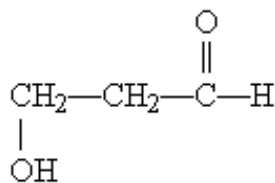


Additional Multiple Choice Review Questions for CHE 4310 Quiz I

1. What functional groups are present on this molecule?



- A. ether and aldehyde
- B. hydroxyl and aldehyde
- C. hydroxyl and carboxylic acid
- D. hydroxyl and ester
- E. hydroxyl and ketone

2. If the free energy change ΔG for a reaction is -46.11 kJ/mol , the reaction is:

- A. at equilibrium
- B. endergonic
- C. endothermic
- D. exergonic
- E. exothermic

3. Which of these statements about hydrogen bonds is *not* true?

- A. Hydrogen bonds account for the anomalously high boiling point of water
- B. In liquid water, the average water molecule forms hydrogen bonds with three to four other water molecules
- C. Individual hydrogen bonds are much weaker than covalent bonds
- D. Individual hydrogen bonds in liquid water exist for many seconds and sometimes for minutes
- E. The strength of a hydrogen bond depends on the linearity of the three atoms involved in the bond

4. The pH of a solution of 1 M HCl is:

- A. 0
- B. 0.1
- C. 1
- D. 10
- E. -1

5. The pH of a solution of 0.1 M NaOH is:

- A. 0.1
- B. 1.0
- C. 12.8
- D. 13
- E. 14

6. Which of the following is true about the properties of aqueous solutions?

- A. A pH change from 5.0 to 6.0 reflects an increase in the hydroxide ion concentration ($[\text{OH}^-]$) of 20%
- B. A pH change from 8.0 to 6.0 reflects a decrease in the proton concentration ($[\text{H}^+]$) by a factor of 100
- C. Charged molecules are generally insoluble in water
- D. Hydrogen bonds form readily in aqueous solutions
- E. The pH can be calculated by adding 7 to the value of the pOH

7. Which of the following statements about buffers is true?

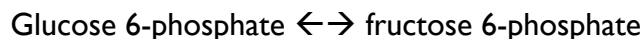
- A. A buffer composed of a weak acid of $\text{p}K_a = 5$ is stronger at pH 4 than at pH 6
- B. At pH values lower than the $\text{p}K_a$, the salt concentration is higher than that of the acid
- C. The pH of a buffered solution remains constant no matter how much acid or base is added to the solution
- D. The strongest buffers are those composed of strong acids and strong bases
- E. When $\text{pH} = \text{p}K_a$, the weak acid and salt concentrations in a buffer are equal

8. If the ΔG° of the reaction $\text{A} \leftrightarrow \text{B}$ is -40 kJ/mol , under standard conditions the reaction:

- A. is at equilibrium
- B. will never reach equilibrium
- C. will not occur spontaneously
- D. will proceed at a rapid rate
- E. will proceed spontaneously from left to right

9. When a mixture of glucose 6-phosphate and fructose 6-phosphate is incubated with the enzyme phosphohexose isomerase (which catalyzes the interconversion of these two compounds) until equilibrium is reached, the final mixture contains twice as much glucose 6-phosphate as fructose 6-phosphate. Which one of the following statements is best applied to this reaction outlined below?

($R = 8.315 \text{ J/mol} \cdot \text{K}$; $T = 298 \text{ K}$)



- A. ΔG° is incalculably large and negative
- B. ΔG° is -1.72 kJ/mol
- C. ΔG° is zero
- D. ΔG° is $+1.72 \text{ kJ/mol}$
- E. ΔG° is incalculably large and positive

10. In glycolysis, fructose 1,6-bisphosphate is converted to two products with a standard free-energy change (ΔG°) of 23.8 kJ/mol . Under what conditions encountered in a normal cell will the free-energy change (ΔG) be negative, enabling the reaction to proceed spontaneously to the right?

- A. Under standard conditions, enough energy is released to drive the reaction to the right
- B. The reaction will not go to the right spontaneously under any conditions because the ΔG° is positive
- C. The reaction will proceed spontaneously to the right if there is a high concentration of products relative to the concentration of fructose 1,6-bisphosphate
- D. The reaction will proceed spontaneously to the right if there is a high concentration of fructose 1,6-bisphosphate relative to the concentration of products
- E. None of the above conditions is sufficient