

November 25, 2002

Fall 2002

Isom

## EXAM 4

Name: \_\_\_\_\_

### Biochemistry I / CHEM 4320

**1) VERY Short Answer.** Provide a short answer for each of the following: (4 points each)

- a) What is meant by a protonmotive force? How is it generated?
  
  
  
  
  
  
  
  
  
  
- b) Why are ATP and AMP common allosteric effectors of enzymes involved in metabolic pathways?
  
  
  
  
  
  
  
  
  
  
- c) Why is it necessary to convert pyruvate to lactic acid in muscle under anaerobic conditions?
  
  
  
  
  
  
  
  
  
  
- d) What is the purpose of CoQ (aka ubiquinone or UQ) in electron transport?
  
  
  
  
  
  
  
  
  
  
- e) What are the roles of glycogenin and thermogenin?

**2) Short Answer.** Answer the following questions using words and /or pictures.

- a) The toxic effects of many compounds come from inhibition of electron transport components. Consider 2 examples Toxin A and Toxin B. Toxin A inhibits complex II while toxin B inhibits cytochrome C. **Explain** the expected effects of each compound on ET. Would you expect one compound to be **more toxic** than the other? **Why or Why not?** (5 pts)

(b) Draw the substrate and product(s) of the following enzymes (dont draw ATP) (4 pts each):

(1) phosphofructokinase

(2) aldolase

**3)** Assume that each condition listed below is the result of a genetic disease (as opposed to a temporary condition). Describe the effect of the following conditions on the ability to regulate blood sugar and on glycolysis/CAC. Would they necessarily be fatal? Why or why not? (5 pts each)

a) absence of citrate synthase

b) a lack of the enzyme phosphoglyceromutase

c) a lack of the enzyme lactate dehydrogenase

d) a lack of the enzyme glucose-6-phosphatase

**4) Fill in** the missing information in the chart below. If the answer involves a specific glycosidic linkage be sure to specify it. (2 point each)

<u>substrate</u>	<u>enzyme</u>	<u>product(s)</u>
	triose phosphate isomerase	
		UDP-glucose
	glycogen phosphorylase	
glucose-1-phosphate		glucose-6-phosphate
	enolase	
	pyrophosphatephosphatase (PPP)	
ATP		cAMP

**(6)** A student skips breakfast and decides to workout before lunch. After her heavy workout, she is dizzy and hungry so she decides to eat a small candybar. A few minutes after ingesting the candy, she notices that she her dizziness has subsided and she doesn't feel hungry anymore.

(a) Why did she feel dizzy after her workout? Briefly describe the response of her pancreas and hepatocytes (liver cells) before she eats the candybar. (3 pts)

(b) Beginning with glucose in the intestine, explain in detail the processes involved in the alleviation of her dizziness and hunger. (4 pts)

(c) What is her blood sugar condition after consumption of the candybar? Briefly describe the response of her pancreas and hepatocytes (liver cells) under these conditions. (2 pts)

(d) Since she is not hungry she decides not to eat. After relaxing for 30 minutes or so, she **suddenly** begins to feel dizzy and hungry again. Explain the processes (regarding blood sugar) involved in the recurrence of her symptoms. (4 pts)

(e) She decides to eat a large plate of spaghetti for lunch. She feels much better. Describe the response of her pancreas and hepatocytes (liver cells) to her blood sugar condition at this point. **Be sure to describe in detail the regulation cascade involved.** (5 pts)

(f) She notices that it takes 5 hours for her to feel hungry again after her pasta meal while it only took 30 minutes after the candy bar for her hunger to return. Explain this difference in time in terms of her blood sugar condition, glycogen stores and hormonal response. (5 pts)