Exam 4

Part I: Multiple Choice (2 points each)

Directions: Please circle the *best* answer for each of the following questions.

Question 1. Surface tension is defined as the

1. tendency of a liquid to evaporate in order to avoid spreading over a surface.
2. ability of a solid to avoid breaking.
3. ability of a liquid to reduce tension in surface muscles during exercise.
4. tendency of a liquid to spread over a surface.
5. resistance of a liquid to increase its surface area.

Question 2. A solution that contains dissolved solute in equilibrium with undissolved solute is classified as a(n)

1. saturated solution.
2. partially saturated solution.
3. equally saturated solution.
4. unsaturated solution.
5. supersaturated solution.

Question 3. What is the total ionic equation

for the reaction:

2 HNO3 (aq) + Ba(OH)2 (aq) 🡪 2 H2O (l) + Ba(NO3)2 (aq)

1. 2 HNO3 (aq) + Ba(OH)2 (aq) 🡪 2 H2O (l) + Ba(NO3)2 (aq)
2. 2 H+ (aq) + 2 NO3- (aq) + Ba2+ (aq) + 2 OH- (aq) 🡪 2 H2O (l) + Ba2+ (aq) + 2 NO3- (aq)
3. H+ (aq) + OH- (aq) 🡪 H2O (l)
4. all spectators
5. none of the above

Question 4. Which does not influence the rate of dissolution for a solid dissolving in water?

1. Temperature
2. Rate of stirring
3. Concentration of solution
4. Particle size
5. Pressure

Question 5. \_\_\_\_\_\_\_\_\_ defines acids as a proton (H+) donor.

1. Arrhenius
2. Lewis
3. Brønsted-Lowry
4. Both Arrhenius and Brønsted-Lowry
5. Brønsted-Lowry and Lewis

Question 6. The general formula for an alkane is

1. CnH2n+2
2. CnH2n-2
3. CnH2n
4. CnHn
5. CnHn+2

Question 7. Which of the following is not a property of a true solution?

1. The solute remains uniformly distributed throughout the solution and will not settle out with time.
2. The solute can generally be separated from the solvent by purely physical means.
3. The dissolved solute is molecular or ionic in size.
4. The solute and solvent form a homogeneous mixture.
5. The solute constitutes no more than 15% of the mass of the solution.

Question 8. Which compound is most soluble in water?

1. Ethane
2. Dimethyl ether
3. Ethanol
4. Ethene
5. Ethyne

Question 9. Complete combustion of an alkane produces

1. CO2 only.
2. CO2 and H2O.
3. H2O only.
4. H2 and O2.
5. alkene

Question 10. Carbohydrates are polyhydroxyl aldehydes and ketones which are known as

1. sugars and starches
2. triglycerides
3. amino acids
4. nucleotides
5. cholesterols

Part II: Short Answer

Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work.

Question 1. Match each of the following properties to acids or bases (6 points).

1. Sour taste \_\_\_\_\_acid property\_\_\_\_\_
2. The ability to react with hydroxide to produce water and an ionic compound. \_\_\_\_\_acid property\_\_\_\_
3. Bitter taste \_\_\_\_\_base property\_\_\_\_\_
4. The ability to react with active metals to produce hydrogen gas. \_\_acid property\_\_\_\_
5. A slippery, soapy feeling \_\_\_\_base property\_\_\_\_\_\_
6. The ability to react with carbonates to form carbon dioxide \_\_\_\_acid property\_\_\_\_\_

Question 2. Rank the following in order of increasing polarity: H2S, H2Se, H2O (4 points):

H2Se < H2S < H2O

Question 3. Determine whether each of the following substances is an electrolyte or a nonelectrolyte. All are mixed with water (6 points).

