**LABORATORY REPORT**

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| Organic functional group identification |
| |  |  | | --- | --- | | Name: | Victor Kwansa | | Index Number: | 41350033 | | Class: | O.1.2.1/O.1.2.2 | | Demonstrator: | Ms. Flora Amarh | | Date: | 5th February 2009 | |
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| **AIMS/OBJECTIVES:**  At the end of the experiment, the individual should be able to:   1. Identify the functional groups of unknown compounds by means of their reactions with certain chemicals. 2. Determine the solubility of unknown solid samples in certain chemical solutions. 3. Determine and note the colour changes of the litmus paper when placed in the aqueous unknown solutions. 4. Determine whether the unknown aqueous solutions are acidic, basic or neutral. |
| **INTRODUCTION/THEORY:**  All organic compounds belong to different functional groups and exhibit different reactivity, depending on the type of functional group in mention. Qualitative analysis of an organic compound refers to the analysis of the characterization and identification of the organic compound.  A functional group refers to a group of organic compounds which belong to a particular class that exhibit similar characteristics. i.e. chemical properties.  Solubility behavior of an unknown substance in various solutions such as in distilled water, NaOH solution, HCl solution, concentrated sulphuric acid solution, etc. provide a useful preliminary information about the nature or type of compound. Thus, the solubility of different unknown samples in such solutions helps us to classify and identify the functional groups of the samples.  When an organic compound contains more than one functional group, the classification is mostly based on that which is easily detected via experimentation.  The structure of the compounds and identification of the functional groups of organic compounds can be determined by other methods.  A spectroscopic method for example, also helps to evaluate the functional group and structure of a compound. |
| **CHEMICALS & EQUIPMENT:**   1. Distilled water 2. Wash bottle 3. Test tubes 4. Red litmus paper 5. 5% NaOH solution 6. 5% HCl solution 7. 5% NaHCO3 solution 8. Concentrated H2SO4 solution 9. Solid samples A, K and 2B |
| **PROCEEDURE:**   |  |  | | --- | --- | | TEST | OBSERVATION | | A. |  | | 1. |  | | 0.1g of solid sample A was put into a test tube |  | | 3ml of distilled water was added to the sample and shaken vigorously. | Soluble | | The solution was tested with red litmus paper. | The red litmus paper did not change colour. | | 2. |  | | 0.1g of solid sample A was put into a test tube. |  | | 3ml of 5%NaOH was added to the sample and shaken vigorously. | Soluble | | 3. |  | | 0.1g of solid sample A was put into a test tube. |  | | 3ml of 5%HCl was added to the sample and shaken vigorously. | Soluble | | 4. |  | | 0.1g of solid sample A was put into a test tube |  | | 3ml of 5%NaHCO3 was added to the sample and shaken vigorously. | Soluble | | 5. |  | | 0.1g of solid sample A was put into a test tube. |  | | 3ml of concentrated H2SO4 was added to the sample and shaken vigorously. | Soluble | |  |  | | B. |  | | 1. |  | | 0.1g of solid sample 2B was put into a test tube. |  | | 3ml of distilled water was added to the sample and shaken vigorously. | Insoluble | | The solution was tested with red litmus paper. | There was no colour change. | | 2. |  | | 0.1g of solid sample 2B was put into a test tube. |  | | 3ml of 5%HCl was added to the sample and shaken vigorously. | Insoluble | | 3. |  | | 0.1g of solid sample 2B was put into a test tube. |  | | 3ml of 5%NaOH was added to the sample and shaken vigorously. | Soluble | | 4. |  | | 0.1g of solid sample 2B was put into a test tube. |  | | 3ml of 5%NaHCO3 was added to the sample and shaken vigorously. | Soluble.  Presence of effervescence. | | 5. |  | | 0.1g of solid sample 2B was put into a test tube. |  | | 3ml of concentrated H2SO4 was added to the sample and shaken vigorously. | Soluble. | |  |  | |  |  | |  |  | | C. |  | | 1. |  | | 0.1g of solid sample K was put into a test tube. |  | | 3ml of distilled water was added to the sample and shaken vigorously. | Insoluble. | | The solution was tested with red litmus paper. | No colour change was observed. | | 2. |  | | 0.1g of solid sample K was put into a test tube. |  | | 3ml of 5%HCl was added to the sample and shaken vigorously. | Insoluble. | | 3. |  | | 0.1g of solid sample K was put into a test tube. |  | | 3ml of 5%NaOH was added to the sample and shaken vigorously. | Insoluble. | | 4. |  | | 0.1g of solid sample K was put into a test tube. |  | | 3ml of 5%NaHCO3 was added to the sample and shaken vigorously. | Insoluble. | | 5. |  | | 0.1g of solid sample K was put into a test tube. |  | | 3ml of concentrated H2SO4 was added to the sample and shaken vigorously. | Soluble. | |
