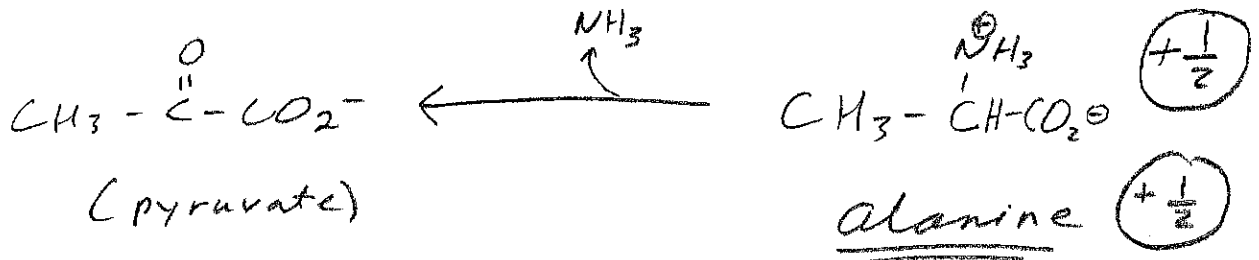


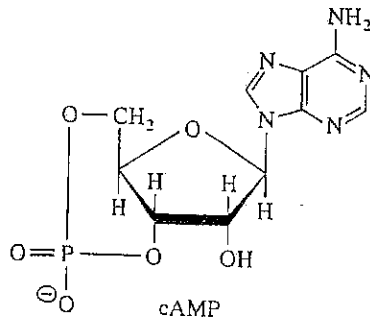
BIOSC 1820
Metabolic Pathways and Regulation
Spring, 2012
Prof. Jeff Brodsky
Quiz #2
February 8, 2012

NAME: KEY

1. Draw the structure AND give the name of the amino acid that can be converted directly into pyruvate:



2. Draw the structure of cyclic (3'-5') AMP. What is the name of the enzyme that breaks down this "second messenger"? (2 points)



+1

"Phosphodiesterase" +1
 breaks down
 cAMP.

3. Under which metabolic condition (and when which metabolite is at high levels) is glucokinase in the nucleus?

Glucokinase is in the nucleus when fructose-6-phosphate levels rise -- this would occur when gluconeogenesis and glycogen breakdown are occurring (i.e., the liver wants to "Feed" glucose into the blood).

4. Suppose that a cell expressed a mutant form of fructose-2,6-bisphosphatase that could not be activated. What would be the effect on glycolysis in the liver? Why?

The levels of fructose-2,6-bisphosphate would rise, so glycolysis would increase.

5. A few years ago, an enzyme was found to bind directly to glycogenin in extracts from skeletal muscle and liver cells. Which enzyme do you think this is?

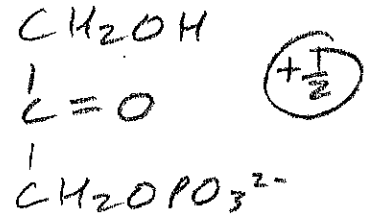
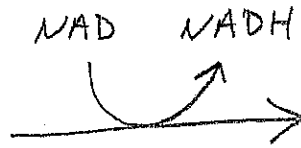
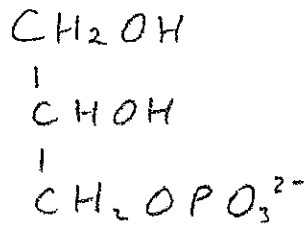
glycogen synthase (which takes over from glycogenin to extend the glycogen polymer).

6. An enzyme known as β -adrenergic receptor kinase ("BARK") was identified some time ago and plays a key role in regulating cellular metabolism in the liver and in other tissues. If a drug inhibited the activity of this kinase, do you think that glycogen breakdown or synthesis would increase? Why?

G protein coupled receptors are down-regulated by phosphorylation. If this failed to take place, then glycogen breakdown would be favored.

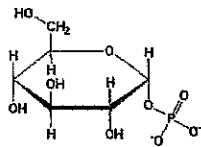
7. Draw the structures AND give the names of the products of the following reactions:

A.



$\left(+\frac{1}{2}\right)$ dihydroxy acetone phosphate

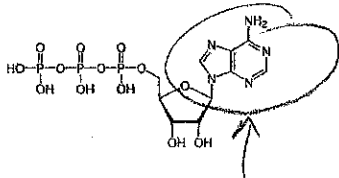
B.



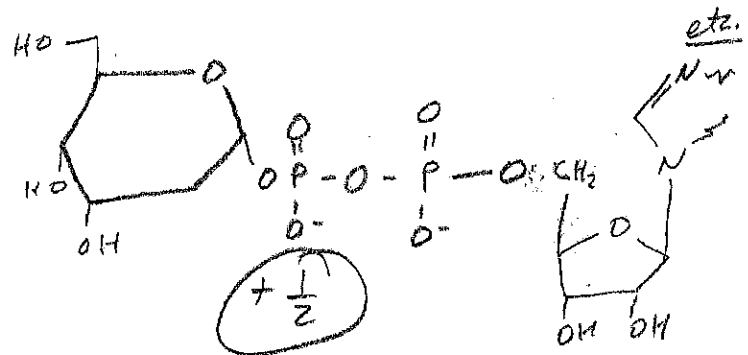
+



ADP-glucose $\left(+\frac{1}{2}\right)$



NOTE:
this is adenosine and not uridine



8. What are the FULL NAMES of the two breakdown products of PIP_2 , which can occur after the activation of some G proteins?

- diacyl glycerol $\left(+\frac{1}{2}\right)$

- inositol trisphosphate $\left(+\frac{1}{2}\right)$

Circle the name that represents the molecule that is able to increase the cytosolic concentration of calcium.

$\left(+1\right)$

9. What is the name of the molecule that inhibits glycogen phosphorylase via direct binding, thus preventing uncontrolled levels of glycogen breakdown in the liver?

glucose

+1

10. The substrates(s) of protein kinase A include (circle one answer):

- ✓ A. Phosphorylase kinase
- ✓ B. Fructose-bis-phosphatase-2/phosphofructokinase-2 complex
- ✓ C. Glycogen phosphorylase
- D. IP₃
- E. None of the above
- F. More than two of the above

+1

11. TRUE or FALSE? The α subunit of a G protein is associated with the β and γ subunits when bound to GTP:

F (GDP is bound ...)

+1

12. In brief, state 2 reasons why the adenovirus delivered, single chain insulin analogue under the control of the LPK promoter could not be used to replenish insulin in diabetic humans.

• Delayed expression / delivery to the blood stream (hyperglycemia)

+ $\frac{1}{2}$

• Prolonged residence in the blood stream (hypoglycemia)

+ $\frac{1}{2}$

/15