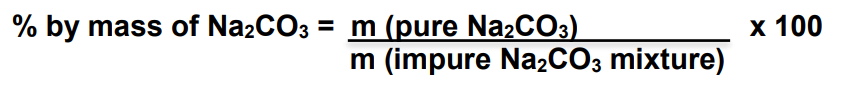
**ATAR CHEMISTRY – UNIT 3 TASK 3 – Titrations Lab**

The aim of this investigation is to use knowledge of acid-base reactions and titration techniques to accurately determine the percentage by mass of sodium carbonate in a sodium carbonate/sodium chloride (Na2CO3/NaCl) mixture.

**HAND THIS SHEET IN WITH YOUR VALIDATION**

**Introduction:**

Determining the composition of a solution is an important analytical and forensic technique. Sodium carbonate, Na2CO3 is an important industrial chemical as it is used in a number of applications including water treatment, general cleaning, descaling and buffer solutions.

Commercial sodium carbonate has a purity of > 98 %. Major impurities in sodium carbonate include sodium chloride. The purity of commercial sodium carbonate depends on the composition of the raw materials, the production process, and the intended use of the product. One common method of measuring the amount of pure sodium carbonate in an impure sodium carbonate mixture is mass percent where:

**Requirements:**

|  |  |  |  |
| --- | --- | --- | --- |
| Burette | Retort stand | Standardised HCl | Burette clamp |
| 20mL pipette & pipette filler | Filter funnel | Indicator | Deionised water |
| 2 x Conical flasks | Na2CO3/NaCl mixture |  |  |

**Procedure:** READ AND CARRY OUT THE FOLLOWING PROCEDURES WITH GREAT CARE

1. Use a pipette to transfer a 20.0mL aliquot of the sodium carbonate/sodium chloride solution mixture into ONE of the conical flasks given.
2. Titrate the 20.0 mL aliquot of the mixture against the standardised hydrochloric acid solution by selecting **ONE** of the two indicators provided.
3. Repeat steps 1 and 2 until you obtain consistent results. Record all your results in the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Titration | 1 | 2 | 3 | 4 | 5 | 6 |
| Final Volume (mL) |  |  |  |  |  |  |
| Initial Volume (mL) |  |  |  |  |  |  |
| Titre (mL) |  |  |  |  |  |  |

**Copy from the whiteboard:**

Concentration of standardised HCl = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mol L-1

Density of Na2CO3/NaCl mixture = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g L-1

**ATAR CHEMISTRY – UNIT 3  
TASK 3 – Titrations Lab Validation**

**TOTAL MARKS:**

/22

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Clearly write your answer in the space provided. Where applicable show all working out and round final calculations to appropriate significant figures.

1. Other than having a relatively low molar mass, give two reasons why hydrochloric acid is not a good primary standard.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(2 marks)

1. Write a balanced chemical equation for the reaction between hydrochloric acid and sodium carbonate.

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(2 marks)

1. From your results, calculate the average titre value.

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(1 mark)

1. Use your titration results and additional information from the whiteboard to calculate the percentage by mass of Na2CO3 in the Na2CO3/NaCl mixture.

(5 marks)

1. Assessment of accuracy: **YOUR TEACHER WILL FILL THIS PART OUT**.

± 0-5% ± 5.1-10% ± more than 10% (2 marks)

1. A household cleaner claims to be 3% ammonia **by mass**, in order to determine if this claim is accurate the following process was performed.

* A 100.0mL sample of the cleaner was diluted and made up to a volume of 2.00L.
* 20.0mL samples of this diluted solution were then titrated against a standardised 1.00 x 10-1 mol L-1 HCl solution.
* A 20.00 mL sample of the cleaner was found to have a mass of 18.20g

1. Complete the following table by writing the name of the most suitable piece of equipment to use for each task, and what that equipment should be rinsed with before use.

|  |  |  |
| --- | --- | --- |
| **Task** | **Equipment Used** | **Final Rinse With** |
| Adding the hydrochloric acid solution to the diluted cleaner. |  |  |
| Diluting the 100.0mL sample of cleaner up to exactly 2.0L. |  |  |
| Measuring 20.0 mL aliquots of the cleaner solution. |  |  |

(6 marks)

1. Name a suitable indicator that could be used for this titration and explain why.

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(2 marks)

1. The colour change for the indicator Thymolphthalein is shown below.

A picture containing text, antenna, clock

Description automatically generated

State and explain how the calculated concentration of ammonia in the cleaner would be affected if the indicator Thymolphthalein were used for this titration.

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(2 marks)

**THINGS TO DO AFTER YOU HAVE COMPLETED THE TEST**

A picture containing clipart

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|  |  |
| --- | --- |
| 1 | Pour all solutions used down the sink. |
| 2 | Rinse all glassware used and put back on shelves or trolley.  Don’t leave it on the sink! |
| 3 | Pack away other equipment used. |