BCH 4054 **HOUR TEST 1** **NAME**_____

September 11, 1998

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(20) 1. Biosynthesis of glucose from pyruvate involves four enzymatic reactions that are not part of the glycolysis pathway from glucose to pyruvate. Identify these four reactions by giving the **reactants** and **products** and the **name of the enzyme** for each.

(10) 2. Give the **name** and **structure** of the **products** formed when sedoheptulose-7-phosphate reacts with glyceraldehyde-3-phosphate in the presence of:

(a) transaldolase

(b) transketolase

(6) 3. Identify by **name** or by **reaction catalyzed** the two enzymes of the glyoxalate cycle that enable plants to convert acetyl-CoA to glucose.

(28) 4. In the oxidation of glucose to CO_2 by glycolysis and the TCA cycle, NADH is produced in five different enzymatic steps. In the oxidation of glucose to CO_2 by the pentose phosphate pathway, NADPH is produced in two different enzymatic steps. Identify each of these **seven** catabolic oxidation steps, giving the reactants and products (structure or name okay), names of coenzyme cosubstrates and prosthetic groups, and names of the seven enzymes

(6) 5. Draw structures of oxaloacetate to show the labeling pattern it would have from incorporation of ^{14}C from [2-^{14}C]acetyl-CoA after

(a) one turn of the TCA cycle.
(b) two turns of the TCA cycle.
(c) three turns of the TCA cycle.

(16) 6. Glucagon is a peptide hormone produced in response to low blood glucose. It stimulates the liver to breakdown glycogen and secrete glucose. This stimulation occurs through an amplification cascade of reactions that ultimately activates phosphorylase to degrade glycogen.

(a) Describe this cascade, including all the intermediate proteins involved and their covalent modification.

(b) Explain how products in this cascade also affect the **rate of glycogen synthesis** and the **rate of glycolysis** in the liver.

(6) 7. Phosphorylase is an allosteric protein, existing in an **R** (active) and a **T** (inactive) conformation. The **T/R** ratio is affected by several allosteric "effectors", which activate or inhibit enzyme activity. For each of the following compounds, indicate whether it primarily affects the **phosphorylated** or **non-phosphorylated** form of the enzyme, whether it shifts the **T/R** ratio toward the **T** form or the **R** form, and whether the effect is an **activation** or **inhibition** of enzyme activity.

Effector	**Phosphorylated or Non-phosphorylated**	**T or R**	**Activation or Inhibition**
ATP	_____	____	_____
AMP	_____	____	_____
Glucose	_____	____	_____
Glucose-6-phosphate	_____	____	_____

(8) 8. Describe the **Cori Cycle**