



ORANGE HIGH SCHOOL

ASSESSMENT TASK NOTIFICATION

Subject	Investigating Science
Year	11 (Preliminary HSC)
Weighting	30%
Teacher	J. Boardman, J. Percival and A. Routh
Head Teacher	J. Huggett
Date given	Week 7, Term 1, 2023
Date and school week	Friday 5th May 2023 - Week 2, Term 2

Assessment Outline

PART 1 – Conducting a scientific investigation to gather data

- To complete this task, you are required to perform a scientific investigation to observe and describe the effect of one of the following investigations:
 - a. How does colour affect heating by the absorption of light **OR**
 - b. Fertilisers on algal growth **OR**
 - c. Solubility of saturated solutions
- The practical investigation and data collection will be performed in your own time

PART 2 – Formal investigation report

- Students will then be required to analyse and interpret the data collected from the scientific investigation and present it in the format of a formal written scientific report (see provided scaffold), including a detailed analysis as their discussion (as specified in the scaffold).

Non-completion of Task:

If you know you are going to be away on the day that the task is due, you must make alternative arrangements with your classroom teacher. If you are away on the day of the examination, you must catch up with your classroom teacher on the first day you return to make alternate arrangements to catch up on this task.

Failure to follow the above procedures may result in a zero award.

Outcomes Assessed

- INS11 – 1** Develops and evaluates questions and hypotheses for scientific investigation
- INS11 – 2** Designs and evaluates investigations in order to obtain primary and secondary data and information
- INS11 – 3** Conducts investigations to collect valid and reliable primary and secondary data and information
- INS11 – 5** Analyses and evaluates primary and secondary data and information
- INS11 – 8** Identifies that the collection of primary and secondary data initiates scientific investigations
- INS11 – 9** Examines the use of inferences and generalisations in scientific investigations

Year 11 Investigating Science Assessment Task 1

PRACTICAL FIRST-HAND INVESTIGATION

MODULES 1 & 2: Cause and Effect -

Observing & Inferences and Generalisations

Due Date: Friday 5th May 2023, Week 2, Term 2

Task Overview:

This task contains two parts.

PART 1 – Conducting a scientific investigation to gather data

To complete this task, you are required to perform a scientific investigation to observe and describe the effect of one of the following investigations:

- a. How does colour affect heating by the absorption of light **OR**
- b. Fertilisers on algal growth **OR**
- c. Solubility of saturated solutions

The practical investigation and data collection will be performed in your own time

PART 2 – Formal investigation report

Students will then be required to analyse and interpret the data collected from the scientific investigation and present it in the format of a formal written scientific report (see provided scaffold), including a detailed analysis as their discussion (as specified in the scaffold).

Syllabus Outcomes:

INS11 – 1 Develops and evaluates questions and hypotheses for scientific investigation

INS11 – 2 Designs and evaluates investigations in order to obtain primary and secondary data and information

INS11 – 3 Conducts investigations to collect valid and reliable primary and secondary data and information

INS11 – 5 Analyses and evaluates primary and secondary data and information

INS11 – 8 Identifies that the collection of primary and secondary data initiates scientific investigations

INS11 – 9 Examines the use of inferences and generalisations in scientific investigations

Content:

Students:

1.3.1 Use data gathered to plan a practical investigation to:

- Pose further questions that will be investigated
- Discuss the role of variables
- Determine the independent and dependent variables
- Formulate a hypothesis that links the independent and dependent variables
- Describe at least three variables that should be controlled in order to increase the validity of the investigation

1.3.2 Develop a method to collect primary data for a practical investigation by:

- Describing how to change the independent variable
- Determining the characteristics of the measurements that will form the dependent variable
- Describing how the data will be collected
- Describing how the controlled variables will be made consistent
- Describing how risks can be minimised

1.4.1 Carry out the planned practical investigation, above, to collect primary data

1.4.2 Apply conventions for collecting and recording observations to qualitatively and quantitatively analyse the primary data, including but not limited to:

- Tabulation and Graphing
- Visual and Digital representations

Scientific Report Writing Scaffold:

To write your formal scientific report you must include the following:

Abstract – An abbreviated version of your final report, usually only one paragraph in length. An abstract should have the following five pieces:

- **Introduction.** This is where you describe the purpose of the investigation with reference to background research surrounding the topic being investigated.
- **Problem Statement.** Identify the hypothesis that was investigated.
- **Procedures.** What was your approach for investigating the problem? Don't go into detail about materials unless they were critical to your success. Do describe the most important variables.
- **Results.** What answer did you obtain? Be specific and use numbers to describe your results. Do not use vague terms like "most" or "some."
- **Conclusions.** State what the investigation contributes to the area you worked in. Did you meet your objectives?

