

Circle the best answer from the answer choices. (2 points each)

- Describe the taste of an acid? Sour taste (like a lemon)
- Describe the taste of a base? bitter taste (like soap)
- A base is characterized by a slippery feel.
- pH is what type of mathematical expression? logarithmic
- What base is used in the mathematical expression of pH? 10
- Describe 2 different ways to determine if a solution is an acid.
 $pH < 7$ or $[H^+] > [OH^-]$
- Describe 2 different ways to determine if a solution is a base.
 $pH > 7$ or $[OH^-] > [H^+]$
- Give three examples of conjugate acid/base pairs.
 $HCl + Cl^-$ $F^- + HF$
 $NH_4^+ + NH_3$

Answer the following in a word, phrase or sentence. (4 points each)

9. How did Arrhenius define an Acid and a Base?

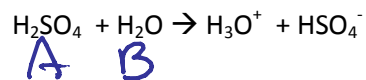
- Acid- produces H^+ ions when dissolved in water
- Base- produces OH^- ions when dissolved in water

10. How did Bronsted-Lowry define an Acid and a Base?

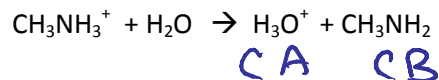
- Acid- donates a proton (H^+)
- Base- accepts a proton (H^+)

Answer the following in a word, phrase or sentence. (3 points each)

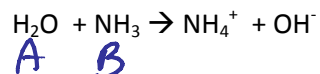
11. Using the Bronsted-Lowry Model, identify the Acid and Base in this equation:



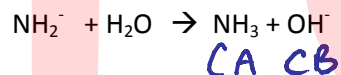
12. Using the Bronsted-Lowry Model, identify the Conjugate Acid and Conjugate Base in this equation:



13. Using the Bronsted-Lowry Model, identify the Acid and Base in this equation:



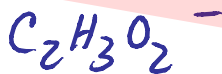
14. Using the Bronsted-Lowry Model, identify the Conjugate Acid and Conjugate Base in this equation:



15. Write the conjugate acid for NO_3^- .



16. Write the conjugate base for $\text{HC}_2\text{H}_3\text{O}_2$.



17. Write the conjugate acid for PO_4^{3-} .



18. Write the conjugate base for NH_3 .



19. What does it mean for a substance to be AMPHOTERIC?

Can act as an acid or base (able to donate or accept a proton)

20. Give an example of an amphoteric substance.



21. What does it mean for a substance to be a STRONG acid or base?

Strong means it will dissociate completely

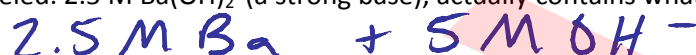
22. Why is the Bronsted-Lowry Model of acids more applicable in higher Chemistry than the Arrhenius Model? (what is the "problem" with the Arrhenius model?)

Arrhenius model only works for ^{aqueous} solutions.

23. A solution labeled: 2.5 M HCl (a strong acid), actually contains what in solution?



24. A solution labeled: 2.5 M Ba(OH)₂ (a strong base), actually contains what in solution?



25. Complete this statement: as pH increases, hydrogen ion concentration decreases.

26. Complete this statement: as pH increases, hydroxide ion concentration increases.

The following are math related problems (6 points each)

27. If the [OH⁻] = 0.2 M what is the [H⁺] in the solution? Is the solution Acidic, Basic or Neutral?

$$[H^+][OH^-] = 1 \times 10^{-14}$$

$$x(.2) = 1 \times 10^{-14} \quad x = \frac{1 \times 10^{-14}}{2} \quad x = 5 \times 10^{-14} \text{ M}$$

28. If the [H⁺] = 0.0000001 M what is the [OH⁻] in the solution? Is the solution Acidic, Basic or Neutral?

$$[H^+][OH^-] = 1 \times 10^{-14}$$

$$(.0000001)(x) = 1 \times 10^{-14} \quad x = \frac{1 \times 10^{-14}}{.0000001} \quad x = 1 \times 10^{-7} \text{ M or } .0000001 \text{ M}$$

29. If the [H⁺] = 0.5 M what is the [OH⁻] in the solution? Is the solution Acidic, Basic or Neutral?

$$[H^+][OH^-] = 1 \times 10^{-14}$$

$$(.5)(x) = 1 \times 10^{-14} \quad x = \frac{1 \times 10^{-14}}{.5} \quad x = 2 \times 10^{-14} \text{ M}$$

30. What is the pH of a solution with a [H⁺] = 1 × 10⁻⁹ M? Is the solution Acidic, Basic or Neutral?

$$\text{pH} = -\log [H^+]$$

$$\text{pH} = -\log 1 \times 10^{-9}$$

$$\text{pH} = 9$$

31. What is the pOH of a solution with a $[\text{OH}^-] = 1.73 \times 10^{-3} \text{ M}$? Is the solution Acidic, Basic or Neutral?

