

1. If you mix equal molar quantities of the following substances, how many will produce an acidic solution?

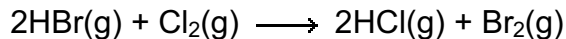
Set 1: NaOH + HCl Set 2: NaOH + HNO₃
Set 3: NH₃ + HCl Set 4: NaOH + CH₃CO₂H

- a. four
b. three
c. two
d. one
e. zero (none are acidic)
2. We mix 100. mL of 0.20 M HBr and 50.0 mL of 0.40 M NaClO. What is the pH of the resulting solution? $K_a(\text{HClO}) = 3.5 \cdot 10^{-8}$
- a. 3.92
b. 4.07
c. 4.17
d. 4.86
e. 9.83
3. We have a solution of acetic acid. What effect will the addition of sodium acetate have on this solution?
1. increase the pH
2. decrease the H₃O⁺
3. decrease the OH⁻
- a. 1 only
b. 2 only
c. 3 only
d. 1 and 2 only
e. 1 and 3 only
4. If you mix 50.0 mL of 0.34 M HCN with 100. mL of 0.17 M KOH, what is the pH of the resulting solution? $K_a(\text{HCN}) = 4.0 \cdot 10^{-10}$
- a. 11.23
b. 10.81
c. 4.60
d. 3.18
e. 2.77

5. If you add 1.0 mL of 10.0 M HCl to 500. mL of a 0.10 M NH₃ solution, what is the pH of the resulting solution? For NH₃, K_b = 1.8•10⁻⁵
- 4.14
 - 5.80
 - 8.21
 - 9.25
 - 9.86
6. What is the pH at the equivalence point in the titration of 10.0 mL of 0.16 M NH₃ with 25.0 mL of 0.064 M HCl? For NH₄⁺, K_a = 5.6•10⁻¹⁰
- 4.75
 - 5.30
 - 7.00
 - 8.70
 - 9.25
7. The molar solubility of HgS is 5.5•10⁻²⁷ mol/L. What is K_{sp} for HgS?
- 4.0•10⁻³
 - 8.2•10⁻⁴
 - 1.3•10⁻¹³
 - 7.4•10⁻¹⁴
 - 3.0•10⁻⁵³
8. A student measures the molar solubility of silver chromate (Ag₂CrO₄) in a water solution to be 1.34•10⁻⁴ M. Based on her data, the solubility product constant for this compound is
- K_{sp} = 1.34•10⁻⁴
 - K_{sp} = 2.68•10⁻⁴
 - K_{sp} = 4.02•10⁻⁴
 - K_{sp} = 1.7•10⁻⁸
 - K_{sp} = 9.62•10⁻¹²
9. Which of the following compounds has the highest molar solubility?
- BaSO₄; K_{sp} = 1.1•10⁻¹⁰
 - FeCO₃; K_{sp} = 3.5•10⁻¹¹
 - PbSO₄; K_{sp} = 1.8•10⁻⁸
 - SrCO₃; K_{sp} = 9.4•10⁻¹⁰
 - ZnCO₃; K_{sp} = 1.5•10⁻¹¹

