**PRACTICAL TEST – TITRATIONS**

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| **Section** | **Marks** |
| Pre-experiment questions | / 3 |
| Skill demonstrations | / 2 |
| Titration results / accuracy | / 6 |
| Calculations | / 9 |
| **TOTAL:** | **/ 20** |

***Overview:***

**In this practical test you will find the concentration of acetic acid in a commercial sample of vinegar. The acetic acid will be titrated against standardised sodium hydroxide.**

*Solutions supplied:*

* 150 mL of 0.107 mol L-1 standardised NaOH solution
* 50 mL of commercial vinegar (undiluted)
* Methyl orange indicator
* Phenolphthalein indicator

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**Part 1: Dilution of vinegar**

Commercial vinegar is much more concentrated than the sodium hydroxide we will use, so it will require dilution before it can be titrated. Use a 20.00 mL volumetric pipette, a 250 mL volumetric flask and distilled water to prepare a diluted vinegar solution.

***IMPORTANT:*** *During this titration you will need to show the teacher a volumetric flask with 250.0 mL of solution. It is recommended that you do this while making up your solution during Part 1. Show the full volumetric flask before inverting the flask as some of the liquid will stick to the stopper during the inversion process.*

**Part 2: Titration against 0.107 M sodium hydroxide**

This titration will be performed with the **sodium hydroxide in the burette** and **20.00 mL of dilute vinegar in a conical flask**. You will have to choose an appropriate indicator for this reaction from the provided materials. Perform a number of titrations and then complete the questions.

***IMPORTANT:*** *During this titration you will need to show the teacher two conical flasks which are at the correct endpoint for your chosen indicator. You should show both conical flasks at the same time so that the consistency of your endpoint can be evaluated.*

**PRE-EXPERIMENT QUESTIONS [3 marks]**

1. Which of the provided indicators will you use in your experiment? (1 mark)

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

1. Circle the solution which will be used to rinse out each piece of glassware: (2 marks)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Glassware** | **Rinse with… (circle one)** | | | |
| **Part 1** | Volumetric pipette | Undiluted vinegar | Diluted vinegar | NaOH solution | Distilled water |
| Volumetric flask | Undiluted vinegar | Diluted vinegar | NaOH solution | Distilled water |
| **Part 2** | Volumetric pipette | Undiluted vinegar | Diluted vinegar | NaOH solution | Distilled water |
| Conical flask | Undiluted vinegar | Diluted vinegar | NaOH solution | Distilled water |
| Burette | Undiluted vinegar | Diluted vinegar | NaOH solution | Distilled water |

**IMPORTANT: GET THE PRE-EXPERIMENT QUESTIONS   
MARKED BEFORE STARTING EXPERIMENT**

**SKILL DEMONSTRATIONS [2 marks]**

|  |  |
| --- | --- |
| **To be shown to teacher during experiment…** | **Teacher mark** |
| A 250 mL volumetric flask made up to the mark | / 1 |
| Two conical flasks showing the endpoint of your chosen indicator | / 1 |

Note that marks will be **deducted** for the following during the experiment:

|  |  |
| --- | --- |
| **Potential mark deductions** | **Teacher mark** |
| Needs reminder to wear safety glasses while out of seat  *(-2 marks per occurrence)* |  |
| Fills up burette by pouring liquids above eye level  *(-2 marks per occurrence)* |  |
| Leaves funnel sitting in the burette during a titration  *(-1 mark per occurrence)* |  |
| Needs to collect additional reagents (e.g. spilt beaker, overfilled flask)  *(-1 mark per occurrence)* |  |
| Did not clean up, rinse and put away equipment at end of experiment  *(-2 marks)* |  |

**RESULTS [6 marks]**

Repeat the experiment until you have at least three concordant titre values. It is expected that you will NOT need to fill in the entire table.

**Circle** the concordant titre values at the end of your experiment and place an **X** underneath any rough or unused titre volumes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Volume of NaOH** | | | | | | |
|  |  |  |  |  |  |  |  |
| **Initial volume (mL)** |  |  |  |  |  |  |  |
| **Final volume (mL)** |  |  |  |  |  |  |  |
| **Titre volume (mL)** |  |  |  |  |  |  |  |

**Marks:**

* Concordant values: \_\_ / 1
* Accuracy of titration: \_\_ / 5

**CALCULATIONS [9 marks]**

1. Write a balanced chemical equation for the reaction that occurs in the conical flask.

(1 mark)

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1. Calculate the average titre volume. (1 mark) (1 mark)

\_\_\_\_\_\_\_\_\_\_\_ mL

1. Calculate the **concentration of acetic acid** in the **diluted vinegar**. (3 marks)
2. Calculate the **mass of acetic acid** in the **20 mL sample of undiluted vinegar** (2 marks)
3. The density of commercial (undiluted) vinegar is 1.01 g/mL. Find the **concentration of acetic acid in 20 mL of undiluted vinegar** expressed as a **%mass/mass**. (2 marks) (2 marks)