Chem 110	Fall 201	1 Exam III	Whela	
SID	Last Key	First Answer	er	
Question 1 5 Points	Consider the following system PCI The production of PCI ₃ (g) is t	₅ (g) + 21.0 kcal ⇔ PCl ₃ (g) + Cl ₂ (g)		
	Indicate True or False for each of the Increasing the temperation Decreasing the pressure	ture Decreasing the vo	lume. <u>F</u>	
Question 2 4 Points	Consider the following system at equilibrium at 573 K: 2 NOCl(g) \Leftrightarrow 2 NO(g) + Cl ₂ (g) If the Volume of the equilibrium system is suddenly decreased at constant temperature:			
	The reaction must:	The number of moles	of Cl ₂ will:	
	 Run in the forward direction 	rection. \square Increase.		
	(i) Run in the reverse dir	ection. 🛈 Decrease.		
	Remain the same	□ Remain the same	3	
Question 3 4 Points	Write a net ionic equation to $\frac{\text{NH3}(\alpha q)}{\text{NH3}(\alpha q)} + \text{H}_2\text{O}$	show that ammonia behaves as a base in	water.	
Question 4 8 Points	Assign each species on the left to a category on the right.			
	□ NaOH	1. Strong Acid		
	□ HNO ₂	2. Weak Acid		
	□ HCN	2 3. Strong Base		
	□ C ₉ H ₇ N	4. Weak Base		
Question 5	An aqueous solution has a hydroxide ion concentration of $1.0 \times 10^{-5} M$.			
6 Points	□ What is the hydronium	n ion concentration in this solution?	1.0 x 10 - 7 M	

 $\ \square$ Is this solution acidic, basic or neutral?

basic

Question 6	The pH of an a	q

ueous solution at 25 $^{\circ}C$ was found to be 7.30.

Question 7

Arrange the following solutions in order of decreasing acidity:

6 Points 1 = most acidic; 3 = least acidic

c. The **pOH** is:

1.
$$[H_3O^+] = 1 \times 10^{-10} M$$

3.
$$[OH^{-}] = 1 \times 10^{-13} M$$

Question 8 6 Points

In the following net ionic equation, identify each reactant as either a Bronsted-Lowry acid or a Bronsted-Lowry base:

$$(C_2H_5)_3N(aq) + H_2O(I) \Leftrightarrow (C_2H_5)_3NH^{\dagger} + OH^{\dagger}$$

Bronsted-Lowry acid: BLA

Bronsted-Lowry base: BLB

$$\Box$$
 $(C_2H_5)_3N$

Question 9

Give the formula for:

6 Points

- 1. The conjugate acid of HCO₃
- 2. The conjugate base of HCO₃

Question 10 Which of the following aqueous solutions are buffer solutions?

6 Points

□ 0.24 M HI + 0.18 M NaI

- □ 0.34 M NH₄NO₃ + 0.39 M NaNO₃
- 0.10 M CH₃COOH + 0.18 M CH₃COOK
- 0.10 M HCl + 0.21 M NaF
- $0.27 \text{ M NH}_4\text{Br} + 0.31 \text{ M NH}_3$

Question 11 4 Points

A buffer solution is 0.622 M in HCN and 0.373 M in KCN. If Ka for HCN is 4.0×10^{-10} . what is the pH of this buffer solution? Must show work

$$PH = PNo + log_{10} \frac{[CN^{-}]}{[HCN]}$$

$$= -log_{10} 4.0 \times 10^{-10} + log_{10} \frac{0.373}{0.622}$$

$$= 9.38 - 0.22$$

$$= 9.16$$

Question 12 A 1L buffer solution solution contains 0.25 mol of NaCN and 0.15 mol of HCN.

8 Points (Chose a number from the list on the right that best describes what happens upon -)

- □ Addition of 0.05 mol of HCl will cause the [HCN] to
- 1. Increase significantly
- □ Addition of 0.05 mol of HCl will cause the pOH to
- $\frac{3(2)}{2}$ 2. Increase
- ullet Addition of 0.05 mol of NaOH will cause the [HCN] to ${\color{red} \underline{5}}$
- 3. Increase slightly
- Addition of 0.05 mol of NaOH will cause the [HCN] to __
- 4. Decrease significantly5. Decrease
- □ Addition of 0.2 mol of NaOH will cause the pH to
- 6. Decrease slightly

Question 13 Write a balanced nuclear equation for the following:

8 Points

- □ ²³⁸92**U** undergoing alpha emission:
- 37 = 1 He + 90 Th
- □ ¹³⁷₅₅**Cs** undergoing beta decay:
- 55 CS = -1 e + 56 B 6 C = 4 e + 5 B
- \Box ¹⁰C undergoing positron emission:
- 51 Cr + 1e
- = 23 \

□ ⁵¹24**Cr** undergoing electron capture:

Question 14 You need to make an aqueous solution of 0.121 M ammonium carbonate for an experiment in lab, using a 125 mL volumetric flask. How much solid ammonium carbonate should you add?

Must show work

$$(NH_4)_2$$
 (03) : $2(14.01 + 4.04) + 12.01 + 48.00$
= 96.11 g. mop-1

$$\# mol(NHu)_{2}CO_{3} = 0.121 \times 0.125$$

= 1.51 × 10⁻²

$$1.51 \times 10^{2} \text{ mol } (NH4)_{2} CO_{3} | 96.11 \text{ g}$$

$$1 \text{ mol}$$

How many moles of hydrochloric acid will be formed upon the complete reaction of 1.5 Question 15 4 Points moles of water with excess chlorine gas?

> Chlorine (g) + water (l) = hydrochloric acid (aq) + chloric acid (HClO₃) Must show work and include a balanced chemical equation.

$$3 O_2(q) + 3 H_2O(q) = 5 HCP(qq) + HCPO_3$$

mol

How many grams of solid aluminum hydroxide are required to neutralize 15.5 mL of a Question 16 8 Points 2.65 M solution of perchloric acid.

Must show work and include a balanced chemical equation.

show work and include a balanced chemical equation.

$$Q(QM_3 + 3HQQ_4 = Q(QQ_4)_3 + 3H_2Q$$
 $g_1?$
 g_2
 g_3
 g_4
 g_4
 g_5
 g_6
 g_6

4.11 mol
$$\frac{\text{Heloy} | 1 \text{ all (oH)}_3}{3 \text{ Heloy}} = 1.37 \times 10^{-2} \text{ mol all (oH)}_3$$

$$\Omega(OH)_3$$
: 26.98 + 3 (16.00 + 1.01) = 78.01 g. mol-1

$$1.37 \times 10^{-2} \text{ mol } 00(0H)_3 | 78.01g = 1.07g$$

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