**Acid Unit: Definitions and Properties**

1. Which ion is **not amphiprotic?**

|  |  |
| --- | --- |
| a | HOOCCOO- (aq) |
| b | HPO42-(aq) |
| c | H2PO4-(aq) |
| d | OOCCOO2-(aq) |

1. The **net ionic equation** for the reaction that occurs between nitric acid and aqueous potassium hydroxide is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | HNO3(aq) + OH-(aq) 🡪 NO3-(aq) + H3O+(aq) |
| b | HNO3(aq) + KOH 🡪 KNO3(aq) + H2O(l) |
| c | K+(aq) + NO3-(aq) 🡪 KNO3(aq) |
| d | H3O+(aq) + OH-(aq) 🡪2 H2O(l) |

1. If 0.10  solutions are prepared for each of the following, which will have the highest conductivity?

|  |  |
| --- | --- |
| a | H2S(aq) |
| b | HOCl(aq) |
| c | HF(aq) |
| d | C6H5COOH(aq) |

1. A 0.10  solution of CH3COOH(aq) at 25oC sits in a beaker in the lab. The TRUE statement below is \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | there are more ions than molecules in the solution |
| b | there are more molecules than ions in the solution |
| c | There are equal numbers of ions and molecules in the solution |
| d | The [H3O+(aq)] is higher than [CH3COO-(aq)] |

1. If four acidic solutions of identical concentration are tested for electrical conductivity, which solution would have the **lowest** electrical conductivity?

|  |  |
| --- | --- |
| a | HCN(aq) |
| b | H2CO3 (aq) |
| c | HNO2 (aq) |
| d | HNO3 (aq) |

1. A neutralization reaction is a reaction between a/an \_\_\_ and a/an \_\_\_ to form a \_\_\_ and \_\_\_\_\_.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | Acid | Base | Salt | Water |
| b | Acid | Metal | Salt | Hydrogen gas |
| c | Aqueous solution | Aqueous solution | Precipitate | Aqueous solution |
| d | Oxidizing agent | Reducing agent | Metal | Aqueous solution |

1. Milk of magnesia tastes bitter and turns HPh to pink. It is reasonable to conclude that the milk of magnesia could \_\_\_\_

|  |  |
| --- | --- |
| a | Neutralize a solution of NaOH(aq) |
| b | Neutralize a solution of HCl(aq) |
| c | Raise the [H3O+(aq)] |
| d | Lower the pH of a solution. |

1. When used to describe an acid, the word "weak" means that the acid will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and exhibit pH that is \_\_\_\_\_\_\_\_ than expected.

|  |  |  |
| --- | --- | --- |
| a | Show incomplete dissociation | Lower |
| b | Show complete dissociation | Lower |
| c | Show incomplete dissociation | Higher |
| d | Show complete | Higher |

1. A student suspects that an unknown acid of known concentration is diprotic. In order to test this hypothesis, the most useful procedure for the student to follow would be to

|  |  |
| --- | --- |
| a | Titrate with a strong base of known concentration |
| b | Determine the molar mass of the acid |
| c | Find the initial pH of the acid |
| d | Establish the degree of electrical conductivity. |

1. Which polyprotic acid will require the fewest moles of NaOH(aq) to bring the titration to completion?

|  |  |
| --- | --- |
| a | H3PO4(aq) |
| b | H2S(aq) |
| c | H2SO3(aq) |
| d | HOOCCOOH(aq) |

1. Four unknown solutions labeled I, II, III, and IV were tested and the following observations were recorded.

|  |  |  |
| --- | --- | --- |
| Solution | Conductivity | pH |
| I | Poor | 8.1 |
| II | Excellent | 1.4 |
| III | Poor | 6.1 |
| IV | Excellent | 13.7 |

The strong acid is solution \_\_\_\_, while the weak base is solution \_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| a | II | IV |
| b | III | I |
| c | II | IV |
| d | II | I |

1. The strongest acid listed below is \_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| a | H3X(aq) |
| b | H2X(aq) |
| c | HX(aq) |
| d | X-(aq) |

