EXAM 1 CHEM/BIOL 260
SPRING 2014

NAME:_____

1. Imagine that you create a stock solution of the dye DCPIP. You need to know the absorbance of the stock solution, but it is too concentrated to read in the OceanOptic. The following dilution scheme allows you to determine the needed absorbance value. Fill in all the blank cells in the table below:

Tube	DCPIP	dH_2O	Dilution Factor from stock	Absorbance
1	stock	0 uL	1	
2	500 uL of tube #1	500 uL	1:2	
3	200 uL of tube #2		1:10	
4	200 uL of tube #3	800 uL		
5	100 uL of tube #4		1:500	0.68

2. You've just eaten lunch.
   a. Circle the metabolic pathways that are active in your hepatocytes.

Glycolysis	Gluconeogenesis
Glycogenesis	Glycogenolysis
Pentose phosphate pathway	Fructose breakdown
Lactate synthesis	

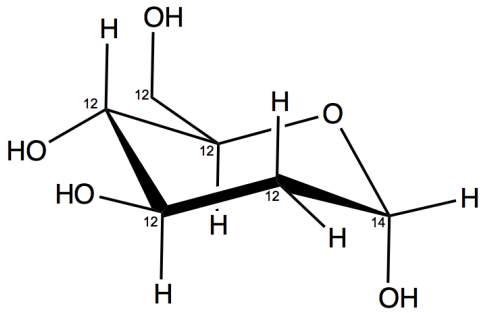
   b. List the hormonally-regulated enzymes that lead to the metabolic pathway pattern that you indicated in *part a* and indicate whether each is phosphorylated or dephosphorylated

Enzyme	Phosphorylated	Dephosphorylated
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

3. Chesney and coworkers concluded that estradiol stimulates glycolysis by increasing expression of PFK-2 in breast cancer cells with estrogen receptors in their recent publication [Imbert-Fernandez *et al.* (2014) **JBC:** *in press*].

   a. Explain how the presence of increased amounts of PFK-2, which is not an enzyme involved in the glycolysis pathway, could be responsible for stimulating flux through glycolysis.

   b. Chesney and coworkers used 2-deoxyglucose labeled with radioactive ^{14}C at C1 to monitor glucose uptake by breast cancer cells. They found that ^{14}C increased 12,000-fold within the cells in the presence of estradiol.



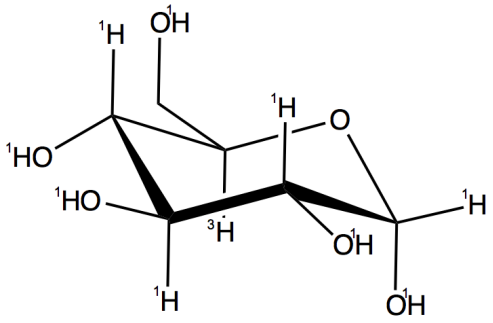
      i. What are the metabolic fates of glucose?

      ii. Of these pathways, which can fully utilize 2-deoxyglucose? Neglect enzyme specificity and focus on the organic chemistry of each pathway.

      iii. Does 2-deoxyglucose labeled with radioactive ^{14}C at C1 accurately monitor glucose uptake or is it an over- or under- estimate? Explain.

      iv. Is it correct to conclude that glucose is accumulated in breast cancer cells in the presence of estradiol?

c. Chesney and coworkers used glucose labeled with radioactive ^{3}H at C5 to monitor flux through glycolysis. They found a 1000-fold increase in H_2O containing ^{3}H within cells in the presence of estradiol.



i. Explain why the accumulation of H_2O containing ^{3}H is a measure of flux through glycolysis.

ii. Could any other position in glucose be labeled with ^{3}H to yield a similar result? Explain why or why not.

4. Chen and coworkers created a transgenic mouse line that had significantly higher levels of a variant of Phosphoprotein phosphatase 1 (PP1) within liver cells. The authors found 8-fold higher levels of glycogen in cells over-producing PP1 than wild-type cells after an overnight fast. Explain this abnormal fasting-state result. [Zhang *et al.* (2014). **Mol. Endocrinol 28(1):** 116]