIS FUNCTION

Gluconeogenesis makes *glucose* from pyruvate to help maintain blood glucose levels.

GLUCONEOGENESIS LOCATION

Liver and kidney—*not muscle*.

GLUCONEOGENESIS REGULATION

Primary signals:	Insulin turns *off*.
	Glucagon turns *on*.
	Acetyl-CoA turns *on*.
	Phosphorylation turns *on* in liver.
Secondary signals:	Glucose signals turn *off*.
	(Fructose 2,6-bisphosphate inhibits fructose 1,6-bisphosphatase.)
	Low-glucose signals activate.
	High-energy signals activate.
	Low-energy signals inhibit.

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c) ATP cost for glycogen biosynthesis. (3 marks)

ATP YIELD

No ATP is required to remove glucose from glycogen stores.

Degradation:[1]

$(\text{Glycogen})_n + P_i \longrightarrow \text{glucose 1-phosphate} + (\text{glycogen})_{n-1}$

$\text{Glucose 1-phosphate} + H_2O \longrightarrow \text{glucose} + P_i$

Net: $(\text{Glycogen})_n + H_2O \longrightarrow (\text{glycogen})_{n-1} + \text{glucose}$

ATP COST

2 ATPs are required to store each glucose as glycogen.

Synthesis:[1]

$\text{Glucose} + \text{ATP} \longrightarrow \text{glucose 6-phosphate} + \text{ADP}$

$\text{Glucose 6-phosphate} \longrightarrow \text{glucose 1-phosphate}$

$\text{Glucose 1-phosphate} + \text{UTP} \longrightarrow \text{UDP-glucose} + 2P_i$

$\text{UDP-glucose} + (\text{glycogen})_n \longrightarrow \text{UDP} + (\text{glycogen})_{n+1}$

$\text{UDP} + \text{ATP} \longrightarrow \text{UTP} + \text{ADP}$

Net: $(\text{Glycogen})_n + \text{glucose} + 2\text{ATP} \longrightarrow (\text{glycogen})_{n+1} + 2\text{ADP} + 2P_i$