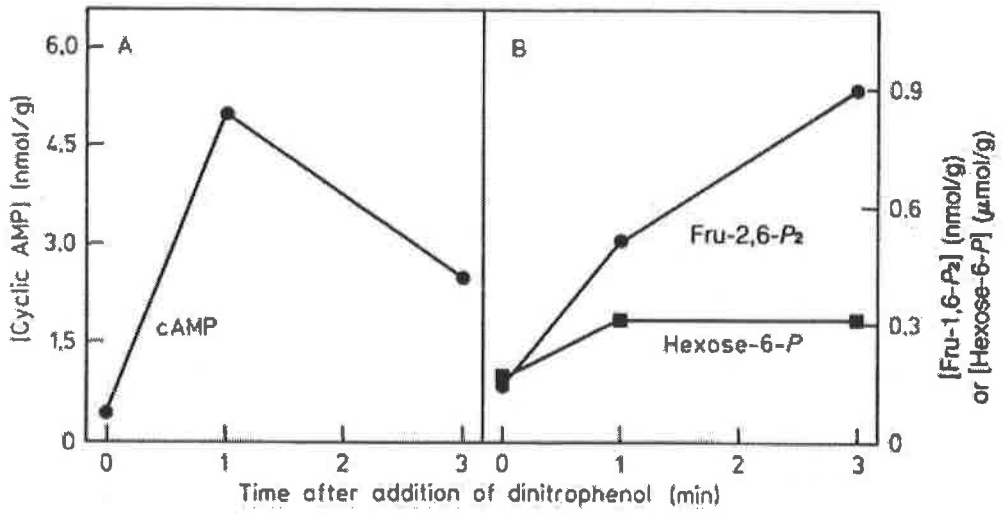
Name: Key Exam 1

1. Imagine that you create a stock solution of oxidized o-dianisidine dye (this is the dye used in the glucose concentration assays) dissolved in phosphate buffer, but it was too concentrated to determine the absorbance with a spectrophotometer. The following dilution scheme starting with tube 1 and continuing through tube 5, using phosphate buffer as a dilutant, allowed you to determine the absorbance value. Fill in all the blank values in the table below:

Tube	o-dianisidine	Phosphate buffer	Dilution Factor from stock	Absorbance
1	Stock	0 uL	1	360
2	150 uL of tube #1	2850 uL	1:20	18
3	600 uL of tube #2	2400 uL	1:100	3.6
4	200 uL of tube #3	800 uL	1:500	0.72
5	500 uL of tube #4	500 uL	1:1000	0.36

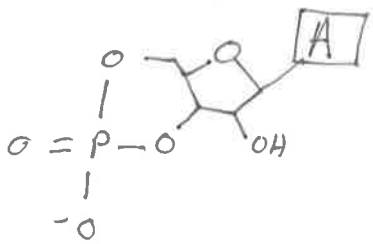
2. In 1984, Jean François discovered that yeast cells use cAMP to regulate metabolism as found in higher multicellular organisms.



François stimulated cAMP production by treating the yeast cells with dinitrophenol (panel A). There is a typo on the y-axis label for panel B. It should read [Fru-2,6-P_2] instead of [Fru-1,6-P_2].

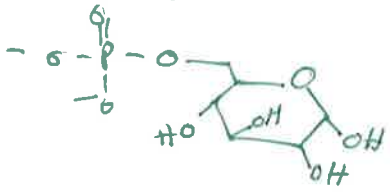
   a. Draw (or Define if you cannot draw) the molecule or molecules represented in the figure
      i. cAMP (A can be represented with box with "A" in it)

Cyclic Adenosine Monophosphate

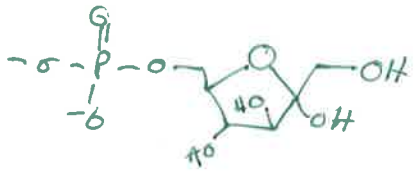


ii. Hexose-6-P

glucose-6-phosphate

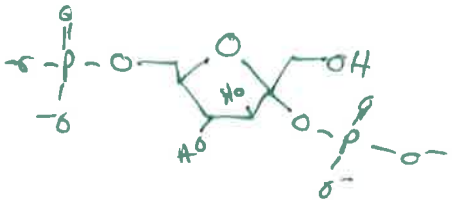


fructose-6-phosphate



iii. Fru-2,6-P_2

fructose-2,6-bisphosphate



b. François concluded that cAMP and Fru-2,6-P_2 were regulatory molecules while Hexose-6-P were pathway intermediates/metabolites. Explain the key observation from the figure that supports this conclusion.

