

CHEM 255 Quiz Questions

Each quiz is worth a total of 15 points. Quiz items will be based on material covered since the preceding quiz. The following items will be included. Each is worth 5 points.

Quiz 1

1. True or False (circle one) A missed quiz in this course can be made up as long as a student has a valid excuse.

Quiz 2

1. Polar bonds and hydrogen bonding are important factors in the behavior of biomolecules.
 - a) Draw the structure of methanol (CH_3OH) showing all covalent bonds.
 - b) Use the appropriate symbols ($\delta+$ or $\delta-$) to show the partial charges on the molecule resulting from any polar bonds.
 - c) Add two water molecules (showing all covalent bonds) showing how they could form hydrogen bonds with the methanol molecule (use dotted or dashed lines to show the hydrogen bonds).

Quiz 3

1. Consider this reaction: $\text{DHAP} \rightleftharpoons \text{G3P} \quad \Delta G^{\circ} = + 7.5 \text{ kJ/mol}$

Assume that you mix DHAP and G3P in water so that both concentrations are 1.0 M and wait until the system reaches equilibrium. At that time:

- a) there will be more DHAP than G3P.
- b) there will be more G3P than DHAP.
- c) the concentrations will both still be 1.0 M.
- d) there could be more DHAP or more G3P, it is not possible to predict which.

Quiz 4

1. Acetyl-CoA carboxylase (ACC) is an allosteric enzyme in the metabolic pathway for synthesis of fatty acids. Based on your understanding of allosteric regulation, circle the best option for each pair in parentheses:

It is reasonable to predict that high concentrations of fatty acids will (*activate* or *inhibit*) ACC. We can predict that there is a binding site for fatty acids on ACC and that fatty acids bind more strongly to the (*T state* or *R state*) of the enzyme.

Quiz 5

1. Draw the structure of one of the cyclic forms of D-glucose. Include the correct number for each carbon atom and an arrow pointing to the anomeric carbon. Clearly indicate whether you have drawn the alpha or beta anomer.

Quiz 6

1. Use the correct terms to complete this description of digestion.

Ingested proteins are degraded by enzymes known as _____ which are stored in inactive forms known as _____ until they are needed. Ingested starch is initially broken down into _____ and finally to glucose. After ingested lipids leave the stomach, emulsification is aided by _____ and the lipids are packaged into _____ for transport into the lymph system and the blood.

Quiz 7

Standard free energies of hydrolysis of some phosphorylated compounds

(similar Fig. 14.1 in your text, but showing the products for each reaction)

Compound	Hydrolysis Reaction	$\Delta G^{0'}$ (kJ/mol)
Phosphoenolpyruvate (PEP)	PEP \rightarrow pyruvate + P_i	-61.9
1,3-Bisphosphoglycerate (1,3-BPG)	1,3-BPG \rightarrow 3-phosphoglycerate + P_i	-49.4
Creatine phosphate	Creatine phosphate \rightarrow creatine + P_i	-43.1
ATP	ATP \rightarrow ADP + P_i	-30.5
Glucose-1-phosphate (G-1P)	G-1P \rightarrow glucose + P_i	-20.9
Pyrophosphate (PP_i)	$PP_i \rightarrow 2 P_i$	-19.3
Glucose-6-phosphate (G-6P)	G-6P \rightarrow glucose + P_i	-13.8

Remember that a hydrolysis reaction written backwards is a phosphorylation reaction and will have an opposite (+) free energy.

1. Making use of the information above, prove that (under standard conditions) PEP can be used to make ATP by a phosphate transfer reaction. You should
- show the phosphate transfer reaction.
 - calculate the free energy change for the transfer reaction.
 - briefly explain what the value of the free energy change tells you.

Quiz 8

1. The equations below show five enzyme-catalyzed reactions. Indicate whether each will be catalyzed by a dehydrogenase (D), a kinase (K), a phosphatase (P), or neither (N) of these classes of enzymes.



Quiz 9

1. High concentrations of each of these compounds affects the activity of pyruvate dehydrogenase. For each, predict whether it will increase or decrease the activity.

pyruvate

acetyl-CoA

ATP

ADP

NADH

Quiz 10

1. Two critical hormones that signal for glycogen breakdown are

- a) insulin and epinephrine.
- b) glucagon and epinephrine.
- c) glucagon and insulin.
- d) all of the above.
- e) none of the above.

Quiz 11

1. Feedback regulation of cholesterol synthesis is mainly controlled at the step catalyzed by the enzyme

- a) 3-hydroxy-3-methylglutaryl CoA reductase.
- b) geranyltransferase.
- c) HMG transferase.
- d) farnesyl reductase.
- e) none of the above.