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| **DISCUSSION:**  Sample A was more likely to be neutral whilst sample 2B was more likely to be acidic. Sample K on the other hand was more likely to be basic.  Sample 2B seems more acidic because it easily dissolves in the presence of NaOH compared to the other solutions. Acidic samples do not easily dissolve in acidic solutions since the acidic properties of both acids would not enable them to react with a few exceptions such as with the concentrated H2SO4 solution which had a far higher concentration over the sample thus, had more precedence over the sample and causing that soluble situation which was recorded. On the other hand, since an acid can easily react with a base, the sample could easily dissolve in the 5%NaOH better than with the other solutions. With the case of the 5%NaHCO3 solution, the acidic sample was able to react with the solution to produce an effervescence of a colourless, odourless, gas most likely to be CO2 gas. i.e. HX +NaHCO3 -------- NaX + H2O + CO2.  Sample K seemed more likely basic because it easily dissolved in the concentrated sulphuric acid. The sample was not soluble in the 5%HCl because its concentration was not strong enough to completely react with all the molecules of the sample hence its insolubility as observed. Sample K could not dissolve in NaOH and NaHCO3 solutions because as with the case of the acids, bases do not easily dissolve in basic solutions due to the fact that the basic properties of both bases do not allow easy coexistence between the individual molecules in both bases.  Sample A on the other hand seemed more neutral since the observations which were made did not show any form of dissolution in any of the solutions meaning no reaction was likely to have occurred. Since neutral substances have a pH of exactly 7, no reasonable reaction is expected to occur between such substances, hence the observations made. |
| **ERROR ANALYSIS:**   1. The amount of solid sample which was taken was not weighed and on putting the sample in the test tubes, not all the sample could be put into the tubes since some fell out hence, the recommended amount of sample for the experiment was not used. 2. The volume of solutions needed for the testing were not also measured thus, any volume of solution was used in the identification process. 3. The few drops of distilled water which remained in the tubes after washing, could have affected the concentrations of the subsequent solutions which were used.   **PRECAUTIONS:**   1. The test tubes were cleaned and washed thoroughly after every experiment to prevent impurities and to ensure that the chemical reactions take place under the most convenient environment or situation. 2. Care was taken in transferring the unknown solid samples into the test tubes to ensure that most of the sample took part in the reaction. 3. Great care was taken in handling the concentrated acid by cautiously pouring out the acid into the test tube and on discarding the used conc. acid, to prevent skin burns or acid reactions to the skin. 4. On discarding the used acid, the conc. acid was poured out before a little water was added to rinse out any remaining acid and further washing out thoroughly with a lot of water. This was to prevent explosion since it is not advised to put water in acid. |
| **CONCLUSION:**  The functional groups that were identified in this experiment were made based on their reactivity in acidic, basic and neutral solution. The different reactivity of the three samples to these situations enabled easy identification of the organic functional group of the samples in relation to their acidity or basicity or neutrality. |
| **REFRENCES:**  -Organic chemistry, Carey A. Francis, Fifth edition, pp. 862 to 867, 941.  -General chemistry, Raymond Chang, Sixth edition, pp. 978,843,844.  -www.answers.com/topic/functional-group. |