



JOHN EDMONDSON HIGH SCHOOL

Assessment Notification

Faculty: Science Course: Chemistry Year: 12

Assessment Task: Task 3: First-hand Practical Investigation and Scientific Report

Assessment Weighting: 25% Due: Term 3 Week 9 Date: 22/06/2023

Task Type: Hand in Task In Class Task Practical Task

Outcomes assessed (NESA)

- CH12-1 Develops and evaluates questions and hypothesis for scientific investigation.
- CH12-2 Designs and evaluates investigations in order to obtain primary and secondary data and information.
- CH12-3 Conducts investigations to collect valid and reliable secondary data and information.
- CH12-4 Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media.
- CH12-5 Analyses and evaluates primary and secondary data and information.
- CH12-6 Solves scientific problems using primary and secondary data, critical thinking skills and scientific processes.
- CH12-7 Communicates Scientific understanding using suitable language and terminology for a specific audience or purpose.
- CH12-13 describes, explains and quantitatively analyses acids and bases using contemporary models.

Task Description/Overview

Students will plan and carry out an unknown titration, gather data and write a scientific report on that data.

Total Marks: 60

Practical Skills in the laboratory: 10 Marks

Scientific Report: 50 Marks

Detailed Assessment Task Description

Context

Acids and bases, and their reactions, are used extensively in everyday life and in the human body. The chemistry of acids and bases contributes to industrial contexts and the environment. Therefore, it is essential that the degree of acidity in these situations is continually monitored. By investigating the qualitative and quantitative properties of acids and bases, students learn to appreciate the importance of factors such as pH and indicators. Students have studied these acid/base reactions and will demonstrate their understanding and skill by carrying out an unknown titration.

PROBLEM:

To analyse a sample of vinegar for the ethanoic acid content using a neutralisation reaction with sodium hydroxide.

The student should demonstrate how to

- 1) Prepare a solution of primary standard
- 2) Determine the molar concentration of a solution of an acid or base using data obtained from titration
- 3) Measure the amount of acetic acid in a solution of vinegar

STUDENT INSTRUCTIONS:

You need to design a method and conduct the following practical investigation:

- PART 1: Creating the Primary Standard using potassium hydrogen phthalate (KHP)
- PART 2: Standardisation of 0.1 M sodium hydroxide with the primary standard potassium hydrogen phthalate (KHP)
- PART 3: Titration of the acetic acid in vinegar with the standardised sodium hydroxide solution
- You need to complete a **Scientific Report** on the titration experiment you conducted in the lab.

You must also complete the questions related to your choice of indicator and overall accuracy and reliability of your results.

Scientific Report: Photos, comments, data etc. may be included.

In your report include the following sections:

- Title
- Introduction: A summary of your report which may include definitions of the processes used, chemical reactions and their explanations and vocabulary related to this practical. Also include details of the indicator used.
- Aim
- Hypothesis
- Equipment List
- Hand drawn scientific diagrams.
- Risk Assessment
- Method
 - Controlled Variables
 - Letter on Sample Bottle: _____
 - Briefly describe how you diluted the sample of vinegar.
- Results Table
- Data/calculations
 - All working must be shown. Calculate the percentage of ethanoic acid in the original sample in g/L.
 - Calculate the molarity of the diluted sample and the original sample.
- Graph(s) if applicable
- Discussion
 - Interpretation of results
 - Validity and Reliability analysis
 - Describe TWO ways of improving the accuracy and TWO ways of improving the reliability of your results.
- Conclusion
- References

Key points to address

Address the following key points in your report. This is best done such that the questions are answered in the report itself, but some can be answered separately at the end of the report.

- Identify how your burette, pipette(s), volumetric flask and conical flask(s) were washed before use.
- Explain why you chose the indicator(s) that you used.
- Describe what 'end point' and 'equivalence point' mean and the difference between the two (if applicable).
- Include balanced chemical equations for all reactions.
- Describe the properties of a primary standard and explain why they are important.
- Use correct units and states.

You have the option of using digital technologies (pH probes, drop counters, conductivity probes) as part of this experiment.