Aim – what was the purpose of the investigation?

Literature Review – A literature review is a critical account of what has been published on a topic by accredited researchers. It should provide a clear statement of the topic area (scope), a range of research on the topic, provide an indication of what further research is necessary and identify areas of controversy in the literature. Reviewing the literature requires four stages:

1. Problem formulation - Which topic is being examined and why? What aspects will be included/excluded? Define your scope.
2. Literature search - Identifying relevant research
3. Critical analysis – Criticise the experts; identify conflicting evidence, assumptions, errors and misconceptions
4. Evaluation – which authors are most convincing and provide the most significant scientific contribution? Have I conducted a fair and objective literature review?

Hypothesis - A tentative explanation for an observed phenomenon, expressed as a precise and unambiguous statement that can be supported or refuted by investigation. A hypothesis is based on prior knowledge and clearly identifies how the independent variable will affect the dependent variable.

Equipment list – a detailed list of all equipment used to perform the investigation.

Variables Identified – Correctly identify the variables in the experiment including; independent, dependent and controlled variables. Indicate your control as well (the thing you're comparing to)

Risk Assessment – Students are to conduct a risk assessment of the investigation. At least 3 risks should be included, and three control measures. The risk assessment should be presented as a table. (see below)

Hazard:	Risk:	Control Measure:
Hazard 1		
Hazard 2		
Hazard 3		

Method – As a class we will create a method to conduct the investigation. You must include the method in your report. Your method will need to include any changes that were made to the way the investigation was conducted. It should be in step form, provide clear logical instructions, include how/what equipment is used to collect the data, and include repetition.

Results (table) - first-hand data should be presented in an appropriate table. All tables should be labelled.

Results (graphs) – Make sure that your graphs have appropriate heading, labels on the axis, even scales, and appropriate units. You may draw your graphs using a computer program (excel) or by hand. All graphs should be labelled.

Discussion - This is the section in which you analyse your results. Your discussion should have at least 4 sections.

Section 1: This is the section in which you interpret your results. You should refer directly to the data that was gathered and analyse it using your graph. You should look for trends and discuss why they have occurred. You can link this to your background research to further indicate your understanding of why this trend has occurred.

Section 2: This is the section in which you analyse the accuracy and precision of the data you collected. It is a good idea to give a definition of each term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't accurate or precise. You should also include how you could improve the investigation to increase accuracy and precision.

Section 3: This is the section in which you analyse the reliability of the data you collected. It is a good idea to give a definition of the term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't reliable. You should also include how you could improve the investigation to increase reliability.

Section 4: This is the section in which you analyse the validity of the data you collected. It is a good idea to give a definition of the term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't valid. You should also include how you could improve the investigation to increase validity.

Conclusion – A paragraph summarising the main findings of the investigation. A concluding paragraph should refer to the aim of the investigation and state whether the hypothesis was proven or disproved, and the consequences/implications of this. Your conclusion may identify an area of potential future research based on your investigation. Your conclusion should always be based on evidence and refer directly to evidence from your investigation.

Reference list – This is where you include any references that you used/referred to in your investigation. You should try to use references in your background information section and in your discussion. A good reference style is APA.

Please use a website like the follow to simplify the process:

<https://www.citethisforme.com/>

Appendix/appendices – An appendix is always included in a scientific investigation. An appendix is where you include any calculations (if any) that you made during your investigation, any additional data that you collected, your raw data collected in the investigation (this is where you put your messy table from when you actually conducted the investigation), any additional data manipulation that isn't required in the main results section. You can also include pictures of your investigation set up.