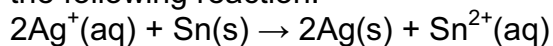
10. Calculate the molar solubility of PbI_2 in a 0.40 M solution of NaI. (K_{sp} of PbI_2 is $8.7 \cdot 10^{-8}$)
- $4.4 \cdot 10^{-3}$ M
 - $2.8 \cdot 10^{-3}$ M
 - $2.8 \cdot 10^{-4}$ M
 - $5.4 \cdot 10^{-7}$ M
 - $2.3 \cdot 10^{-7}$ M
11. Calculate the change in entropy for the condensation of butane, the fuel in hand-held, disposable lighters at its boiling point of -0.5°C given $\Delta H_{\text{vap}} = 24.3$ kJ/mol.
- -89.2 J/K \cdot mol
 - -0.0892 J/K \cdot mol
 - 0.0892 J/K \cdot mol
 - 89.2 J/K \cdot mol
 - 53600 J/K \cdot mol
12. Calculate the standard molar entropy of urea [$\text{CO}(\text{NH}_2)_2(\text{s})$] if the standard entropy change for the formation is -456.3 J/K \cdot mol and given $S^\circ[\text{C}(\text{s})] = 5.74$ J/K \cdot mol, $S^\circ[\text{O}_2(\text{g})] = 205.1$ J/K \cdot mol, $S^\circ[\text{N}_2(\text{g})] = 191.6$ J/K \cdot mol, and $S^\circ[\text{H}_2(\text{g})] = 130.7$ J/K \cdot mol.
- -1017.2 J/K \cdot mol
 - $+314.1$ J/K \cdot mol
 - $+194.2$ J/K \cdot mol
 - $+105.0$ J/K \cdot mol
 - -56.0 J/K \cdot mol
13. Which of the following do you expect to have the largest entropy at 25°C ?
- Fe(s)
 - Xe(g)
 - $\text{H}_2\text{O}(\text{l})$
 - Hg(l)
 - He(g)
14. If ΔG is positive at all temperatures, then ΔS is _____ and ΔH is _____.
- positive, negative
 - negative, positive
 - small, zero
 - large, zero
 - large, small

15. A student determines the value of the equilibrium constant to be $2.34 \cdot 10^{14}$ for the following reaction:

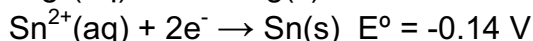


Based on this value of K_{eq} , calculate the free energy change for the reaction of 2.37 moles of HBr(g) at standard conditions at 298K. ($R = 8.314 \text{ J/K}\cdot\text{mol}$)

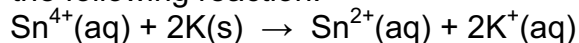
- $\Delta G^\circ = -82.0 \text{ kJ}$
 - $\Delta G^\circ = +97.1 \text{ kJ}$
 - $\Delta G^\circ = +194.2 \text{ kJ}$
 - $\Delta G^\circ = -97.1 \text{ kJ}$
 - $\Delta G^\circ = -194.2 \text{ kJ}$
16. Calculate ΔG for the following reaction:



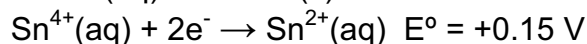
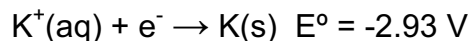
using the following half-reactions:



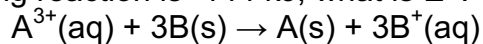
- +64 kJ
 - +91 kJ
 - +181 kJ
 - 64 kJ
 - 181 kJ
17. Calculate E° for the following reaction:



using the following half-reactions:

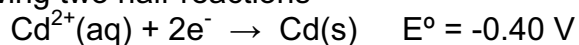


- +6.00 V
 - 3.08 V
 - +3.08 V
 - +2.78 V
 - 2.78 V
18. If ΔG of the following reaction is -144 kJ, what is E° ?

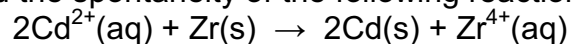


- +0.394 V
- +0.591 V
- +1.18 V
- 0.591 V
- 1.18 V

19. Given the following two half-reactions



determine E° and the spontaneity of the following reaction:



- a. +1.13 V and not spontaneous
 - b. +1.13 V and spontaneous
 - c. -1.13 V and not spontaneous
 - d. -1.13 V and spontaneous
 - e. -1.93 V and not spontaneous
20. How long would it take to deposit 1.36 g of copper from an aqueous solution of copper(II) sulfate by passing a current of two amperes through the solution?
- a. 2070 sec
 - b. $1.11 \cdot 10^{-5}$ sec
 - c. 2570 sec
 - d. 736 sec
 - e. 1030 sec