Week 4	Monday 15/5/23	Wednesday 17/5/23	Thurs/Friday 18-19/5/23	Weekend 21/5/23 and 22/5/23	
	Receive notification	Researching and planning at home <ul style="list-style-type: none"> • Watch Atomi video on Titration at home. • Following Resources could be used: <ol style="list-style-type: none"> 1. https://scienceready.com.au/pages/preparing-for-titration 2. https://www.conquerhsc.com/hsc-chemistry-guide-titration-and-tips 3. Chem.libretexts: Titration of Vinegar (Experiment) 			
Week 5	Wednesday 24/5/23	Thursday 25/5/23	Friday 26/5/23	Weekend 27/5/23 and 28/5/23	
	<ul style="list-style-type: none"> • Researching and planning at home • Writing your own Aim – Method and Results tables. 				
Week 6	Monday 29/5/23	Wednesday 31/5/23	Thursday 1/6/23	Friday 2/6/23	Weekend 3/6/23 and 4/6/23
	UPTO method checked including results table	Preparing Standard Solution	Planning at home. Writing your own Aim – Method and Results tables.		
Week 7	Wednesday 7/6/23	Thursday 8/6/23	Friday 9/6/23	Weekend 8/6/23 and 9/6/23	
	Conducting Experiment	Conducting Experiment	Conducting Experiment	Finalising Scientific Report write up at home	
Week 8	Monday 12/6/23	Wednesday 14/6/23	Thursday 15/6/23	Friday 16/6/23	Weekend 17/6/23 and 18/6/23
	Conducting Experiment (only if needed)	Finalising Scientific Report write up at home.			
Week 9	Thursday 22/6/23				
	Submit via canvas by 8:40am				

Student Name _____

Marking Criteria Practical Assessment: Practical Skills

4	3	2	1	Comment
Demonstrates an extensive ability to identify and set up the most appropriate equipment and carry out the first-hand investigation.	Demonstrates a thorough ability to identify and set up appropriate equipment and carry out the first-hand investigation.	Demonstrates a sound ability to identify and set up appropriate equipment and carry out the first-hand investigation.	Demonstrates an elementary ability to identify and set up appropriate equipment and carry out the first-hand investigation.	
	Demonstrates an extensive ability in identifying and addressing all potential hazards and chemical disposal requirements and using safe work practices during the investigation.	Demonstrates a thorough ability in identifying and addressing most potential hazards and chemical disposal requirements and using safe work practices during investigation.	Demonstrates a sound ability in identifying and addressing some potential hazards and chemical disposal requirements and using safe work practices during investigation.	
	Demonstrates an extensive ability in measuring, observing, and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate.	Demonstrates a thorough ability in measuring, observing, and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate.	Demonstrates a basic ability in measuring, observing, and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate.]	
Teacher Comment:				/10

Scientific Report Marking Criteria

Criteria	5	4	3	2	1
Title and Aim				Clear title and aim which describes what the experiment is designed to test.	Basic title and aim which outlines what the experiment is designed to test.
Introduction	Identifies & explains the nature of the problem the experiment is designed to investigate. Includes detailed, clear, and relevant information. Analysis and synthesis of main ideas are integrated and linked to the investigation. Justifies the hypothesis related to current facts or theories.	Identifies & explains the nature of the problem the experiment is designed to investigate. Includes clear and relevant information. Justifies hypothesis related to current facts or theories.	Identifies the nature of the problem the experiment is designed to investigate, some explanation provided. Most information is clear and relevant.	Introduction is very brief giving some background information. Minimal explanation of what the experiment is designed to investigate. Or Includes significant amounts of irrelevant information	Introduction is very brief. It does not give background information and shows limited understanding of the topic being investigated. May include irrelevant or incorrectly interpreted information.
Hypothesis				Hypothesis is correctly stated. A clear statement of prediction regarding the Titration analysis	A statement of prediction of the concentration of Titration analysis of vinegar is made OR Poorly worded hypothesis. May not have taken research into consideration.
Equipment and Diagram			Identifies the most appropriate equipment needed to undertake the investigation. Comprehensive list of materials and equipment including sizes and quantities. Diagram is neatly drawn and accurately labelled.	Acceptable materials used. Complete list of equipment may lack some information such as units and quantity. Diagram is neatly drawn with most labels. Or labelled correctly but diagram not drawn scientifically.	Choice of materials poor OR Incomplete list of equipment. If included, diagram is poorly drawn e.g. without a ruler and inadequately labelled.
Risk Assessment			Thorough: Risk assessment covering ALL high potential risks/injury from necessary equipment and chemicals provided in a table format.	Sound: Risk assessment covering high potential risks/injury from necessary equipment and chemicals provided in a table format.	Risk assessment is incomplete.

