Name_____

Topic 9 Questions - Acids and Bases

_____1. Which equation represents a neutralization reaction?

1) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$
2) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
3) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
4) $NaOH + HCl \rightarrow H_2O + NaCl$

_____2. Water containing a dissovled electrolyte conducts electricity because the solution contains mobile

1) electrons 2) ions
3) molecules 4) atoms

_____3. As additional solid KCl is added to a saturated solution of KCl, the conductivity of the solution

1) increases 2) decreases
3) remains the same

_____4. Which of the following is the *most* likely pH for a weak acid?

1) 1 2) 5 3) 11 4) 14

_____5. Household vinegar has a pH of approximately 3.0. Which would appear yellow when added to a vinegar solution?

1) methyl orange
2) litmus
3) bromcresol green
4) phenolphthalein

_____6. Which compound reacts with an acid to form a salt and water?

1) KOH 2) KCl
3) CH_3COOH 4) CH_3Cl

_____7. According to the Arrhenius theory of acids, citric acid in oranges and acetic acid in vinegar are classified as acids because their aqueous solutions contain

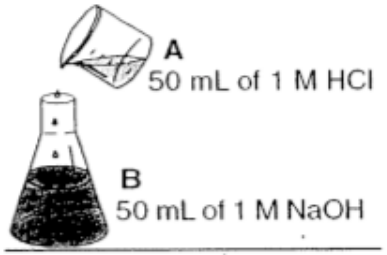
1) hydrogen atoms 2) hydroxide ions
3) hydroxide atoms 4) hydrogen ions

_____8. What type of reaction is represented by the following equation?

$Al_2S_3 + 6H_2O \rightarrow 2Al(OH)_3 + 3H_2S$

1)neutralization 2) dehydration
3) hydrolysis 4) electrolysis

_____9. The diagram below shows an acid being added to a base.



As the acid in beaker A is added to the base in flask B, the number of OH^- ions in flask B

1) decreases and the number of Na^+ ions decrease
2) decreases and the number of Na^+ ions remains the same
3) increases and the number of Na^+ ions decreases
4) increases and the number of Na^+ ions remains the same

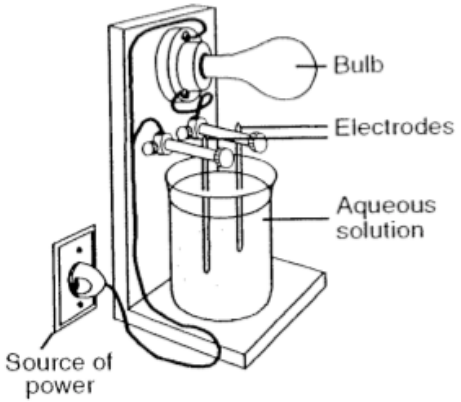
_____10. Methyl orange indicator is added to a beaker containing a solution of HCl with a pH of 2.0. What color change occurs as $NaOH_{(aq)}$ is added to the beaker?

1) red to yellow 2) blue to red
3) yellow to red 4) red to blue

_____11. Pure water at 25°C has a pH of

1) 1×10^{-7} 2) 7
3) 14 3) 1×10^{-14}

_____12. The diagram below shows an apparatus used to test the conductivity of various materials.



Which aqueous solution will cause the bulb to light?

1) $C_6H_{12}O_{6(aq)}$
2) $C_{12}H_{22}O_{11(aq)}$
3) $CH_3OH_{(aq)}$
4) $LiOH_{(aq)}$

_____13. According to an alternate acid-base theory, an acid

1) a proton donor, only
2) neither a proton donor nor a proton acceptor
3) a proton donor and a proton acceptor
4) a proton acceptor, only

_____14. Which solution will change litmus red?

1) $CH_3COO^-_{(aq)}$ 2) $NaOH_{(aq)}$
3) $NH_4OH_{(aq)}$ 4) $CH_3COOH_{(aq)}$

_____15. A solution of a base differs from a solution of an acid in that the solution of a base

1) has a greater $[H_3O^+]$
2) is able to conduct electricity
3) has a greater $[OH^-]$
4) is able to cause an indicator color change

_____16. Given the net reaction:

$$H^+ + OH^- \rightarrow H_2O$$

This reaction is *best* described as

1) addition 2) reduction
3) neutralization 4) hydrolysis

_____17. According to the Arrhenius theory, which list of compounds includes only bases

1) Li(OH), $Ca(OH)_2$, $C_2H_4(OH)_2$
2) KOH, NaOH, LiOH
3) KOH, $Ca(OH)_2$, CH_3OH
4) NaOH, $Ca(OH)_2$, CH_3COOH

_____18. Which compound is an electrolyte?

1) $C_6H_{12}O_6$ 2) CH_3COOH
3) $C_{12}H_{22}O_{11}$ 4) C_2H_5OH

_____19. Nitric acid is added to potassium hydroxide solution containing bromthymol blue indicator. What color will the solution be once all of the base is neutralized?

