Chem 1124 Exam 3. December 2, 2011

Name Key

useful information: M = (moles of solute)/(L of solution),mM = (mmol solute)/(L of solution), % = solute/solution x 100%, ppm = (mass solute)/(mass of solution) x 10^6, ppb = (mass solute)/(mass of solution) x 10^9.

(1)(3 points) Classify the following as a solution, a suspension, or a colloid

(a) milk straight from the cow suspension

(b) fog colloid

(c) mineral water solution

(2) (4 points) Why is a saturated solution said to be in dynamic equilibrium?

because the solid is dissolving & forming at the same rate. Dissolution hasn't stopped.

(3)(4 points) In the summertime, fish in the river often suffocate? Why do they suffocate and why does it happen in the summer?

Gases in water are less soluble at high temps when the water temp increases in the summer, there isn't enough O_2 for all the fish.

(4)(4 points) What is the difference between and electrolyte and a nonelectrolyte?

An electrolyte forms ions when dissolved.

A nonelectrolyte doesn't.

(5)(6 points) A solution has a concentration of dioxin of 600 ppb.

(a) How many grams of dioxin is in 1.00 L?

$\frac{\text{mass dioxin}}{1000\,g} \times 10^9 = 600\,ppb$ mass dioxin $= 6.00\times10^{-4}\,g$

(b) What is this concentration in ppm?

$\frac{6.00\times10^{-4}\,g}{1000\,g} \times 10^6 = 0.600\,ppm$

(c) What is this concentration in mass%

$\frac{6.00\times10^{-4}}{1000\,g} \times 100\% = 6.00\times10^{-5}\%$

(6)(4 points) How is water purified by reverse osmosis?

More pressure is applied than the osmotic pressure. This can force the ~~dilute~~ water in a solution through a semipermeable membrane against osmosis.

(7) Define the following:

(a) Arrhenius Acid forms H_3O^+ in water

(b) Arrhenius Base forms OH^- in water

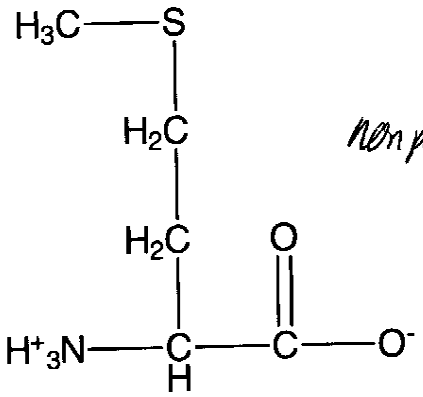
(8)(2 points) What is the pH of a 0.00100 M solution of HCl?

3.00

(9)(2 points) What is the $[H_3O^+]$ of a solution with a pH = 10.00?

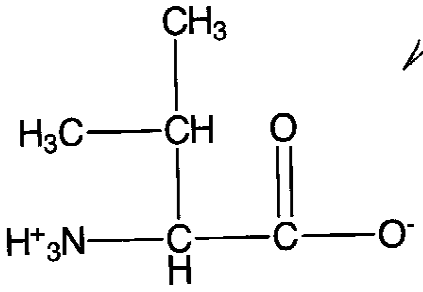
1.00×10^{-10} M

(10)(3 points) Label the following amino acids as acidic, basic, nonpolar, or neutral and polar.



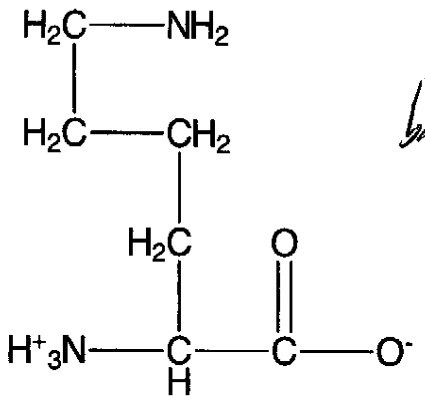
nonpolar

(a)



nonpolar

(b)



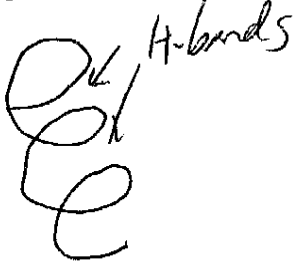
basic

(c)

(11) (4 points) List 2 different ways that enzymes accellerate reactions

They can hold 2 substrates close together.
They can change the shape of a substrate

(12)(4 points) Sketch a cartoon picture of an α-helix. What holds the protein in this arrangement?



(13) (4 points) How does a change in pH denature proteins?

Changing the pH changes the protonation state of the side chains. Formerly protonated sites become deprotonated (if pH is raised) or deprotonated sites become protonated (if pH is lowered). The changes in protonation change the H-bonding in the protein

Chem 1124 Exam 3. December 2, 2011

Name Key

useful information: M = (moles of solute)/(L of solution),mM = (mmol solute)/(L of solution), % = solute/solution x 100%, ppm = (mass solute)/(mass of solution) x 10^6, ppb = (mass solute)/(mass of solution) x 10^9.

