Gymea Technology High School
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Year 9 Science

Task 3: Acid/base Indicators

Due Date: Thursday, 5th September 2024 by 3PM.

Task Distributed: 09/08/24

Unit: Chemistry

Task Type: Student Research Project

Task Weighting: 20%

Outcomes: SC5-4WS, SC5-5WS, SC5-6WS, SC5-7WS, SC5-8WS and SC5-9WS

Task Description

The work of scientists involves planning and carrying out investigations, and then communicating your findings and conclusion.

This investigation will allow you the opportunity to practice working scientifically. You will be required to undertake a task that involves you to plan and perform a well-designed experiment, collecting, presenting, and analysing your results, and drawing appropriate conclusions from your collected data, as well as some background research on your topic. You will also need to include a **logbook** (Can be an A4 sheet with dates from the start of your project) to show the process of how you researched, planned, and collected the results for your project as well as any changes you needed to make along the way.

Background

Acids and bases are groups of compounds found in many common substances, in our bodies and our homes. DNA is an acid and codes for many of our characteristics. Vinegar (Ethanoic acid) and lemon juice (Citric acid) are acids found in the home and used in food production. Bases are the chemical opposite to acids, and when combined with them, they will neutralise them forming a salt and water. Common bases found at home include soaps and Baking soda (Sodium hydrogen carbonate, $NaHCO_3$).

The pH scale gives an indication of how acidic or basic a substance is. The scale is between 0 and 14. On this scale any substance with a pH of below 7 is acidic and any substance with a pH above 7 is basic. A pH of 7 is classified as neutral. When we need to know how acidic or basic a substance is i.e. When maintaining a fish tank or swimming pool, we use a substance called an indicator.

Acid – base indicators are substances that change colour when added to an acid or a base and can be sourced from a range of naturally occurring things including, some flower petals (Petunia, Rose, Hydrangea), turmeric, red cabbage, beetroot, grape juice, cherries, beetroot or blackcurrant juice to name a few.

In this assessment you will need to:

- ***Create a logbook, and keep it updated with what you did each day you worked on the project.***
- ***Research substances that can act as indicators at home.***
- ***Choose one of the substances and make a solution of the natural indicator.***
- ***Plan an investigation to test the effectiveness of your indicator.***
- ***Test your indicator against common foods or soap products found at home.***

Once you have completed your investigation you will need to write a scientific report, including:

- ***Background Research***
- ***Aim***
- ***Equipment (be specific, and make sure you include <u>everything</u> you use!)***
- ***Safety (risk assessment – what were the hazards and how did you manage or minimise them)***
- ***Procedure (method – numbered, brief steps in correct order, each starting with a verb)***
- ***Results (the raw data you collect, and your graph, but you may wish to include some images)***
- ***Discussion (what the results show, problems encountered along the way and how you solved them, as well as how the experiment could be improved if it were to be repeated)***
- ***Conclusion (a brief summary of your findings and what the results prove)***
- ***Bibliography (Following Harvard Referencing format).***

A scaffold for writing a scientific report is available on Google classroom. Make sure you **refer to the supplied marking criteria** to ensure you have included everything needed, and in sufficient depth to score well.

The formatting of this investigation has been designed to mirror that of the major student research project attempted by students in Year 10. This will help to familiarise yourself with what will be expected next year and give you the opportunity to improve your scientific report writing skills, enabling you to produce work of a higher standard.

Harvard referencing is a citation style used by students, writers and researchers to legally incorporate other people's quotes, findings and ideas into their own work to validate their conclusions. It includes formatting rules for in-text citations and listing different types of sources in a reference list. The web addresses below will help generate your references in the correct format.

https://www.citethisforme.com/citation-generator/harvard
https://www.mybib.com/tools/harvard-referencing-generator

NESA Glossary of Key Words

Understand the verb associated with the task. These verbs will provide an understanding of the detail needed to successfully answer the question.

- ☐ DISCUSS: Identify issues and provide points for and/or against
- ☐ EXPLAIN: Relate cause and effect; make the relationships between things evident; provide why and/or how.
- ☐ INVESTIGATE: Plan, inquire into and draw conclusions about
- ☐ https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/hsc-student-guide/glossary-keywords

Details of Submission

You must submit **BOTH** your **logbook** (Diary Entry Booklet / A4 pages) as well as your **FINAL SCIENTIFIC REPORT on Google Classroom**.