1. The property that acids and bases have in common is that they

|  |  |
| --- | --- |
| a | Both undergo reduction |
| b | Both change indicators |
| c | Both undergo oxidation |
| d | Both have a high concentration of [OH-(aq)] |

1. When butter goes rancid, it has a sour taste. One should also expect it to

|  |  |
| --- | --- |
| a | Neutralize a solution of HCl(aq) |
| b | Have a pH > 7 |
| c | React with Zn(s) to form H2(g) |
| d | Turn blue in the presence of HBb. |

1. If acid HX(aq) is stronger than acid HY(aq) then\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | HY(aq) will have a lower pH than HX(aq) |
| b | HX(aq) will have a lower [H3O+(aq)] than HY(aq) |
| c | HY(aq) will have a higher [OH-(aq)] than HX(aq) |
| d | HX(aq) will have a higher pH than HY(aq) |

1. What is the essential difference between a 1.0  solution of a weak acid and a 1.0 solution of a strong acid?

|  |  |
| --- | --- |
| a | The strong acid can act as a buffer, while the weak acid cannot. |
| b | The strong acid can undergo a stoichiometric reaction with NaOH(aq) while the weak acid cannot. |
| c | The strong acid has a lower pH than the weak acid. |
| d | The weak acid is more dilute than the strong acid. |

1. As NaOH(s) is added to HCl(aq), all of the following changes in solution properties should be observed EXCEPT\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Decrease in temperature |
| b | Increase in pH |
| c | Increase in [OH-(aq)] |
| d | Decrease in [H3O+(aq)] |

1. Which statement about acids is true?

|  |  |
| --- | --- |
| a | Acids increase [H3O+(aq)] |
| b | Acids increase [OH-(aq)] |
| c | Acids accept protons in a chemical reaction. |
| d | Acids increase the pH of an aqueous solution. |

1. When a base is added to an acid, the reaction will show

|  |  |
| --- | --- |
| a | A decrease the pH of an aqueous solution |
| b | A decrease of [OH-(aq)] in the aqueous solution |
| c | A gain of electrons by the base |
| d | A gain of protons by the base |

1. A student observed that a solution spilled in the garage at home was reacting with a zinc container. The solution could be expected to

|  |  |
| --- | --- |
| a | Be a reducing agent |
| b | To have a high pH |
| c | To donate protons |
| d | To turn HPr red. |

1. Some 25 mL portions of 0.10solutions of H2SO4(aq), HCl(aq) and CH3COOH (aq) are contained in separate, unlabeled flasks. Simple laboratory tests are to be done to identify the solutions. Which test could best identify one of the solutions?

|  |  |
| --- | --- |
| a | The H2SO4(aq) can be identified by the amount of KOH that will be required to reach an endpoint. |
| b | The HCl(aq) can be identified by its reaction with Mg(s) to produce H2(g) |
| c | The HCl(aq) can be identified by the red colour that results when HMo indicator is added. |
| d | CH3COOH(aq) can be identified as having the lowest pH. |

1. A student observed that a solution spilled in the garage at home reacted with a zinc container. The correct statement regarding the solution is \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | the solution is a reducing agent |
| b | the solution turns phenol red to a yellow colour |
| c | Accepting protons |
| d | the solution is undergoing oxidation |

1. **Numerical response question**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Left justify your answer in the boxes provided.

|  |
| --- |
| Consider the list of reactants below   1. HCl(aq) and NaOH(s) 2. CH3COOH(aq) and NaCH3COO(aq) 3. HNO3(aq) and NaNO3(aq) 4. NaH2PO4(aq) and Na2HPO4(aq) 5. H2CO3(aq) and NaHCO3(aq) 6. HBr(aq) and Na2CO3(aq)   Choose the combination of chemical compounds that will act as buffers. Put the answer(s) in ascending order. |

Solutions

1. D
2. D
3. C
4. B
5. A
6. A
7. B
8. C
9. A
10. B
11. D
12. A
13. B
14. C
15. C
16. C
17. A
18. A
19. D
20. C
21. A
22. B
23. 245