

University of Kentucky Department of

Name: _____ SID: _____ Seat No.: _____ Room: _____

1.	Which of the following 1.0 M aqueous solutions are basic? NaCl, NaNO ₃ , NaNO ₂ , NaF, NH ₄ Cl
	A. NaCl, NaNO ₃ , NaNO ₂ , NaF C. NaNO ₃ , NaNO ₂
	B. NH ₄ Cl, NaF D. NaNO ₂ , NaF
2.	What is the pH of a 0.35 M anilinium chloride, C ₆ H ₅ NH ₃ Cl, solution? K _b for aniline, C ₆ H ₅ NH ₂ , is 3.8 x 10 ⁻¹⁰ .
	A. 4.94 B. 2.52 C. 11.48 D. 5.03
3.	Which of the following are Lewis acids? NH ₃ , BCl ₃ , H ⁺ , I ⁻
	A. NH ₃ , H ⁺ B. BCl ₃ , I ⁻ C. BCl ₃ , H ⁺ D. NH ₃ , I ⁻
4.	Which of the following result in a buffered solution?
	A. 100 mL of 0.10 M HCl + 100 mL of 0.1 M NH ₃
	B. 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH ₃
	C. 200 mL of 0.1 M HCl + 100 mL of 0.1 M NH ₃
	D. 100 mL of 0.1 M NH ₃
5.	What is the pH of a buffer solution made of 0.15 M CH ₃ NH ₃ Cl and 0.25 M CH ₃ NH ₂ ? K _b for CH ₃ NH ₂ is 4.4 x 10 ⁻⁴ .
	A. 10.64 B. 10.86 C. 8.80 D. 10.42

6.	What mass of acetic acid, CH_3COOH , (molar mass = 60.0 g) should be added to 1.00 L of a 0.250 M sodium acetate, CH_3COONa , solution to make a buffer solution with $\text{pH} = 4.200$? K_a for $\text{CH}_3\text{COOH} = 1.80 \times 10^{-5}$.
	A. 0.876 g B. 4.28 g C. 60.0 g D. 52.6 g

7.	A 0.1 M solution of an acid is being titrated by NaOH . Which point or region on this titration curve represents a buffer?
	A. 1 B. 2 C. 3 D. 4

8.	Which of the following indicators would be good choices for a strong acid–weak base titration?										
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-right: 20px;">Indicator</th> <th>pH range</th> </tr> </thead> <tbody> <tr> <td>1. bromophenol blue</td> <td>3.0 – 4.6</td> </tr> <tr> <td>2. methyl red</td> <td>4.2 – 6.3</td> </tr> <tr> <td>3. cresol red</td> <td>7.2 – 8.8</td> </tr> <tr> <td>4. phenolphthalein</td> <td>8.3 – 10.0</td> </tr> </tbody> </table>	Indicator	pH range	1. bromophenol blue	3.0 – 4.6	2. methyl red	4.2 – 6.3	3. cresol red	7.2 – 8.8	4. phenolphthalein	8.3 – 10.0
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	A. 1 and 2 B. 2 and 3 C. 3 and 4 D. 1 and 4										

9.	What is the pH at the equivalence point when 45.3 mL of 0.0506 M HNO_2 is titrated with 0.105 M KOH ? K_a for HNO_2 is 4.5×10^{-4} . Assume volumes are additive.
	A. 7.00 B. 7.94 C. 6.06 D. 8.57

10.	Calculate the pH of a solution after 10. mL of 0.10 M NaOH has been added to 20. mL of 0.25 M HBr. Assume volumes are additive.
	A. 0.69 B. 1.48 C. 1.00 D. 0.88

11.	What is the pH of the solution that results when 0.20 moles of HCl(g) are added to 1.0 L of a 0.40 M sodium acetate, CH ₃ COONa, solution? K _a for acetic acid = 1.8 x 10 ⁻⁵ (Assume constant volume.)
	A. 4.44 B. 5.04 C. 4.74 D. 0.70

12.	Calculate the molar solubility of CrF ₃ , given that the K _{sp} for CrF ₃ is 6.6 x 10 ⁻¹¹ .
	A. 1.3 x 10 ⁻³ M B. 2.5 x 10 ⁻⁴ M C. 6.6 x 10 ⁻¹¹ M D. 5.1 x 10 ⁻⁴⁰ M

13.	Calculate the solubility, in mol/L, of AgCl in 0.015 M MgCl ₂ . K _{sp} for AgCl = 1.6 x 10 ⁻¹⁰ .
	A. 0.030 M B. 1.1 x 10 ⁻⁸ C. 1.2 x 10 ⁻⁵ D. 5.3 x 10 ⁻⁹

14.	The K _{sp} for Ag ₂ SO ₃ is 1.5 x 10 ⁻¹⁴ . If 10.0 mL of 0.0020 M AgNO ₃ is mixed with 10.0 mL of 0.010 M Na ₂ SO ₃ , which of the following is correct? (Assume volumes are additive.)
	A. Q = 5.0 x 10 ⁻⁹ ; precipitation occurs B. Q = 4.0 x 10 ⁻¹⁴ ; precipitation occurs C. Q = 5.0 x 10 ⁻⁶ ; precipitation occurs D. Q = 1.5 x 10 ⁻¹⁴ ; solution is at equilibrium

15.	A solution contains 1.0 x 10 ⁻⁴ M Cu ⁺ and 2.0 x 10 ⁻³ M Pb ²⁺ ions. If the concentration of I ⁻ is 5.0 x 10 ⁻⁶ M, which salt(s), CuI and/or PbI ₂ will precipitate? K _{sp} = 5.1 x 10 ⁻¹² for CuI, and K _{sp} = 1.4 x 10 ⁻⁹ for PbI ₂ .
	A. CuI B. PbI ₂ C. both D. neither

16.	What is the concentration of Cu ²⁺ at equilibrium after 0.0250 mol of CuSO ₄ are dissolved in 1.000 L of 0.450 M NH ₃ ? K _f = 5.0 x 10 ¹³ for:
	$\text{Cu}^{2+}(\text{aq}) + 4 \text{NH}_3(\text{aq}) \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}(\text{aq})$
	A. 3.3 x 10 ⁻¹⁴ M C. 1.5 x 10 ⁻¹⁴ M B. 1.4 x 10 ⁻¹⁵ M D. 0.025 M

