South Pasadena • Chemistry

Name _____
Period ___ Date ___/___/___

4 • Equilibrium & Acids & Bases

PRACTICE TEST

Describe these household substances:

a) acidic
b) basic
c) neutral

1. Sugar water ___
2. Vinegar ___
3. Rubbing Alcohol ___
4. Milk of Magnesia ___
5. Household ammonia ___

Questions 6 - 10

Match the household chemical with its formula

___6. Vinegar a) $NaOH$
___7. Pool Acid b) $NaHCO_3$
___8. Rubbing Alcohol c) HCl
___9. Drano d) $HC_2H_3O_2$
___10. Baking Soda e) C_3H_7OH

11. According to Svante Arrhenius, acids are substances that
    a) increase the [H+]
    b) increase the [OH-]
    c) decrease the [H+]
    d) decrease the [OH-]

12. A substance that turns cabbage juice blue and only slightly lights up a light bulb is a:
    a) strong acid c) weak acid
    b) strong base d) weak base

13. Which of the following substances is a base?
    a) H_2O c) $Ca(OH)_2$
    b) $HC_2H_3O_2$ d) H_2SO_4

14. When an acid and a base react, the products are
    a) salt and water c) base and acid
    b) salt and base d) water and acid

15. When NaOH is mixed with H_2SO_4, one of the products is
    a) $NaSO_4$ c) H_2
    b) H_2OH d) Na_2SO_4

16. A property of acids are that they
    a) taste sour c) feel slippery
    b) taste bitter d) neutralize water

17. How many grams of sodium hydroxide pellets, NaOH, are required to prepare 50.0 mL of a 0.150 M solution?
    a) 0.300 c) 3.00
    b) 2.00 d) 200.

18. If 50 mL of a 200 mL sample of 0.10 M sodium chloride solution is spilled, what is the concentration of the remaining solution?
    a) 0.20 M c) 0.075 M
    b) 0.10 M d) 0.025 M

19. A 100 mL sample of a solution with a concentration of 5.00 M is diluted by adding 300 mL of distilled water. The new concentration will be
    a) 1.25 M c) 1.66 M
    b) 20.0 M d) 15.0 M

20. A common laundry bleach is 0.700 M sodium hypochlorite, NaOCl. Which one of the following statements is true?
   a) NaOCl is the solvent.
   b) The solution can be made by mixing 0.700 moles of NaOCl with 1.00 liter of water.
   c) A 0.500 Liter sample of bleach would contain 0.350 moles of NaOCl.
   d) Each of these statements is true.

21. What is the hydrogen ion concentration, [H+], of a solution in which the pH is 5?
   a) 5×10^{2} M c) 5×10^{-1} M
   b) 1×10^{5} M d) 1×10^{-5} M

22. What is the molarity of a solution of sodium hydroxide, NaOH, if 15 mL of this base neutralizes 45 mL of 0.10 M hydrochloric acid, HCl?
   a) 0.10 M c) 0.20 M
   b) 0.15 M d) 0.30 M

23. When an acid is added to a solution of a base, what change in pH of the solution could be observed?
   a) An increase from 7 to 8
   b) An increase from 3 to 8
   c) A decrease from 7 to 6
   d) A decrease from 9 to 5

24. What is the pH of 0.001 M HCl, assuming complete ionization?
   a) 1 c) 3
   b) 2 d) 4

25. Which expression represents the equilibrium constant, K_{eq}, for this equation?

$$2\,NO(g) + O_2(g) \rightleftharpoons 2\,NO_2(g)$$

   a) $\frac{[NO][O_2]}{[NO_2]}$ c) $\frac{[NO_2]^2}{[NO]^2[O_2]}$
   b) $\frac{[NO]^2 + [O_2]}{[NO_2]^2}$ d) $\frac{[NO_2]}{[NO]\,[O_2]}$

26. Consider the reaction system,
$CoO(s) + H_2(g) \rightleftharpoons Co(s) + H_2O(g)$.
The equilibrium constant expression is
   a) $\frac{[CoO][H_2]}{[Co][H_2O]}$ d) $\frac{[H_2]}{[H_2O]}$
   b) $\frac{[Co][H_2O]}{[CoO][H_2]}$ e) $\frac{[H_2O]}{[H_2]}$
   c) $\frac{[Co][H_2O]}{[H_2]}$

27. In this equation

$$N_2(g) + 3\,H_2(g) \rightleftharpoons 2\,NH_3(g) + \text{heat}$$

decreasing the temperature of the total system causes the equilibrium to shift to produce
   A) more $NH_3(g)$.
   B) more $N_2(g)$.
   C) more $N_2(g)$ and $H_2(g)$.
   D) no change in either reactants or products.

28. For which of the following systems at equilibrium will decreasing the volume cause the equilibrium to shift to the right?
   A) $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$
   B) $2H_2O(g) \rightleftharpoons 2H_2(g) + O_2(g)$
   C) $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$
   D) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$
   E) $H_2(g) + F_2(g) \rightleftharpoons 2HF(g)$

29. For the reaction system,

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \text{heat}$$

the conditions that would most favor the formation of products would be

A) high temperature and high pressure
B) high temperature, pressure unimportant
C) high temperature and low pressure
D) low temperature and high pressure
E) low temperature and low pressure

Consider the household product:

Vinegar, $HC_2H_3O_2$

30. Is it an **acid** or a **base**? _____
31. **Circle** the portion of the formula that makes it an acid or a base.
32. Write an **equation** that shows why it is an acid or a base. (dissociation)

_____

33. This substance _____ (weak/strong)

34. A solution has an [H+] = 0.000100 M. What is the [OH-]? ___
a) 1×10^{-3} c) 1×10^{-14}
b) 1×10^{-4} d) 1×10^{-10}

35. A 1×10^{-3} M NaOH solution has an [H+] = ___
a) 1×10^{-3} c) 1×10^{-11}
b) 1×10^{-7} d) 1×10^{-14}

36. A 1×10^{-2} M HCl solution has an pH = ___
a) 2 b) 3 c) 7 d) 12

37. Write an equation that shows how $Ba(OH)_2$ neutralizes HNO_3.

Questions 38 - 40 refer to the following data collected in a titration experiment.

Titration Data:	
molarity of base	0.185 M
final volume of acid	22.75 mL
initial volume of acid	12.75 mL
final volume of base	25.25 mL
initial volume of base	3.50 mL

Calculate the **concentration** of the **acid**.
Show all work including:

38. the mathematical formula used
39. values substituted into the formula
40. units on all numbers, and a box around the answer.

Answers:

1.		11.		21.		31.	
2.		12.		22.		32.	
3.		13.		23.		33.	
4.		14.		24.		34.	
5.		15.		25.		35.	
6.		16.		26.		36.	
7.		17.		27.		37.	
8.		18.		28.		38.	
9.		19.		29.		39.	
10.		20.		30.		40.	