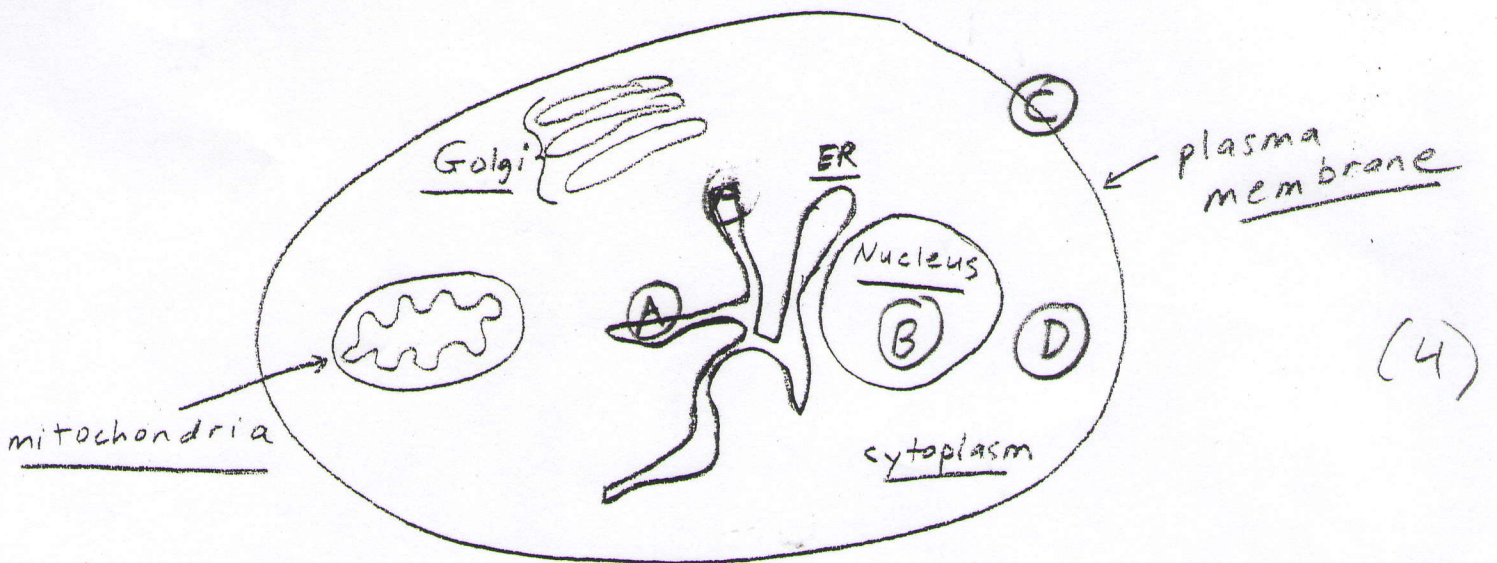


BIOSC 1820
 Metabolic Pathways and Regulation
 Spring, 2010
 Prof. Jeffrey L. Brodsky
 Quiz #2
 February 10, 2010

NAME: KEY

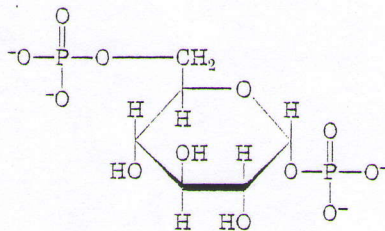
1. Place the following letters, corresponding to each enzyme name, within the correct subcellular compartment or membrane in the following cartoon of a cell:

- A. glucose-6-phosphatase in a liver cell
- B. glucokinase in a liver cell when high levels of fructose-6-phosphate are present
- C. A G-protein coupled receptor
- D. Phosphofructokinase-1



2. The following molecule is an intermediate in the reaction catalyzed by which enzyme?

phosphoglucomutase (1)



3. The generation of phosphate
from pyro phosphate

(1)

provides the favorable energy to drive the covalent attachment of UDP onto glucose during glycogen synthesis.

4. What would be the effect on blood sugar levels if you expressed a form of phosphofructokinase-2/fructose-2,6-bisphosphatase that could not be phosphorylated? Why?

(1)

The dephosphorylated, bi-Functional enzyme would lead to active PFK-2 and inactive FBPase-2, which would increase F-2,6-BisP levels. This drives glycolysis and inhibits gluconeogenesis, leading to reduced blood sugar.

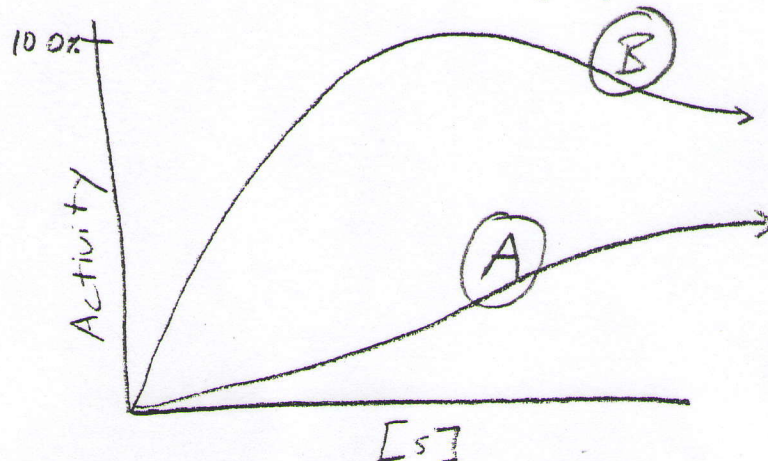
5. Place the following molecules/enzymes in the correct order in the glucagon response pathway (write the letters, in order, on the line below):

