

## Chem 1124 Practice Exam 3.

Key

(1) (4 points) Classify the following as a solution, suspension, or a colloid

- (a) Kool Aid™ *solution*
- (b) toothpaste *colloid*
- (c) vegetable stew *suspension*
- (d) Italian Dressing *suspension*

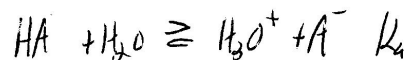
(2) (4 points) What is a supersaturated solution? How can it exist?

*It is a solution with more solute than can dissolve, dissolved. Precipitation is sometimes very slow. Eventually, a precipitate will form.*

(3) (4 points) A cup of saturated sugar water at 25 °C is removed and heated to 75 °C. Is the solution still saturated? Explain why or why not.

*No, most solids are more soluble at higher temperature. When the temp is raised, the solubility increases, so the solution can hold more at 75°C.*

(4) (4 points) Why are strong acids strong electrolytes while weak acids are weak electrolytes?



*If  $K_a$  is large (strong acid) then HA forms  $A^- + H_3O^+$  almost completely. It forms charged particles completely.*

*If  $K_a$  is small (weak acid) very few charged particles are formed.*

(5) (4 points) A 1.00 L solution contains 175 g of NaCl.  $FW = 58.44 \frac{g}{mole}$

(a) What is the concentration in molarity?

$$\frac{175g}{1} \div 58.44 \frac{g}{mole} = 2.99 \text{ moles NaCl}$$

$$\frac{2.99 \text{ moles}}{1.00L} = 2.99M$$

(b) What is the concentration in mM?

$$\frac{2.99 \text{ moles}}{1} \times \frac{1000 \text{ mM}}{1 \text{ mole}} = 2990 \text{ mM}$$

$$\frac{2990 \text{ mM}}{1.00L} = 2990 \text{ mM}$$

(c) What is the concentration in m/v %?

$$\frac{175g}{1000 \text{ mL}} \times 100\% = 17.5\%$$

(6) (4 points) Why is it bad for cells to be immersed in solutions that are either hypotonic or hypertonic?

If a solution is hypotonic, water will rush into the cell and it can burst. If the solution is hypertonic, water flows out of the cell shrivelling it.

(7) (4 points) Define the following:

(a) Brønsted-Lowry Acid: an  $H^+$  donor

(b) Brønsted-Lowry Base: an  $H^+$  acceptor

(8) (4 points) What is the pH of the following solutions:

(a) 0.100 M HCl

$$\text{pH} = -\log(0.100) = 1.000$$

(b) 0.100 NaOH

$$[\text{OH}^-][\text{H}_3\text{O}^+] = 1.00 \times 10^{-14}$$

$$(0.100)[\text{H}_3\text{O}^+] = 1.00 \times 10^{-14}$$

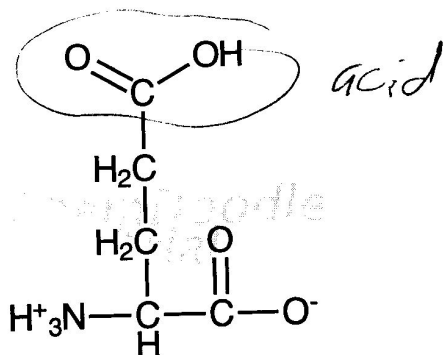
$$[\text{H}_3\text{O}^+] = 1.00 \times 10^{-13}$$

$$\text{pH} = -\log(1.00 \times 10^{-13}) = 13$$

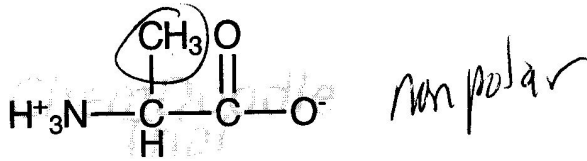
(9) (4 points) How does a buffer resist changes in pH?

A buffer is a solution of a weak acid and its conjugate base. If an acid is added, it reacts with the weak base of the buffer to form the weak acid. A buffer swaps a strong acid for a weak acid.

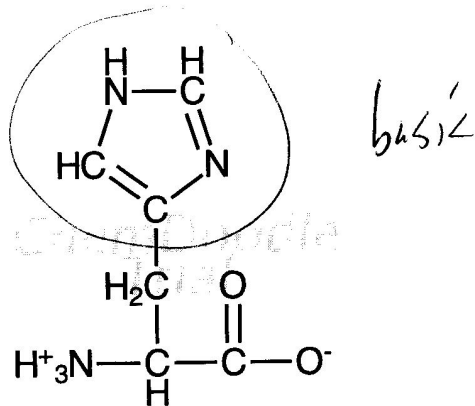
(10) (4 points) Label the following amino acids as nonpolar, basic, or acidic (ignore the chemdoodle logo and address).



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(11) (4 points) What is the difference between primary, secondary, tertiary, and quaternary structure of proteins?

- 1<sup>o</sup> - amino acid sequence of the protein chain
- 2<sup>o</sup> -  $\alpha$ -helices and  $\beta$ -pleated sheets
- 3<sup>o</sup> - the 3D shape of the protein
- 4<sup>o</sup> - how multiple protein chains interact to form a protein

(12) (4 points) What do enzymes do and how do they do it? What are two different models of enzyme action and how do they differ?

They accelerate chemical reactions by holding reagents together and changing their shapes.

Lock & key mechanism - substrate & enzyme fit together like a rigid lock & key

Induced fit - substrate & enzyme change shape some during the binding.

(13) (4 points) What are some factors that affect enzyme action?

pH, temperature, heavy metals

(14) (4 points) How do changes in pH affect enzymes? Why?

The side chains on the enzymes can become protonated or deprotonated with changing pH. This can then affect the 3° structure