1. Glucose, C6H12O6 \_\_\_\_nonelectrolyte\_\_\_\_\_\_\_
2. Diphosphorus pentaoxide, P2O5 \_\_\_\_nonelectrolyte\_\_\_\_\_\_\_
3. Sodium hypochlorite, NaClO \_\_\_\_electrolyte\_\_\_\_\_\_\_\_\_\_\_
4. Lithium hydroxide, LiOH \_\_\_\_electrolyte\_\_\_\_\_\_\_\_\_\_
5. Ethanol, C2H5OH \_\_\_nonelectrolyte\_\_\_\_\_\_\_\_
6. Potassium permanganate, KMnO4 \_\_\_electrolyte\_\_\_\_\_\_\_\_

Question 4. The molecular formula for lactic acid is C3H6O3, and its structural formula is CH3CH(OH)COOH. Is this compound a carbohydrate? Explain you answer (4 points).



Lactic acid is not a carbohydrate, because it has neither an aldehyde (R-CHO) nor a ketone group (R-CO-R), and will not yield one upon hydrolysis. Lactic acid contains hydroxyl (R-OH) and carboxylic acid (R-COOH) groups.

Question 5. Are the fatty acids in vegetable oils more saturated or unsaturated than those in animal fats? Explain your answer (4 points).

Fatty acids in vegetable oils are more unsaturated than fatty acids in animal fats. This is because vegetable oils contain higher percentages of oleic and linoleic (unsaturated) acids than animal fats.

Question 6. Which is more acidic 2 M HI or 1 M HI? Explain your answer (3 points).

2 M HI is more acidic because it will yield 2 M H+ concentration.

Question 7. Answer the following questions about pancreatic fluids, which help to digest food once it has left the stomach, 6.0 x 10-9 M H+ (6 points).

1. What is the pH?
2. What is the pOH?

1. What is the hydroxide ion, OH-, concentration?

or

1. Are the pancreatic fluids acidic, basic, or neutral? \_\_\_basic\_\_\_\_\_\_\_\_

Question 8. Write the formula for the following (4 points):

1. The conjugate base of H2C2O4 \_\_\_HC2O4- \_\_\_\_\_\_\_\_\_\_
2. The conjugate acid of HSO4- \_\_\_\_\_H2SO4\_\_\_\_\_\_\_\_\_\_
3. The conjugate base of H3PO4 \_\_\_\_H2PO4-\_\_\_\_\_\_\_\_\_\_
4. The conjugate acid of C2H3O2- \_\_\_\_HC2H3O2\_\_\_\_\_\_\_\_\_

Question 9. A 15.00 mL sample of sulfuric acid, H2SO4, solution required 24.57 mL of 0.4821 M sodium hydroxide, NaOH, solution for complete neutralization (8 points).

1. Write the balanced neutralization reaction.

H2SO4 (aq) + 2 NaOH (aq) 🡪 2 H2O (l) + Na2SO4 (aq)

1. What is the molarity of the sulfuric acid?

Question 10. Name the following compounds using the IUPAC method (8 points):

* 1. CH3- CH2-CH2-CH-CH=CH-CH2 –CH3 6-ethyl-3-nonene

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CH2-CH2-CH3

* 1. CH3-CH2-CH3 2-propanol

|

OH

* 1. CH3CH2 CH2CH2Cl 1-chlorobutane
  2. CH3- CH2-C≡C-CH3 2-pentyne

Question 11. Write the condensation reaction for the esterification of propanoic acid (CH3CH2COOH) and methanol (CH3OH) (5 points):



Question 12. Identify each dibromobenzene as ortho, meta, or para (3 points).



ortho meta para

Question 13. What is the mass percent of sodium hydroxide in a solution that is made by dissolving 5.15 g NaOH in 49.0 g H2O (5 points)?

Question 14. Calculate the grams of nitric acid in 548 mL of 12 M HNO3 solution (5 points).

Question 15. A stock solution of 18 M hydrochloric acid is diluted from 10.00 mL to 500.00 mL, what is the new molarity (6 points)?

M1 = 18 M

V1 = 10.00 mL

V2 = 500.0 mL

M2 = ?

Question 16. Write the hydrogenation reaction for 2-hexene and hydrogen gas (3 points).