1) pink 2) colorless
3) red 4) green

_____20. As $HCl_{(aq)}$ is added to a basic solution, the pH of the solution will

1) increase 2) decrease
3) remain the same

_____21. Which of the following is a net ionic equation for a neutralization reaction?

1) $H^+ + HCO_3^- \rightarrow H_2CO_3$
2) $NH_4^+ + OH^- \rightarrow NH_4OH$
3) $H^+ + OH \rightarrow H_2O$
4) $Ag^+ + Cl^- \rightarrow AgCl$

_____22. When tested, a solution turns litmus blue. This indicates that the solution contains more

1) H_3O^+ ions than OH^- ions
2) H^+ ions than OH^- ions
3) H^+ and OH^- ions than H_2O molecules
4) OH^- ions than H_3O^+ ions

_____23. Which substance, when dissolved in water, signifies an acid that adheres to the alternative acid-base theory?

1) CH_3COO^- 2) NaOH
3) C_2H_5COOH 4) CH_3OH

_____24. Which 0.1M solution contains the *highest* concentration of OH^- ions?

1) NaOH 2) KNO_3
3) H_2SO_4 4) NH_4Cl

_____25. How many moles of KOH are needed to *exactly neutralize* 500mL of a 1.0M HCl solution?

1) 1.0 2) 0.25
3) 2.0 4) 0.50

_____26. Sodium chloride will be produced by a reaction between sodium hydroxide and

1) hydrochloric acid
2) chlorous acid
3) hypochlorous acid
4) chloric acid

_____27. In the reaction:

$NO_2^-{}_{(aq)} + H_2O_{(l)} \rightarrow HNO_{2(aq)} + OH^-{}_{(aq)}$,

the $NO_2^-{}_{(aq)}$

1) accepts a proton
2) donates a proton
3) accepts an electron pair
4) donates an electron pair

_____28. One sample of a solution with a pH of 10 is tested with phenolphthalein and another sample of this solution is tested with litmus. In this solution the color of the litmus is

1) blue and the phenolphthalein is pink
2) red and the phenolphthalein is pink
3) red and the phenolphthalein is colorless
4) blue and the phenolphthalein is colorless

_____29. According to Arrhenius theory, when an acid substance is dissolved in water it will produce a solution containing only one kind of positive ion. To which ion does the theory refer?

1) acetate 2) chloride
3) hydrogen 4) sodium

_____30. How many milliliters of 5.0M NaOH are needed to *exactly neutralized* 40. milliliters of 2.0M HCl?

1) 8.0mL 2) 10.mL
3) 40.mL 4) 16mL

_____31. If 50 mililiters (mL) of 0.01M HCl solution is required to neutralize exactly 25 mL of NaOH, what is the concentration of the base?

1) 0.0005 M 2) 0.01 M
3) 0.04 M 4) 0.02 M

_____32. Which 0.1 M solution has a pH closest to 7?

1) $HC_2H_3O_{2(aq)}$ 2) $NH_{3(aq)}$
3) $NaCl_{(aq)}$ 4) $NaOH_{(aq)}$

_____33. Given the neutralization reaction:

$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2HOH$

Which compound is a salt?

1) H_2SO_4 2) KOH
3) K_2SO_4 4) HOH

_____34. Which 0.1 M solution has a pH *greater* than 7?

1) $C_6H_{12}O_6$ 2) KOH
3) CH_3COOH 4) HCl

_____35. According to acid base theory, H_2O is considered a base when it

1) accepts a proton
2) accepts an electron
3) donates an electron
4) donates a proton

_____36. According to Arrhenius theory, when a base is dissolved in water it will produce a solution containing only one kind of negative ion. To which ion does this theory refer?

