

Chemistry 12

Acid Base Part 1 Review Package

Name:

Date:

Block:

I. Multiple Choice:

1. In which of the following is HSO_3^- acting as a Brønsted-Lowry acid?

- A. $\text{HSO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{SO}_3 + \text{OH}^-$
- B. $\text{NH}_3 + \text{HSO}_3^- \rightleftharpoons \text{NH}_4^+ + \text{SO}_3^{2-}$
- C. $\text{HSO}_3^- + \text{HPO}_4^{2-} \rightleftharpoons \text{H}_2\text{SO}_3 + \text{PO}_4^{3-}$
- D. $\text{H}_2\text{C}_2\text{O}_4 + \text{HSO}_3^- \rightleftharpoons \text{HC}_2\text{O}_4^- + \text{H}_2\text{SO}_3$

2. What is the conjugate base of H_2PO_4^- ?

- A. OH^-
- B. PO_4^{3-}
- C. HPO_4^{2-}
- D. H_3PO_4

3. Which of the following describes the relationship between acid strength and K_a value for weak acids?

- | | <u>Acid Strength</u> | <u>K_a</u> |
|----|----------------------|-------------------------|
| A. | decreases | increases |
| B. | decreases | remains constant |
| C. | increases | increases |
| D. | increases | decreases |

4. Which of the following is the strongest acid that can exist in an aqueous solution?

- A. O^{2-}
- B. NH_2^-
- C. H_3O^+
- D. HClO_4

5. What is the pH of a 0.050M KOH solution?

- A. 0.30
- B. 1.30
- C. 12.70
- D. 13.70

6. What is the value of K_b for H_2PO_4^- ?

- A. 1.3×10^{-12}
- B. 6.2×10^{-8}
- C. 1.6×10^{-7}
- D. 7.5×10^{-3}

7. Which of the following is the net ionic equation for the neutralization of $\text{HNO}_3(\text{aq})$ with $\text{Sr}(\text{OH})_2(\text{aq})$?

- A. $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons \text{H}_2\text{O}(\text{l})$
- B. $\text{Sr}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) \rightleftharpoons \text{Sr}(\text{NO}_3)_2(\text{s})$
- C. $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightleftharpoons \text{Sr}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
- D. $2\text{H}^+(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + \text{Sr}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightleftharpoons \text{Sr}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

8. Water will act as an acid with which of the following?

- I. H_2CO_3
- II. HCO_3^-
- III. CO_3^{2-}

- A. I only. B. III only. C. I and II only. D. II and III only.

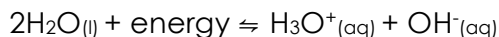
9. Which of the following 1.0M solutions will have the greatest electrical conductivity?

- A. HI B. H_2S C. HCN D. H_3PO_4

10. An acid is added to water and a new equilibrium is established. The new equilibrium can be described by:

- A. $\text{pH} < \text{pOH}$ and $K_w = 1.0 \times 10^{-14}$
- B. $\text{pH} < \text{pOH}$ and $K_w < 1.0 \times 10^{-14}$
- C. $\text{pH} > \text{pOH}$ and $K_w = 1.0 \times 10^{-14}$
- D. $\text{pH} > \text{pOH}$ and $K_w > 1.0 \times 10^{-14}$

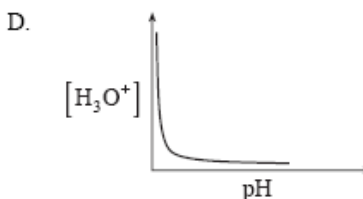
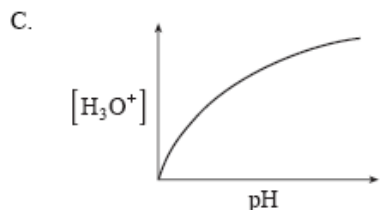
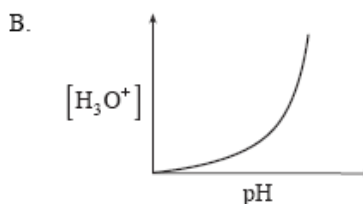
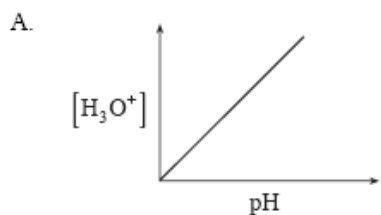
11. Consider the following equilibrium:



The $[\text{H}_3\text{O}^+]$ will decrease and the K_w will remain constant when

- A. a strong acid is added.
- B. a strong base is added.
- C. the temperature is increased.
- D. the temperature is decreased.

12) Which of the following graphs describes the relationship between $[\text{H}_3\text{O}^+]$ and pH ?



13) When the $[\text{H}_3\text{O}^+]$ in a solution is increased to twice the original concentration, the change in pH could be from

- A. 1.7 to 1.4 B. 2.0 to 4.0 C. 5.0 to 2.5 D. 8.5 to 6.5

14. The relationship $\frac{[\text{H}_2\text{P}_2\text{O}_7^{2-}][\text{H}_3\text{O}^+]}{[\text{H}_3\text{P}_2\text{O}_7^-]}$ is the

- A. K_a for $\text{H}_3\text{P}_2\text{O}_7^-$
- B. K_b for $\text{H}_3\text{P}_2\text{O}_7^-$
- C. K_a for $\text{H}_2\text{P}_2\text{O}_7^{2-}$
- D. K_b for $\text{H}_2\text{P}_2\text{O}_7^{2-}$

15. Which of the following describes the relationship between acid strength and K_a value for weak acids?

	Acid Strength	K_a
A.	increases	increases
B.	increases	decreases
C.	decreases	increases
D.	decreases	remains constant