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pOH} = -\log 1.73 \times 10^{-3}$$

$$\text{pOH} = 2.76$$

32. What is the pH of a solution with a pOH of 8.38? Is the solution Acidic, Basic or Neutral?

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} + 8.38 = 14$$

$$14 - 8.38 =$$

$$\text{pH} = 5.62$$

33. What is the pOH of a solution with a $[\text{H}^+] = 4.60 \times 10^{-12} \text{ M}$? Is the solution Acidic, Basic or Neutral?

$$-\log[\text{H}^+] = \text{pH} \quad \text{pH} + \text{pOH} = 14$$

$$-\log 4.6 \times 10^{-12}$$

$$11.34 + x = 14$$

$$\text{pH} = 11.34$$

$$\text{pOH} = 2.66$$

34. What is the $[\text{OH}^-]$ of a solution with a pH of 2.37? Is the solution Acidic, Basic or Neutral?

$$\text{pH} + \text{pOH} = 14$$

$$2.37 + x = 14$$

$$\text{pOH} = 11.63$$

$$10^{-\text{pOH}} = [\text{OH}^-]$$

$$10^{-11.63}$$

$$2.34 \times 10^{-12} \text{ M}$$

35. What is the pH of a 0.83 M solution of H_2SO_4 (a strong acid)? Is the solution Acidic, Basic or Neutral?



$$0.83$$

$$\times 2$$

$$1.66$$

$$-\log 1.66$$

$$-0.22 = \text{pH}$$

36. If the $[\text{H}^+] = 1.9 \times 10^{-3} \text{ M}$ what is the $[\text{OH}^-]$ in the solution? Is the solution Acidic, Basic or Neutral?

$$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

$$(1.9 \times 10^{-3})(x) = 1 \times 10^{-14}$$

$$\frac{1 \times 10^{-14}}{1.9 \times 10^{-3}}$$

$$= 5.26 \times 10^{-12} \text{ M}$$

37. If the $[\text{OH}^-] = 1.95 \text{ M}$ what is the $[\text{H}^+]$ in the solution? Is the solution Acidic, Basic or Neutral?

$$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

$$(x)(1.95) = 1 \times 10^{-14}$$

$$x = \frac{1 \times 10^{-14}}{1.95} = 5.128 \times 10^{-15} \text{ M}$$

38. If the $[H^+] = 1 \times 10^{-7} M$ what is the $[OH^-]$ in the solution? Is the solution Acidic, Basic or Neutral?

$$[H^+][OH^-] = 1 \times 10^{-14}$$

$$(1 \times 10^{-7})(x) = 1 \times 10^{-14}$$

$$\frac{1 \times 10^{-14}}{1 \times 10^{-7}} = 1 \times 10^{-7} M$$

39. What is the pH of a solution with a $[H^+] = 0.92 M$? Is the solution Acidic, Basic or Neutral?

$$-\log[H^+] = pH$$

$$-\log .92 = pH$$

$$pH = 0.0362$$

40. What is the pOH of a solution with a $[OH^-] = 1.8 \times 10^{-8} M$? Is the solution Basic or Neutral?

$$-\log[OH^-] = pOH$$

$$-\log 1.8 \times 10^{-8}$$

$$pOH = 7.74$$

41. What is the pOH of a solution with a pH of 2.08? Is the solution Acidic, Basic or Neutral?

$$pH + pOH = 14$$

$$2.08 + x = 14$$

$$pOH = 11.92$$

42. What is the pH of a solution with a $[OH^-]$ of $9.60 \times 10^{-5} M$? Is the solution Acidic, Basic or Neutral?

$$-\log[OH^-] = pOH$$

$$-\log 9.6 \times 10^{-5}$$

$$pOH = 4.02$$

$$pOH + pH = 14$$

$$4.02 + x = 14$$

$$14 - 4.02 = 9.98 = pH$$

43. What is the $[H^+]$ of a solution with a pH of 12.37? Is the solution Acidic, Basic or Neutral?

$$10^{-pH}$$

$$10^{-12.37} = 4.27 \times 10^{-13} M$$

44. What is the pH of a 0.12 M solution of $Ba(OH)_2$ (a strong base)? Is the solution Acidic, Basic or Neutral?

0.12 M $Ba(OH)_2$

$$1 Ba^{2+} 2 OH^{-}$$

$$.12 \times 2 = .24 M OH^{-}$$

$$-\log[OH^-] = pOH$$

$$-\log .24$$

$$pOH = .620$$

$$pH + pOH = 14$$

$$x = .620 = 14$$

$pH = 13.38$