There is 75-fold (cAMP) and 300-fold (Fru-2,6-P_2) more hexose-6-P in the cell.

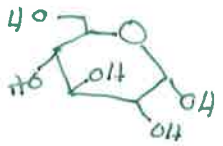
c. Does cAMP in yeast function similar to hepatocytes, adipocytes, cardiac myocytes, and/or skeletal myocytes?

Cardiac myocytes

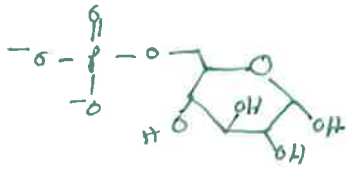
3. An alternate pathway for glucose metabolism combines some of the steps from the pentose phosphate pathway with some of the steps from glycolysis to generate two pyruvates. Fill in the following pathway:

   From the pentose phosphate pathway:

   a. Draw α-D-glucose.

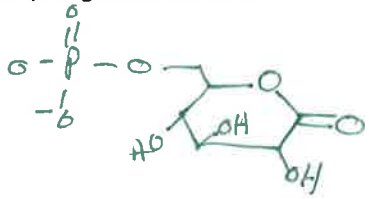


   b. Draw the product of the reaction catalyzed by hexokinase.



      i. Suggest any other reactants for this reaction. ATP

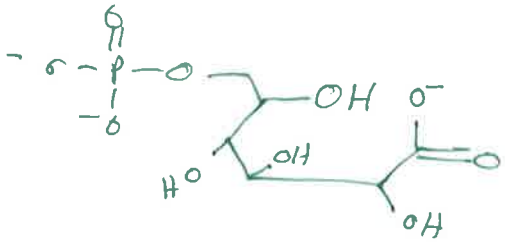
   c. Convert C1 to a carbonyl (i.e., an ester). This is named 6-phosphoglucolactone. Draw 6-phosphoglucolactone.



      i. Suggest a name for this enzyme glucose-6 phosphate dehydrogenase

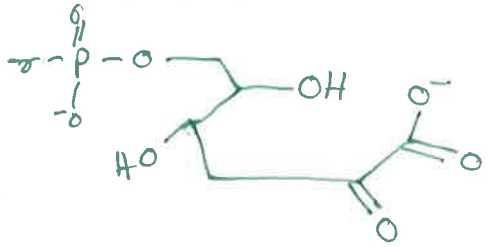
      ii. Suggest any other reactants for this reaction. NADP+

   d. Linearize 6-phosphoglucolactone and convert C1 to a carboxylate. The enzyme that catalyzes this reaction is 6-phosphoglucolactonase, while the product is 6-phosphogluconate. Draw 6-phosphogluconate.



      i. Suggest any other reactants for the reaction. H_2O

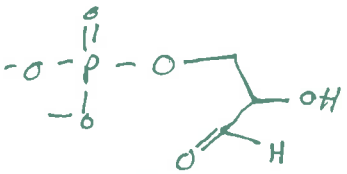
e. Convert C2 to a ketone and C3 to a methylene. Water leaves. The product is called 2-keto-3-deoxy-6-phosphogluconate. Draw 2-keto-3-deoxy-6-phosphogluconate.



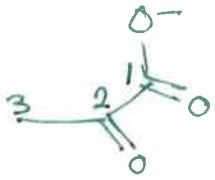
i. Suggest a name for this enzyme enolase like

ii. Suggest any other reactants for the reaction. None

f. An aldolase reacts with 2-keto-3-deoxy-6-phosphogluconate to yield pyruvate and glyceraldehyde-3-phosphate. Draw pyruvate and glyceraldehyde-3-phosphate.



glyceraldehyde-3-phosphate



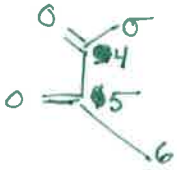
pyruvate

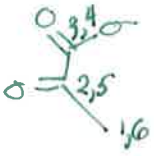
i. Label each carbon in pyruvate with respect to its origin in glucose (e.g., C1, C2, C3, C4, C5, or C6).

g. Fill in the enzymes in order required to convert the glyceraldehyde-3-phosphate to a pyruvate

i. glyceraldehyde-3-phosphate dehydrogenase
ii. phosphoglycerate kinase
iii. phosphoglycerate mutase
iv. enolase
v. pyruvate kinase

h. Label each carbon in this second pyruvate with respect to its origin in glucose (e.g., C1, C2, C3, C4, C5, or C6).



i.) from glycolysis  from alternate