

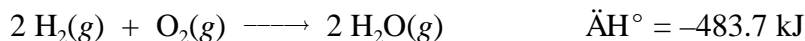
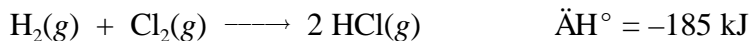
University of Kentucky

Department of Chemistry

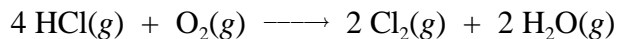
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1. Which of the following combinations will **NOT** produce a buffer solution?
- A. NaCl and $\text{CH}_3\text{CO}_2\text{H}$ C. KCN and HCN
B. NH_4Cl and NH_3 D. NaHCO_3 and H_2CO_3
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2. At the neutralization point of the titration of an acid with base, what condition is met?
- A. Volume of base added from buret equals volume acid in reaction flask.
B. Molarity of base from the buret equals molarity of acid in reaction flask.
C. Moles of base added from the buret equals moles of acid in the reaction flask.
D. % ionization of base added from the buret equals % ionization of the acid in flask.
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3. We mix 100. mL of 0.10 M HCl and 100. mL of 0.10 M NaCN. What is the pH of the resulting solution? $K_a(\text{HCN}) = 4.0 \times 10^{-10}$.
- A. 5.20 B. 5.35 C. 6.20 D. 8.65
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4. Which of the following salts would produce an acidic solution when dissolved in H_2O ?
- A. KI B. KNO_3 C. KNO_2 D. NH_4Cl
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5. Which of the following weak acids should be used to prepare a buffer of pH = 6.50?
- A. HA, $K_a = 1.0 \times 10^{-4}$ C. HC, $K_a = 1.0 \times 10^{-8}$
B. HB, $K_a = 1.0 \times 10^{-6}$ D. HD, $K_a = 1.0 \times 10^{-10}$
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6. What is the pH of the solution after addition of 10. mL of 0.1 M NaOH to 25.0 mL of 0.1 M HCl?
- A. 1.04 B. 1.84 C. 1.37 D. 2.84
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7. Which of the following is the solubility product constant for PbI_2 ?
- A. $K_{sp} = [\text{Pb}^{2+}][2\text{I}^-]^2$ C. $K_{sp} = [\text{Pb}^{2+}]^2[\text{I}^-]$
B. $K_{sp} = [\text{Pb}^{2+}][2\text{I}^-]$ D. $K_{sp} = [\text{Pb}^{2+}][\text{I}^-]^2$
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8. If 0.1 mole of NaCl is added to a saturated solution of AgCl, which of the following is true after the system has achieved equilibrium?
- A. $[\text{Ag}^+] = [\text{Cl}^-]$
B. The chloride ion concentration is smaller than before the addition of NaCl.
C. The silver ion concentration is smaller than before the addition of NaCl.
D. K_{sp} for AgCl decreases after addition of NaCl.
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17. From the following data at 25°C,

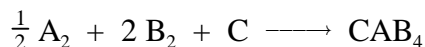


Calculate ΔH° at 25°C for the reaction below.



- A. +299 kJ B. -114 kJ C. -299 kJ D. +114 kJ
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18. The formation



has an enthalpy of formation of -104 kJ and a change in entropy of -60.8 J/K at 30°C. What is ΔG and the spontaneity of the reaction?

- A. -85.6 kJ, spontaneous C. +18.3 kJ, spontaneous
B. -18.3 kJ, not spontaneous D. +85.6 kJ, not spontaneous
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-

19. If ΔG is negative at all temperatures, then ΔS is _____ and ΔH is _____.

- A. positive, negative C. negative, positive
B. zero, large D. large, zero
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20. The following general reaction is not spontaneous at room temperature.



At what temperature will the reaction become spontaneous?

- A. 500°C B. 0.5 K C. 500 K D. 250°C
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21. Which of the following do you expect to have the largest entropy at 25°C?

- A. Fe(s) B. Xe(g) C. H₂O(l) D. Hg(l)
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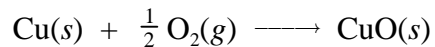
22. In which of the following reactions do you expect to have the largest increase in entropy?

- A. I₂(s) \longrightarrow I₂(g) C. Mn(s) + O₂(g) \longrightarrow MnO₂(s)
B. 2 IF(g) \longrightarrow I₂(g) + F₂(g) D. Hg(l) + S(s) \longrightarrow HgS(s)
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23. If a forward reaction has $\Delta G > 0$ at 25°C, which of the following is true?

- A. ΔS and ΔH are both positive.
B. The reverse reaction is spontaneous.
C. The reaction will not occur under any conditions.
D. ΔS and ΔH are negative.
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24. Calculate the standard entropy change for the following reaction,



given that:

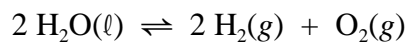
$$S^\circ[\text{Cu}(s)] = 33.15 \text{ J/K} \cdot \text{mol},$$

$$S^\circ[\text{O}_2(g)] = 205.14 \text{ J/K} \cdot \text{mol} \quad \text{and}$$

$$S^\circ[\text{CuO}(s)] = 42.63 \text{ J/K} \cdot \text{mol}$$

- A. -195.66 J/K B. 93.09 J/K C. -45.28 J/K D. -93.09 J/K
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25. Calculate the equilibrium constant (K_p) for the following reaction at 25°C .



$$\Delta G_{\text{rxn}}^\circ = 474.4 \text{ kJ}$$

- A. -191.5 B. 7.66×10^{-84} C. 191.5 D. 7.66×10^{84}
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