(1)(3 points) Classify the following as a solution, a suspension, or a colloid

(a) homogenized milk colloid

(b) filtered sea water solution

(c) muddy river water suspension

(2) (4 points) What is a saturated solution?

(3) (4 points) If a sample of water is placed under 3 atm pressure of CO_2, what will happen to the amount of CO_2 dissolved in the water? Why?

It will increase. The solubility of a gas in water increases when the gas pressure increases

(4)(4 points) What is the difference between a strong electrolyte and a weak electrolyte? A strong electrolyte breaks up completely to form ions in solution.

In a weak electrolyte, only a small % of particles form ions.

(5)(6 points) A solution is 5% (m/v) in glucose.

(a) How much glucose is in 1.50 L of the solution (in g)?

75 g

(b) How many moles of glucose is in 1.50 L of solution?

$75\,g \div 180\,g/mol = 0.417\,moles$

(c) What is the concentration in molarity?

$$\frac{0.417\,moles}{1.50\,L} = 0.278\,M$$

(6)(4 points) When salt is added to ice on a sidewalk, it often melts. Why?

When you dissolve particles in water, it decreases the melting point.

(7) Define the following:

(a) Arrhenius Acid produces H_3O^+ in water

(b) Arrhenius Base produces OH^- in water

(8)(2 points) What is the pH of a 0.00100 M solution of HCl?

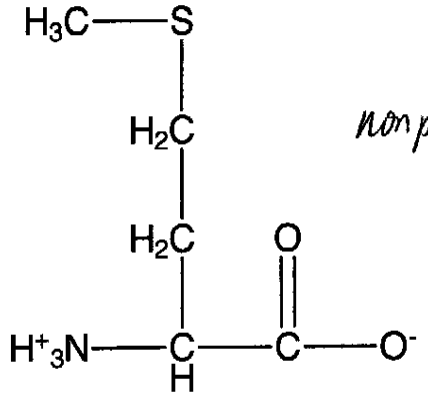
3.00

(9)(2 points) What is the $[H_3O^+]$ of a solution with a pH = 9.00?

1.0×10^{-9} M

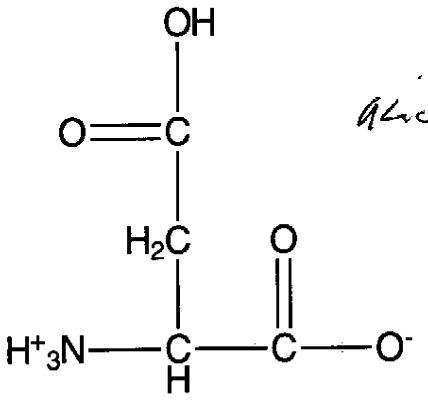
(10)(3 points) Label the following amino acids as acidic, basic, nonpolar, or neutral and polar.

a)

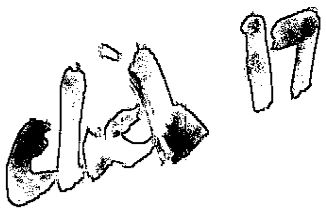


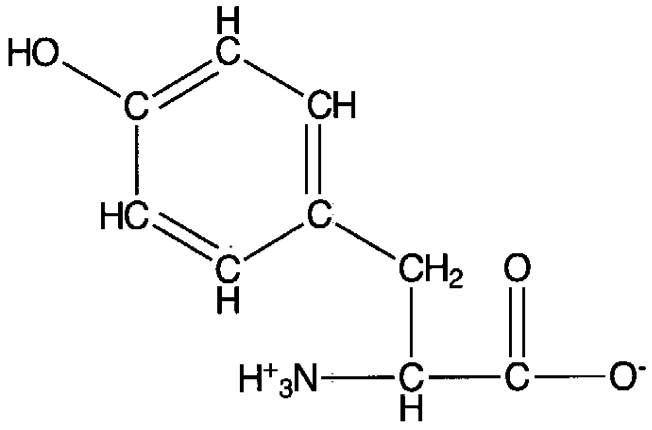
nonpolar

(b)



acidic

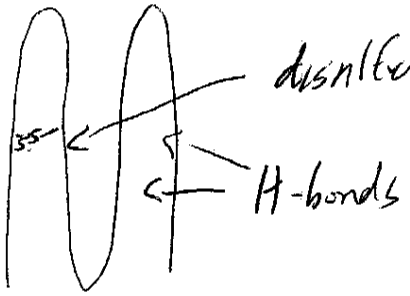




polar

(c)

(11)(4 points) Sketch a cartoon picture of a β-pleated sheet. What holds the protein in this arrangement?



(12) (4 points) What is the difference between reversible and irreversible inhibition of an enzyme (pointing out that one is reversible and the other one isn't is not sufficient)?

Reversible inhibition is when something binds to the active site that isn't the substrate or something binds to another site on the enzyme that deactivates it.

Irreversible inhibition is when something destroys the enzyme by denaturing it

(13)(4 points) How do heavy metal ions denature proteins?

Heavy metal ions bind to cysteines on the protein surface and this can change the shape of the protein