- A. the cAMP-dependent protein kinase
- B. glycogen phosphorylase
- C. adenylate cyclase
- D. debranching enzyme

C-A-B-D

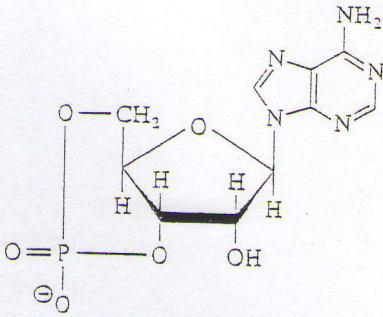
(1)

6. The following curves show the activity-substrate relationship for fructose 1,6-bisphosphatase. Label the curves that represent the relationship in (A) the presence of fructose-2,6-bisphosphate and (B) the absence of fructose-2,6-bisphosphate



(1)

7. Which enzyme catalyzes the breakdown of the following molecule?



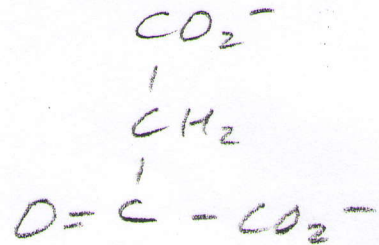
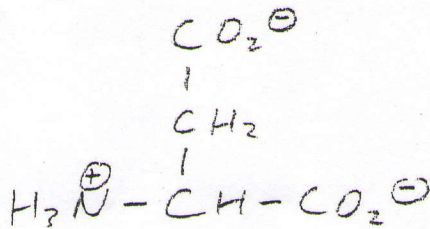
(1)
cAMP phosphodiesterase

8. An increase in cytoplasmic calcium acts on each of the following EXCEPT:

- A. protein kinase C
- B. calmodulin-kinase
- C. InsP₃ release from the ER
- D. phosphorylase-kinase
- E. None of the above; they are all acted on by calcium

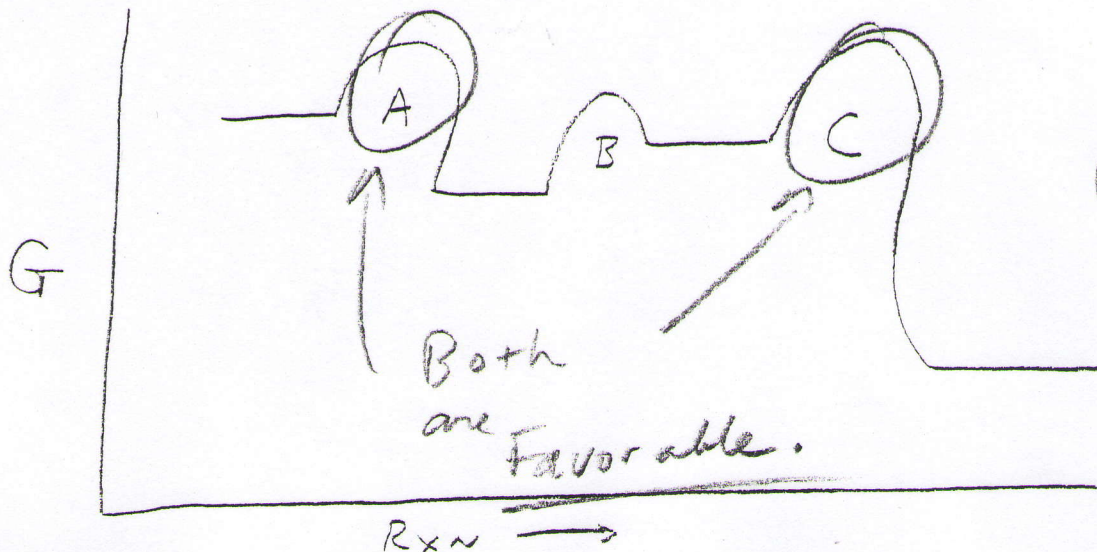
(1)
 InsP₃ triggers the release of Ca²⁺ from the ER.

9. Draw the structure and write the name of the product of the following reaction:



Oxaloacetate

10. Assume that the following diagram represents the free energy change for a multi-step metabolic pathway. Which step(s) might be most prone to regulation?



11. At first, it seems odd that insulin favors glycolysis in the liver since the role of insulin is usually thought to be required to aid in the storage of metabolites; in fact, as we learned, insulin inhibits glycogen breakdown by activating protein phosphatase-1. So, why is it necessary that insulin activates glycolysis?

Increasing glycolysis leads to (1)
the generation of pyruvate,
and then to acetyl-CoA, which
is a precursor for Fat synthesis
and storage.

Recitation

12. What is the name of the promoter that was used to control the expression of the insulin analogue, and why was this promoter chosen?

The pyruvate kinase promoter,
which is a glucose (1)
responsive promoter.

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