Your final report should be **a Google Doc**, approximately **4** to **6 pages** (including ***tables***, ***graphs*** and ***diagrams***). If it is shorter, you should check very carefully that the required depth to score well is there.

Teacher Feedback and Student Self-Reflection

- The task will typically be returned to students within 4 weeks of the due date.
- At this time feedback including information on how to improve will be provided through mechanisms such as marking criteria, and/or written comments.
- Students can clarify or seek further feedback by the speaker with their teacher or the assessment marker.
- You will also receive feedback on your literacy performance based on the criteria in the school's literacy marking rubric. The marks achieved for literacy will account for between 10% – 20% of the maximum task value.

Upon return of the task, students will also be expected to complete a self-reflection.

Students will be required to complete a self-reflection worksheet at the time students receive their assessment mark and teacher feedback. Self-reflection is an important part of the learning process as it provides an opportunity to reflect on the strength of our performance, as well as areas that have been identified to strengthen in future tasks.

How does this link to my learning?

Learning and integrating the basic science process skills together and gradually developing abilities to design fair tests is increasingly emphasised in successive grade levels and is an expectation of students in senior science subjects.

Assessment Procedures

All students should be fully aware of the School Assessment Procedures for their year group. These were provided at the beginning of the school year and are available on the school website under the Learning Tab for each year group.

MARKING CRITERIA:

OUTCOME	*INDICATOR*	**EXPERIENCING DIFFICULTY**	**DEVELOPING**	**COMPETENT**	**OUTSTANDING**	**MARK**
	Research	No evidence of research on project topic	Very brief or simplistic account of researched material	Satisfactory depth of research presented.	>2 paragraphs dedicated to research findings with multiple points	
		0	1	2	3	
	Aim	The stated purpose of the investigation is irrelevant.	The purpose of the investigation is identified but is stated in a somewhat unclear manner.	The purpose of the investigation is clearly identified and stated.		
		0	*1*	*2*		
	Hypothesis	Fails to propose hypothesis	Proposes a hypothesis that is not valid	Proposes a valid hypothesis and justification		
		0	*1*	*2*		
SC5-4WS develops questions or hypotheses to be investigated scientifically **SC5-5WS** produces a plan to investigate identified questions, hypotheses or problems, individually and collaboratively	*Independent variable*	Fails to identify independent variable		Student clearly identifies independent variable		
		0		*1*		
	Dependent variable	Fails to identify dependent variable		Student clearly identifies dependent variable		
		0		*1*		
	Equipment	No equipment list	Equipment list incomplete	Imprecise list of appropriate materials.	Complete, detailed list of appropriate materials	
		0	*0.5*	*1*	*2*	
	Describes a logical procedure to make and test an indicator	Procedures do not accurately list the steps of the experiment	Procedures are listed but are not in a logical order or are difficult to follow.	Procedure is appropriate and is listed in logical order but lacking full detail	Procedure is detailed and is listed in clear, logical and coherent steps.	
		0	*1*	*3*	*5*	
	Validity	Other factors not kept constant	Some factors kept constant during experiment	All effects of other factors minimised		
		0	*1*	*2*		
SC5-6WS undertake first-hand investigations independently with safety & competence	*Identifies and controls safety risks*	*Identifies and controls safety risks*	Includes only critical safety concerns or fails to list management strategies	Addresses most safety concerns and includes plans to minimise safety risks	Comprehensive assessment that includes all predictable risks and management strategies	
		0	*1*	*2*	3	
SC5-6WS gathers first-hand data accurately	*Reliability*	Data not collected	Data was collected once. (i.e. single trial only)	Data was collected twice.	Data was collected more than twice	
		0	*1*	*2*	*3*	
	Accuracy	*Not addressed*	*Includes an attempt to improve accuracy*	*Includes and explains an attempt to improve accuracy*		
		0	*1*	*2*		