1) hydrogen 2) hydroxide
3) hydronium 4) hydride

_____37. The table below shows the color of an indicator in specific pH ranges.

Color	pH Range
Red	1-4
Orange	5-6
Green	6-7
Blue	8-10
Violet	11-14

If this indicator is used when titrating an unknown strong base by adding a strong acid, the color of the indicator will change from

1) orange to green
2) blue to green
3) green to violet
4) red to green

_____38. As the H_3O^+ concentration of a solution increases, the pH of a solution

1) decreases 2) increases
3) remains the same

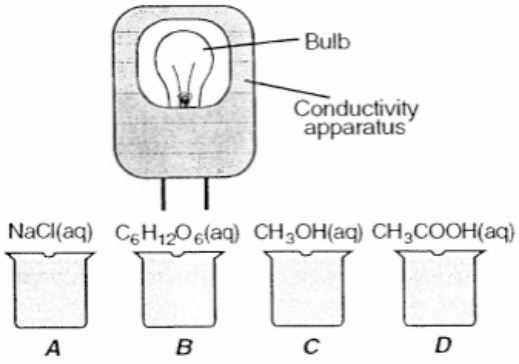
_____39. Which 0.1 M solution has the *highest* concentration of H_3O^+ ions?

1) NaCl 2) KBr
3) $Ba(OH)_2$ 4) CH_3COOH

_____40. The reaction between 1 mole of hydronium ions and 1 mole of hydroxide ions is called

1) hydrolysis 2) reduction
3) neutralization 4) oxidation

_____41 Beakers A, B, C, and D show below each contain a different solution.



The bulb will glow when the conductivity apparatus is placed into which beakers?

1) B and C 2) A and D
3) C and D 4) A and B

Constructed Response Questions

1. In the laboratory, a student neutralized 0.20 M HCl with 0.40 M KOH.

   a. Write the balanced equation for the reaction between HCl and KOH.

   b. How many milliliters of 0.20 M HCl are needed to exactly neutralize 40. milliliters of 0.40 M KOH? [*Write the correct formula. Show ALL work. Indicate the correct answer with an appropriate unit.*]

2. In the laboratory, a student titrated HNO_3 with 0.50 M LiOH until the indicator changed from colorless to pink.

   a. Write the balanced equation for the reaction between HNO_3 and LiOH.

   b. If 50. mL of 0.50 M LiOH is required to exactly neutralize 100. mL of an HNO_3 solution, what is the molarity of an HNO_3 solution? [*Write the correct formula. Show ALL work. Indicate the correct answer with an appropriate unit.*]

   c. What indicator was used in the titration? _____

3. In the laboratory, a student neutralized 0.10 M LiOH with 0.20 M HCl.

   a. Write the balanced equation for the reaction between HCl and LiOH.

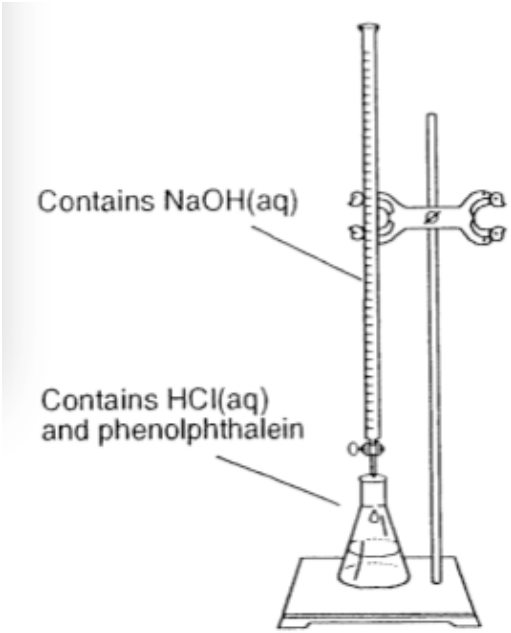
   b. What is the maximum volume of 0.10 M LiOH that can be completely neutralized by 25 mL of 0.20 M HCl? [*Write the correct formula. Show ALL work. Indicate the correct answer with an appropriate unit.*]

4. In the laboratory, a student titrated NaOH with 3.0 M HNO_3.

   a. Write the balanced equation between HNO_3 and NaOH.

   b. If 50. mL of 3.0 M HNO_3 completely neutralized 150 mL of NaOH, what was the molarity of the NaOH solution? [*Write the correct formula. Show ALL work. Indicate the correct answer with an appropriate unit.*]

5. In the laboratory, a student performed an acid-base titration. The diagram below shows $NaOH_{(aq)}$ being added to $HCl_{(aq)}$.



The following data was collected:

Volume of the acid, HCl = 20.0mL
Molarity of the acid = 0.50 M
Volume of the base, NaOH = 40.0mL

a. Write the balanced equation for the reaction between HCl and NaOH.

b. Based on the data above, calculate the molarity of NaOH. [*Write the correct formula. Show ALL work. Indicate the correct answer with an appropriate unit.*]

c. What color does the indicator appear at the endpoint of the titration?

_____

d. What name is given to the reaction between equivalent quantities of an acid and a base?

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