Exam 4

Part I: Multiple Choice (2 points each)

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

Question 1. Oil does not dissolve in water because

1. water is nonpolar.
2. oil is polar.
3. oil is nonpolar.
4. water is saturated.
5. oil is hydrated.

Question 2. What is the concentration (m/m%) of a solution of 10.0 g of sodium chloride in 100. g of solution?

1. 10.0 M
2. 10.0%
3. 100.%
4. 0.100 M
5. 9.09%

Question 3. The solubility of carbon dioxide in soda water

1. is lower as the temperature increases.
2. depends significantly on whether the soda is flavored or not.
3. is always a fixed concentration.
4. is not affected by the temperature of the atmosphere.
5. is not affected by the pressure of the atmosphere.

Question 4. HSO4- is the conjugate \_\_\_\_ of H2SO4 and the conjugate \_\_\_\_\_ of SO42-.

1. acid/acid
2. acid/base
3. base/acid
4. base/base
5. amphoteric

Question 5. According to the Arrhenius concept, if HNO3 were dissolved in water, it would act as \_\_\_\_\_\_.

1. an acid
2. a base
3. a proton acceptor
4. a source of hydroxide ions
5. a source of H- ions

Question 6. Which of the following represent the addition polymer formed from the compound below? CH2=CHCl

1. 
2. 
3. 
4. 
5. 

Question 7. Which compound is a saturated hydrocarbon?

1. 1-butyne
2. cycloheptene
3. 3- methylheptane
4. 2-heptyne
5. acetic acid

Question 8. Identify the symptom that is not from radiation exposure.

1. Increased white cell count
2. Increased cancer risk
3. Death
4. Genetic effects
5. Weaker immune systems.

Question 9. The splitting of the uranium atom is called \_\_\_\_\_\_\_\_\_\_.

1. radioactive cleavage
2. nuclear fission
3. nuclear fusion
4. radioactive merge
5. half-life

Question 10. Which group of carbohydrates cannot be hydrolyzed to give smaller molecules?

1. Trisaccharides
2. Disaccharides
3. Polysaccharides
4. Monosaccharides
5. Oligosaccharides

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. Indicate whether each of the following is characteristic of the fission or fusion process or both (6 points):

1. This process produces radioactive by-products. Fission
2. Two small nuclei combine to form a larger nucleus. Fusion
3. Large amounts of energy are released. Both
4. This nuclear process provides the energy of the sun. Fusion
5. A large nucleus is split into smaller nuclei. Fission
6. Very high temperatures must be achieved to initiate Fusion

the reaction.

Question 2. A 25.00 mL sample of vinegar, which is an aqueous solution of acetic acid, CH3COOH, requires 23.15 mL of 0.4587 M barium hydroxide, Ba(OH)2, to reach the endpoint in a titration. What is the molarity of the acetic acid solution? Given the unbalanced equation (10 points):

2 CH3COOH (aq) + Ba(OH)2 (aq) 🡪 Ba(C2H3O2)2 (aq) + 2 H2O (l)

$$23.15 mL Ba(OH)\_{2} soln×\frac{0.4587 mmol Ba(OH)\_{2}}{1 mL Ba(OH)\_{2} soln}×\frac{2 mmol CH\_{3}COOH}{1 mmol Ba(OH)\_{2}}×\frac{1}{25.00 mL CH\_{3}COOH soln }=0.8495 M CH\_{3}COOH $$

Question 3. Write equations to illustrate the acid-base reactions that can take place between the following Bronsted-Lowry acids and bases. For each reaction identify the acid, base, conjugate acid, and conjugate base (8 points).

1. Acid HClO Base H2O

HClO (aq) + H2O (l) $⇌$ H3O+ (aq) + ClO- (aq)

Acid Base c.a. c.b.

1. Acid H3O+ Base NH3

H3O+ (aq) + NH3 (aq) $⇌$ NH4+ (aq) + H2O (l)

Acid Base c.a. c.b

Question 4. Write balanced nuclear equations for the decay of the nuclides (8 points):

* 1. $$ (by alpha decay) $⟶+$
	2. $$ (by beta decay) $⟶+$
	3. $$ (by electron capture) $+⟶$
	4. $$ (by gamma emission) $⟶+$

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



Question 6. A solution is prepared by dissolving 8.975 grams of KNO3 to make 550.0 mL of solution (11 points).

1. Calculate the molarity of the solution.

$$8.975 g KNO\_{3}×\frac{1 mol KNO\_{3}}{101.102 g KNO\_{3}}×\frac{1}{550.0 mL}×\frac{1000 mL}{1 L}=0.1614 M KNO\_{3}$$

1. If 25.00 mL of the above solution was diluted to 45.00 mL, what is the molarity of the new solution?

M1 = 0.1614 M

V1 = 25.00 mL

V2 = 45.00 mL

M2 = ?

$$M\_{1}V\_{1}=M\_{2}V\_{2}⇒M\_{2}=M\_{1}\frac{V\_{1}}{V\_{2}}=\left(0.1614 M\right)\left(\frac{25.00 mL}{45.00 mL}\right)=0.08967 M$$

Question 7. Complete the following table (12 points):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [H3O+] | [OH-] | pH | pOH | Acidic or basic |
| 1.29 x 10-13 M | 7.76 x 10-2 M | 12.890 | 1.110 | basic |
| 6.34 x 10-9 M | 1.577 x 10-6 M | 8.198 | 5.802 | basic |
| 5.0 x 10-6 M  | 2.0 x 10-9 M | 5.30 | 8.70 | acidic |

Question 8. Calculate the mass percent of solute if 6.50 g of NaCl dissolved in 95.01 g of H2O (6 points).

$$mass\%=\frac{m\_{solute}}{m\_{solution}}×100=\frac{m\_{solute}}{m\_{solute}+m\_{solvent}}×100$$

$$mass\%=\frac{6.50 g}{(6.50 g+95.01 g)}×100=\frac{6.50 g}{101.51 g}×100=6.40\% NaCl$$

Question 9. Identify the functional groups in capsaicin, the active component of chili powder (4 points):



**Part III: Matching (1 point each)**

**Directions: Select the key term that corresponds to each of the following definitions.**

a. enzyme

b. fat

c. glycoside linkage

d. fatty acid

e. nuclei acid

f. oil

g. phospholipid

h. protein

i. steroid

j. wax

i 1. a lipid hormone composed of four rings of carbon atoms.

a 2. a protein molecule that catalyzes a biochemical reaction.

f 3. a triglyceride from a plant source that has mostly

 unsaturated fatty acids

 j 4. a lipid composed of a fatty acid and a long-chain alcohol.

c 5. an -O- bond that joins two simple sugars.

d 6. a carboxylic acid with a long hydrocarbon chain.

g 7. a lipid composed of glycerol, two fatty acids, and

 phosphoric acid.

h 8. a biological compound that is a polymer of amino acids.

b 9. a triglyceride from an animal source that has mostly

 saturated fatty acids.

e 10. a biological polymer compound that can transit genetic

 information.