SC5-7WS processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions	*Discussion*	No discussion	Discussion is simplistic	Discussion reflects on experiment and decisions that were made.	Discussion evaluates the accuracy, reliability and validity and suggests ways it could be improved.	
		0	*1*	*2*	*4*	
	Conclusion	A conclusion has been suggested which has not been based on the results.	A conclusion has been suggested based on the results.	A conclusion has been suggested based on the aim and results.		
		1	*1.5*	*2*		
	Justifies inferences (linking data to theory in discussion)	Inferences are not justified by the information gathered.	Justifies inferences through available information but inferences are very weak.	Supports and justifies inferences through specific data.		
		0	*1*	*2*		
SC5-9WS presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations						
		Report uses no images or diagrams	Report uses very rough or inappropriate images or diagrams	Report uses relevant images or diagrams	Report uses many relevant images and diagrams	
		0	*0.5*	*1*	*2*	
		No graph	Unsuitable graph used to display results	Graph with minor errors or omissions used	Well formatted and correctly used graph included	
		0	*1*	*2*	3	
	References	*No references included*	*Incorrectly formatted references used*	*Correctly formatted references used*		
		0	*1*	*2*		
	Logbook	*No Logbook*	*Partially completed*	*Several entries covering the length of the project.*		
		0	*1*	*2*		
Literacy (refer to last page)						/5
	Bibliography	Bibliography not submitted	Bibliography submitted but not in Harvard Style	Bibliography submitted in the appropriate format (Harvard Style)	**TOTAL**	/50
		Zero marks	1	*2*		

GTHS Literacy Criteria - V2. 2023

Literacy Outcomes	Elementary achievement You have:	Limited achievement You have:	Satisfactory achievement You have:	High achievement You have:	Outstanding achievement You have:
Vocabulary *Uses technical vocabulary to explain concepts and/or range of precise and appropriate words for effect*	Very limited response. Few content words used.	Only simple words are used.	Some precise and technical words are used.	Sustained use of precise and technical words.	Sustained, consistent and fluent use of precise and technical words.
	0	0.25	0.5	0.75	1
Punctuation *Use of correct and appropriate sentence and other punctuation for effect, and to aid in reading of the text*	No evidence of correct sentence punctuation.	Sentence punctuation is correctly used in at least one place - *one sentence is punctuated correctly.*	Some correct sentence level punctuation (at least 50%). May attempt other punctuation where it is required.	Mostly correct sentence level punctuation (80%) and at least two correct examples of other punctuation.	Writing contains accurate use of all applicable punctuation.
	0	0.25	0.5	0.75	1
Sentences & Cohesion *The intentional construction of a variety of sentences to match purpose and audience, and the control of multiple sentence threads across the whole text.*	No clear evidence of sentences: a list of words OR text fragments.	At least one sentence is used correctly. Some meaning can be construed from the text.	Some correct formation of sentences. Mainly uses simple and compound sentences, but may attempt more complex structures.	Most sentences are correct. Range of sentence types and connectives are evident, but with varied effectiveness.	All sentences are correct, effective and controlled, and include a range of sentence types and connectives (complex sentences and other sophisticated structures)
	0	0.25	0.5	0.75	1
Paragraphs *Paragraphs are used to effectively structure information and partition events and ideas*	No correct use of paragraphing; may be a block of text or random breaks.	Ideas are separated; paragraphs may contain some unrelated ideas.	At least ONE paragraph is well structured and develops an idea	Writing is organised into paragraphs that assist the reader to digest chunks of the text, but may not be linked or executed effectively.	All components of the paragraphs are evident and paragraphing is consistent and well-developed across the whole text.
	0	0.25	0.5	0.75	1
Text Structure *Uses features of the appropriate text type*	No evidence of the structural features of the appropriate text type. *No attempt to write in the appropriate text type and/or response is off task.*	Minimal evidence of the structural features - *1 component evident* - of the appropriate text type.	Some evidence of the structural features - *2 components evident* - of the appropriate text type.	Substantial evidence of the structural features - *all components evident but there may be some lapses* - of the appropriate text type.	Coherent and controlled use of **all** the appropriate structural features of the text type.
	0	0.25	0.5	0.75	1
	Level of response is well below syllabus expectation	Level of response is below syllabus expectation	Level of response is equivalent to syllabus expectation	Level of response is above syllabus expectation	Level of response is well above syllabus expectation