16. The value of K_b for HPO_4^{2-} is:

- A. 2.2×10^{-13}
- B. 6.2×10^{-8}
- C. 1.6×10^{-7}
- D. 4.5×10^{-2}

17. What volume of 0.100M NaOH is required to completely neutralize 15.00mL of 0.100M H_3PO_4 ?

- ~~A. 5.00mL~~
- ~~B. 15.0 mL~~
- ~~C. 30.0mL~~
- ~~D. 45.0 mL~~

18. What is the pH of the solution formed when 0.060 moles NaOH is added to 1.00 L of 0.050M HCl?

- A. 2.00
- B. 7.00
- C. 12.00
- D. 12.78

19. The conjugate acid of $\text{C}_6\text{H}_5\text{NH}_2$ is:

- A. $\text{C}_6\text{H}_5\text{NH}^-$
- B. $\text{C}_6\text{H}_5\text{NH}_3$
- C. $\text{C}_6\text{H}_5\text{NH}_2^+$
- D. $\text{C}_6\text{H}_5\text{NH}_3^+$

20. Which of the following is a property of 1.0M HCl but not a property of 1.0M CH₃COOH ?

- A. turns litmus red
- B. ionizes completely

- C. has a pH less than 7.0
- D. produces H₃O⁺ in solution

21. In a 1.0M HF solution, the concentration of HF, F⁻ and OH⁻, from highest to lowest is:

- A. [HF]>[F⁻]>[OH⁻]
- B. [F⁻]>[HF]>[OH⁻]

- C. [OH⁻]>[HF]>[F⁻]
- D. [OH⁻]>[F⁻]>[HF]

22. In which of the following reactions is water behaving as a Brønsted-Lowry acid?

- A. 2H₂O ⇌ 2H₂ + O₂
- B. HCl + H₂O → H₃O⁺ + Cl⁻
- C. NH₃ + H₂O ⇌ NH₄⁺ + OH⁻
- D. NH₄⁺ + H₂O ⇌ H₃O⁺ + NH₃

23. What is the [OH⁻] of a solution with [H₃O⁺] = 9.3 x 10⁻² M?

- A. 9.3 x 10⁻¹⁶ M
- B. 8.6 x 10⁻¹³ M
- C. 1.1 x 10⁻¹³ M
- D. 9.3 x 10⁻² M

24. The pH of 0.10M HNO₃ is:

- A. 0.79
- B. 1.00
- C. 1.26
- D. 13.00

25. What is the pOH of a solution made by adding 50.0mL of 0.50M NaOH to 250.0mL of water?

- A. 0.30
- B. 1.00
- C. 1.08
- D. 12.92

26. Which of the following 1.0M solutions will have the lowest pH?

- A. HCl
- B. HCN
- C. H₃PO₄
- D. H₂C₂O₄

27. In an aqueous solution of NaCl, the pH is:

- A. less than 7 and the solution is acidic.
- B. equal to 7 and the solution is neutral.
- C. greater than 7 and the solution is basic.
- D. greater than 7 and the solution is acidic.

28. How many moles of KOH are necessary to completely neutralize 42.0mL of 3.00M HCl?

- ~~A. 0.0630 moles~~
- ~~B. 0.126 moles~~
- ~~C. 0.252 moles~~
- ~~D. 3.00 moles~~

29. The solution with the lowest electrical conductivity is:

- A. 0.10M H₂S
B. 0.10M HNO₂
C. 0.10M H₂SO₃
D. 0.10M NH₄Cl

30. The solution with the lowest pH is:

- A. 1.0M HF
B. 1.0M HCN
C. 1.0M HCOOH
D. 1.0M CH₃COOH

31. As the [H₃O⁺] in a solution decreases, the [OH⁻]:

- A. increases and the pH increases.
B. increases and the pH decreases.
C. decreases and the pH increases.
D. decreases and the pH decreases.

32. The value of pK_w at 25°C is;

- A. 1.0 x 10⁻¹⁴
B. 1.0 x 10⁻⁷
C. 7.00
D. 14.00

33. Consider the following equilibrium:



In pure water at a temperature of 50°C,

- A. pH < 7
B. pH + pOH = 14
C. K_w = 1.0 x 10⁻¹⁴
D. [OH⁻] < 1.0 x 10⁻⁷

34. What is the pOH of 2.5 M NaOH?

- A. -0.40
B. 0.0032
C. 0.40
D. 13.60

35. A 0.010M acid solution has a pH of 2.00. The acid could be

- A. HNO₃
B. H₂SO₃
C. HCOOH
D. CH₃COOH

36. Consider the following:

- I. PO₄³⁻
II. HPO₄²⁻
III. H₂PO₄⁻
IV. H₃PO₄

The term amphiprotic can be used to describe:

- A. I only.
B. II and III only.
C. I, II and III only.
D. II, III and IV only.

37. Calculate the [H₃O⁺] in a solution prepared by mixing 25.0mL of 1.0M HCl with 50.0mL of 0.50M KOH.

- A. 1.0 M
B. 0.50 M
C. 0.25 M
D. 1.0 x 10⁻⁷ M

II. Short Answers:

- 1) Calculate the pH of 0.50M H_3BO_3 .
- 2) Calculate the pH of 1.50M NH_3 .
- 3) Calculate the pOH of 0.25M $\text{Sr}(\text{OH})_2$.
- 4) A 2.00M diprotic acid has a pH of 0.50. Calculate its K_a value.
- 5) Calculate the pH of a solution prepared by adding 15.0 mL of 0.500M H_2SO_4 to 35.0 mL of 0.750M NaOH .
- 6) Determine the pH of a 0.75M solution of HPO_4^{2-} .