Method	Appropriate method—well written & thorough including ALL the parts . The method is written so that it could be repeated exactly by another person without prior knowledge of the experiment. Written in third person, past tense. Correct washing procedures are outlined.	Appropriate method—well written although some minor details are missing. Written in third person, past tense. Correct washing procedures are outlined.	Satisfactory method—minor details missing. May be difficult for another person to repeat without consultation. May not be written in third person, past tense.	Method is missing information. Units and or quantities may be incorrect or absent. May not be written in third person, past tense.	Method is poorly written with sections missing. Could not be accurately repeated by someone else. Written in first person.
Variables			Correctly identifies at least 3 controlled variables and justifies why/how they were controlled.	Correctly identifies controlled variables with some justification.	Identifies controlled variables.
Results	Results are presented in well-designed tables, graphs, and figures . All data is accurately recorded . All working out is shown. Correct number of significant figures is used.	Presentation of results is clear, but there are some minor omissions. Most working out is shown. Calculations are correct.	Data is complete and correctly recorded. Some omissions in working out or recording of data.	Data is displayed in a table with components missing &/or errors in calculations.	Data is poorly displayed and unorganised. Have only given raw data. Significant omissions e.g. missing units, headings, labels etc.
Discussion -Validity (2marks) -Accuracy (2marks) -Reliability (1 mark)	Outstanding analysis of the validity of the method. References the variables, repetition, and calculation of the average titre volume. Outstanding analysis accuracy of the results with direct reference to research and results obtained in this experiment. Outstanding analysis of reliability of the results. References made to the repetition and consistency of the results.	Thorough assessment of the reliability and validity of the method and accuracy of the results.	Sound information assessment of the reliability and/or validity of the method and /or accuracy of the results.	Basic information of reliability and/or validity of the method and /or accuracy of the results.	Limited reliability and/or validity of the method and /or accuracy of the results.
Conclusion				Acceptable concise conclusion drawn which correctly states how the hypothesis has been supported or refuted.	Conclusion poorly stated. Does not state if the hypothesis was supported or refuted.

Key Points	All six key points addressed either on their own or within the report	At least five of the key points addressed correctly, either on their own or within the report	At least four of the key points addressed correctly, either on their own or within the report	At least three of the key points addressed correctly, either on their own or within the report	Only one or two of the key points addressed correctly, either on their own or within the report
References	Provides an accurate reference list of at least ten sources using the appropriate referencing style including text referencing.	Provides an accurate reference list of 8-9 sources using the appropriate referencing style including text referencing.	Provides an accurate reference list of 5- 8 sources using the appropriate referencing style including text referencing.	Provides an accurate reference list of some(3- 5)sources using the appropriate referencing style.	Provides accurate list of very limited sources 1-3 OR inaccurate reference list provided
Overall Presentation	Report is set out neatly in a clear and logical order with headings and subheadings. Ideas are coherently expressed with correct sentence structure, grammar, and spelling. Sophisticated language used. Correct scientific terminology used. Report is written in past tense, third person.	Report is clearly set out. Ideas are expressed with correct sentence structure. Use of scientific language. Minimal grammatical & spelling errors. Report is written in third person, past tense.	Report is clearly set out. Some grammatical and spelling errors. Sections of report may not be written in past tense, third person.	Report formatting is basic. Basic use of scientific language. Contains grammatical and spelling errors. May not be written in third person/past tense.	Report is poorly set out. Minimal use of scientific language. Contains multiple grammatical and spelling errors. May not be written in past tense, third person.
Teacher Comment					/50

Assessment Criteria		
Grade	Description	Mark Range
Outstanding (O)	The student has an extensive knowledge and understanding of the content and can readily apply this knowledge. In addition, the student has achieved a very high level of competence in the processes and skills and can apply these skills to new situations.	84.5-100%
High (H)	The student has a thorough knowledge and understanding of the content and a high level of competence in the processes and skills. In addition, the student is able to apply this knowledge and these skills to most situations.	69.5-84%
Sound (S)	The student has a sound knowledge and understanding of the content and has achieved a good level of competence in the processes and skills.	49.5- 69%
Basic (B)	The student has a basic knowledge and understanding of the content and has achieved a basic level of competence in the processes and skills	27.5-49%
Limited (L)	The student has an elementary knowledge and understanding in a few areas of the content and still requires further work to achieve competence in the processes and skills.	0-27%

Satisfactory completion of courses

A course has been satisfactorily completed, when the student has:

- Followed the course developed/endorsed by the NSW Educational Standards Authority (NESA)
- Applied himself/herself with diligence and sustained effort to the set tasks and experiences provided in the course.
- Achieved some or all of the course outcomes

