Chemistry 102 Name

Martin Larter

Exam 3A Fall 2015

Multiple Choice (28 points)

Page 3 (26 points)

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Page 5 (18 points)

Total (100 points)

Percent Grade \_\_\_\_\_\_\_\_\_\_\_\_

Multiple Choice

1. Which of the following liquids will be miscible in one another?

|  |  |
| --- | --- |
| 1. Hexane, C6H14, and water | 1. Acetic acid, HC2H3O­2 and toluene, C7H8 |
| 1. Water and ethanol, CH3CH2OH | 1. All of the above |
| 1. None of the above |  |

1. The solubility of carbon dioxide in soda water

|  |  |
| --- | --- |
| 1. Is always a fixed concentration. | 1. Is higher as temperature increases. |
| 1. Is lower as the pressure increases | 1. Is lower as the temperature increases. |
| 1. Depends significantly on whether the soda is flavored or not. | |

1. When preparing a solution, a homogeneous mixture, the substance present in the smaller amount is called the \_\_\_\_\_\_\_ and the substance in larger amount is called the \_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| 1. solute; solvent | 1. solvent; solute | 1. dissolving agent; solute |
| 1. dissolving agent; solvent | 1. homogeneous; heterogeneous |  |

1. According to the Bronsted-Lowry definition,

|  |  |  |
| --- | --- | --- |
| 1. An acid is a proton acceptor. | 1. A base is a proton acceptor. | 1. An acid acts as the solvent. |
| 1. A base is a proton donor. | 1. A base produces H+ ions in aqueous solutions. | |

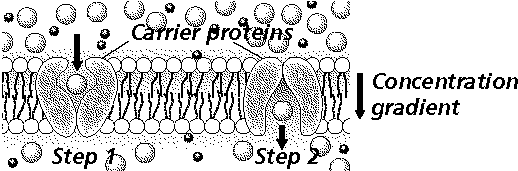
1. What is the conjugate base of HS-

|  |  |  |
| --- | --- | --- |
| 1. H+ | 1. OH- | 1. HS+ |
| 1. H2S | 1. S2- |  |

1. When a system is at equilibrium:
2. The amount of product and reactant is exactly equal.
3. The reaction rate of the reverse reaction is small compared to forward.
4. The reaction rate of the forward reaction is small compared to the reverse.
5. The reaction rate of the forward reaction is equal to the rate of the reverse.
6. None of the above
7. The volume of a gas must always decrease when
   1. Temperature increases and pressure increases
   2. Temperature increases and pressure decreases
   3. Temperature decreases and pressure increases
   4. Temperature decreases and pressure decreases
   5. None of the above
8. HBr, HCl, HClO4, KBr, and NaCl are all classified as

|  |  |  |
| --- | --- | --- |
| 1. Weak electrolytes. | 1. Acids | 1. Strong electrolytes. |
| 1. Nonelectrolytes | 1. None of the above |  |

1. Which statement is **true** for a reaction with *Kc* equal to 2.43 x 10-12?
   1. The reaction proceeds nearly all the way to completion.
   2. There are appreciable concentrations of both reactants and products.
   3. The reaction proceeds hardly at all towards completion.
   4. Increasing the temperature will not change the value of *Kc*.
   5. None of the above
2. What cell process is responsible for the effect shown in Figure below?



**Figure**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. active transport | 1. passive transport | 1. facilitated diffusion | 1. osmosis | 1. None listed |

1. Consider the following exothermic reaction at equilibrium in a closed container

4 NH3 *(g)* + 3 O2 *(g)* C:\Users\MARTIN~1.LAR\AppData\Local\Temp\Q lechatelier problems_files\equilibrium_arrow.gif2 N2 *(g)* + 6 H2O *(g)*

1. Increasing the amount O2 will \_\_\_\_\_\_\_\_\_\_ the amount of NH3.
   1. Increase b) Decrease c) Not change
2. Increasing the temperature of the reaction vessel will \_\_\_\_\_\_\_\_\_\_ the amount of NH3.

a) Increase b) Decrease c) Not change

1. A chemical reaction has reached equilibrium when
2. The concentrations of reactants and products are equal.
3. All reactants have been converted to products.
4. All products have been removed from the reaction mixture.
5. The catalyst has been used up.
6. The rate of the forward reaction equals the rate of the reverse reaction.
7. For the reaction of carbon with carbon dioxide to make carbon monoxide, the reaction is as follows. Write the equilibrium constant expression for the *Kc*.

