

Ch. 15 MC Review

1. In the reaction $\text{H}_2\text{CO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{HCO}_3^- + \text{H}_3\text{O}^+$, the Brønsted acids are
- H_2CO_3 and H_2O .
 - HCO_3^- and H_2CO_3 .
 - H_2O and H_3O^+ .
 - H_3O^+ and H_2CO_3 .
 - H_2O and HCO_3^- .
2. In the reaction $\text{HSO}_4^-(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons \text{SO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l})$, the conjugate acid–base pairs are
- | <i>pair 1</i> | <i>pair 2</i> |
|--|---|
| A. HSO_4^- and SO_4^{2-} ; | H_2O and OH^- . |
| B. HSO_4^- and H_3O^+ ; | SO_4^{2-} and OH^- . |
| C. HSO_4^- and OH^- ; | SO_4^{2-} and H_2O . |
| D. HSO_4^- and H_2O ; | OH^- and SO_4^{2-} . |
| E. HSO_4^- and OH^- ; | SO_4^{2-} and H_3O^+ . |
3. Identify the conjugate base of HSO_4^- in the reaction $\text{H}_2\text{PO}_4^- + \text{HSO}_4^- \rightleftharpoons \text{H}_3\text{PO}_4 + \text{SO}_4^{2-}$
- H_2PO_4^-
 - H_2SO_4
 - H_2O
 - H_3PO_4
 - SO_4^{2-}
4. Which one of these statements about strong acids is *true*?
- All strong acids have H atoms bonded to electronegative oxygen atoms.
 - Strong acids are 100% ionized in water.
 - The conjugate base of a strong acid is itself a strong base.
 - Strong acids are very concentrated acids.
 - Strong acids produce solutions with a higher pH than weak acids.
5. The OH^- concentration in a 7.5×10^{-3} M $\text{Ca}(\text{OH})_2$ solution is
- 7.5×10^{-3} M.
 - 1.5×10^{-2} M.
 - 1.3×10^{-12} M.
 - 1.0×10^{-7} M.
 - 1.0×10^{-14} M.
6. A 0.10 M HF solution is 8.4% ionized. Calculate the H^+ ion concentration.
- 0.84 M
 - 0.12 M
 - 0.10 M
 - 0.084 M
 - 8.4×10^{-3} M
7. A 0.10 M NH_3 solution is 1.3% ionized. Calculate the H^+ ion concentration.
- $$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$$
- 1.3×10^{-3} M
 - 7.7×10^{-2} M
 - 7.7×10^{-12} M
 - 0.13 M
 - 0.10 M
8. Calculate the pH of a 0.10 M HCN solution that is 0.0070% ionized.
- 1.00
 - 0.00070
 - 3.15
 - 5.15
 - 7.00
9. Calculate the pH of a 1.6 M KOH solution.
- 1.60
 - 0.20
 - 0.20
 - 14.20
 - 13.80
10. Diet cola drinks have a pH of about 3.0, while milk has a pH of about 7.0. How many times greater is the H_3O^+ concentration in diet cola than in milk?
- 2.3 times higher in diet cola than in milk
 - 400 times higher in diet cola than in milk
 - 0.43 times higher in diet cola than in milk
 - 1,000 times higher in diet cola than in milk
 - 10,000 times higher in diet cola than in milk

11. What is the pH of a solution prepared by mixing 10.0 mL of a strong acid solution with pH = 2.00 and 10.0 mL of a strong acid solution with pH = 6.00?
- 2.0
 - 2.3
 - 4.0
 - 6.0
 - 8.0
12. Acid strength decreases in the series $\text{HI} > \text{HSO}_4^- > \text{HF} > \text{HCN}$. Which of these anions is the *weakest* base?
- I^-
 - SO_4^{2-}
 - F^-
 - CN^-
13. Arrange the acids HOBr , HBrO_3 , and HBrO_2 in order of increasing acid strength.
- $\text{HOBr} < \text{HBrO}_3 < \text{HBrO}_2$
 - $\text{HOBr} < \text{HBrO}_2 < \text{HBrO}_3$
 - $\text{HBrO}_2 < \text{HOBr} < \text{HBrO}_3$
 - $\text{HBrO}_3 < \text{HOBr} < \text{HBrO}_2$
 - $\text{HBrO}_3 < \text{HBrO}_2 < \text{HOBr}$
14. When comparing acid strength of binary acids HX , as X varies within a particular group of the periodic table, which *one* of these factors dominates in affecting the acid strength?
- bond strength
 - electron withdrawing effects
 - percent ionic character of the H–X bond
 - solubility
 - Le Châtelier's principle
15. Which one of these net ionic equations represents the reaction of a *strong acid* with a *weak base*?
- $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{aq})$
 - $\text{H}^+(\text{aq}) + \text{CH}_3\text{NH}_2(\text{aq}) \rightarrow \text{CH}_3\text{NH}_3^+(\text{aq})$
 - $\text{OH}^-(\text{aq}) + \text{HCN}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{aq}) + \text{CN}^-(\text{aq})$
 - $\text{HCN}(\text{aq}) + \text{CH}_3\text{NH}_2(\text{aq}) \rightarrow \text{CH}_3\text{NH}_3^+(\text{aq}) + \text{CN}^-(\text{aq})$
16. Predict the direction in which the equilibrium will lie for the reaction
- $$\text{H}_2\text{CO}_3 + \text{F}^- \rightleftharpoons \text{HCO}_3^- + \text{HF}.$$
- $K_a(\text{H}_2\text{CO}_3) = 4.2 \times 10^{-7}$; $K_a(\text{HF}) = 7.1 \times 10^{-4}$
- to the right
 - to the left
 - in the middle
17. Which of the following yields an acidic solution when dissolved in water?
- NO_2
 - LiOH
 - K_2O
 - NaCl
 - $\text{Ca}(\text{OH})_2$
18. In the reaction $\text{CaO}(\text{s}) + \text{SO}_2(\text{g}) \rightleftharpoons \text{CaSO}_3(\text{s})$,
- O^{2-} acts as a Lewis base, and SO_2 acts as a Lewis acid.
 - Ca^{2+} acts as a Lewis base, and SO_4^{2-} acts as a Lewis acid.
 - SO_4^{2-} acts as a Lewis base, and SO_2 acts as a Lewis acid.
 - SO_2 acts as a Lewis base, and O^{2-} acts as a Lewis acid.
 - SO_2 acts as a Lewis base, and Ca^{2+} acts as a Lewis acid.
19. Which one of the following salts will form an *acidic* solution on dissolving in water?
- LiBr
 - NaF
 - KOH
 - FeCl_3
 - NaCN