C(*s*) + CO2(*g*) ⇌ 2CO(*g*)

A) *Kc* =  B) *Kc* =  C) *Kc* =  D) *Kc* =  E) *Kc* = 

Problems

1. (6 points) In the boxes under the structures given below write “1” for the molecule with the highest boiling point and “4” for the molecule with the lowest boiling point.



1

4

b. Give a brief explanation for your choice of the molecule with the lowest boiling point.

The straight chained and branched alkane is effected only by the weakest inter-molecular attractive interactions, London dispersion; whereas the alcohol and ether are affected by stronger inter-molecular attractive interactions, H-bonding and dipole-dipole respectively. When comparing the straight-chain alkane to the branched chain alkane, the branched chain alkane is more compact, and thus has a smaller surface area and thus a lower boiling point.

1. (4 points) Calculate the mass percent of solute if 6.50 g of NaCl dissolved in 95.01 g of water?
2. (4 points) To what volume must a 15.00 mL sample of a 4.297 M solution of nitric acid, HNO3 be diluted to make a 0.2954 M solution of nitric acid?
3. (6 points) Calculate the molarity of a solution prepared by dissolving 4.198 grams of citric acid H3C6H5O7 (192.12 g/mol) in enough water to make 50.00 mL of solution.
4. (6 points) What would happen to a red blood cell that was placed into each of the following types of solution (discuss water flow)?
   1. Hypotonic Cell swells and bursts (water flows in due to osmosis)
   2. Isotonic Nothing happens (inside and outside cell are same, equal water flow)
5. (6 points) Identify the following as strong or weak acids; write S or W for your answers.

|  |  |
| --- | --- |
| HNO3 S | HF W |
| HBr S | CH3CO2H W |
| H3PO4 W | H2CO3 W |

1. (8 points) Pancreatic fluids has a hydronium concentration of 6.00 x 10-9 M. Determine the hydroxide concentration, pH and pOH as well as if this fluid is acidic and basic. (Show work)

|  |  |  |  |
| --- | --- | --- | --- |
| [OH-1] | pH | pOH | Acidic or basic |
|  | 8.22 | 5.78 | Basic |

or

1. (10 points) A 35.0 L flask is filled with methane gas (CH4) at a pressure of 8.64 atm and a temperature of 42oC.
   1. How many moles of methane are contained in the flask?
   2. What is the pressure (in torr) of methane in the flask?
   3. If the temperature of the methane were raised to 79oC, what would the new pressure of the methane be?
2. (4 points) Draw Hydrogen bonding between 3 ammonia molecules (NH3)



1. (12 points) Do the following
2. Draw structure of a triacylglycerol of your choice with two saturated fatty acids and one unsaturated fatty acid. Then give the result of the hydrogenation of your triacylglycerol. 
3. Is the product an oil or fat (explain based on intermolecular forces)

Product is a fat

* Molecules will now fit closely together in a regular pattern, since they are no longer kink due to the cis double bond
* There is now strong attractions (dispersion forces) between fatty acid chains
* Now the product will have a higher melting points that makes it a solids at room temperature.

1. What would the reaction of a triacylglycerol and sodium hydroxide produce?



1. (6 points) Consult the Table of Acid strength (below).
2. Which acid has the biggest equilibrium constant? \_\_\_\_\_\_ H3PO4\_\_\_\_\_\_
3. Which acid on the list has the smallest pKa value? \_\_\_\_\_\_\_\_ H3PO4\_\_\_\_\_\_\_\_\_\_
4. Which is the stronger acid, acetic acid or ammonium ion? \_\_\_ acetic acid \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| **Weak acid** | **Ka** |
| H3PO4 | 7.5 x 10-3 |
| NH4+ | 6.2 x 10-10 |
| HCN | 1.75 x 10-5 |
| H2CO3 | 5.5 x 10-7 |
| HCO3- | 4.8 x 10-11 |
| HF | 6.5 x 10-4 |
| CH3CO2H | 6.3 x 10-10 |