Marking Rubric: Practical first-hand investigation

NAME: _____

Criteria: (mark)	Extensive (A)	Thorough (B)	Sound (C)	Basic (D)	Elementary (E)
1. Title and Aim	<ul style="list-style-type: none"> Sophisticated title given (uses scientific language), detailed scientific aim given, includes the independent and dependent variable <p style="text-align: center;">3 marks</p>		Interesting title given and a scientific aim given, includes either the independent or dependent variable <p style="text-align: center;">2 marks</p>		Simple title given and aim given <p style="text-align: center;">1 mark</p>
2. Abstract	<ul style="list-style-type: none"> The abstract extensively shows an understanding of the investigation, a summary of the method used, key results and a conclusion <p style="text-align: center;">5 marks</p>	The abstract is thorough and has all the required elements but depth is somewhat detail <p style="text-align: center;">4 marks</p>	The abstract is sound and has the basis of a general description of the investigation <p style="text-align: center;">3 marks</p>	The abstract is a basic statement of the investigation or is missing parts and is in general terms <p style="text-align: center;">2 marks</p>	The abstract is simplistic, generally describe the investigation, missing various elements <p style="text-align: center;">1 mark</p>
3. Literature Review	<ul style="list-style-type: none"> Clear explanation of the project. Detailed and sophisticated explanation of the topic area of study. 4 or more relevant pieces of scientific information given. At an extensive level. <p style="text-align: center;">5 marks</p>	Clear explanation of project. Detailed explanation of the topic area of study. 4 relevant pieces of information given. At a thorough level. <p style="text-align: center;">4 marks</p>	Explanation of project given. Explanation of topic area of study. 3 relevant pieces of information given. At a sound level. <p style="text-align: center;">3 marks</p>	Explanation of project. Basic explanation of the topic area. Less than 2 pieces of information given. At a basic level. <p style="text-align: center;">2 marks</p>	Explanation of project given. No scientific information present. At elementary level. <p style="text-align: center;">1 mark</p>
4. Hypothesis	<ul style="list-style-type: none"> Predict what you think will happen. State how the changing the independent variable will affect the dependent variable <p style="text-align: center;">2 marks</p>				Any one of the previous points <p style="text-align: center;">1 mark</p>
5. Variable in the investigation	<ul style="list-style-type: none"> Controlled variables – correct (4 or more) Independent variable – correct Dependent variable – correct Scientific language used At an extensive level. <p style="text-align: center;">5 marks</p>	Any 4 of the previous at thorough level. <p style="text-align: center;">4 marks</p>	Any 3 of the previous at sound level. <p style="text-align: center;">3 marks</p>	Any 2 of the previous at basic level. <p style="text-align: center;">2 marks</p>	Any 1 of the previous at elementary level. <p style="text-align: center;">1 mark</p>
6. Equipment list	<ul style="list-style-type: none"> Sophisticated and completed list of all equipment used <p style="text-align: center;">3 marks</p>		List of most of the equipment used <p style="text-align: center;">2 marks</p>		Simple list of some of the equipment used <p style="text-align: center;">1 mark</p>
7. Risk Assessment	List all safety issues (3 or more) with conducting the investigation Explain how each issue was solved or reduced At an extensive level. <p style="text-align: center;">5 marks</p>	List all safety issues (3 or more) with conducting the investigation Explain how each issue was solved or reduced At a thorough level. <p style="text-align: center;">4 marks</p>	List some safety issues (2) with conducting the investigation Explain how each issue was solved or reduced At a sound level. <p style="text-align: center;">3 marks</p>	List some safety issues (2) with conducting the investigation Attempts to explain how each issue was solved or reduced At a basic level. <p style="text-align: center;">2 marks</p>	List some safety issues (1) with conducting the investigation Attempts to explain how issue was solved or reduced At an elementary level. <p style="text-align: center;">1 mark</p>

<p>8.</p> <p>Method</p>	<ul style="list-style-type: none"> • Clear and logical method in third person • Need to be in correct order, detailed and in numbered steps • Include how the dependent variable will be measured, along with any other variables • Include how many times the experiment will be repeated • Scientific terms used and at an extensive level. No use of “I” or “we”. (past tense) <p>5 marks</p>	<p>Any 4 of the previous at thorough level.</p> <p>No use of “I” or “we”.</p> <p>4 marks</p>	<p>Any 3 of the previous at sound level.</p> <p>3 marks</p>	<p>Any 2 of the previous at basic level.</p> <p>2 marks</p>	<p>Any 1 of the previous at elementary level.</p> <p>1 mark</p>
<p>9.</p> <p>Results - Table</p>	<ul style="list-style-type: none"> • Presented in an appropriate table • Has appropriate headings and correct units • No units present on the data in the table (in heading only) • Averages included and correct • Neatly presented and at an extensive level (is enclosed and has been drawn with ruler). <p>5 marks</p>	<p>Any 4 of the previous at thorough level.</p> <p>4 marks</p>	<p>Any 3 of the previous at sound level.</p> <p>3 marks</p>	<p>Any 2 of the previous at basic level.</p> <p>2 marks</p>	<p>Any 1 of the previous at elementary level.</p> <p>1 mark</p>
<p>10.</p> <p>Results - Graph</p>	<ul style="list-style-type: none"> • Presented in an appropriate graph for the data collected • A line of best fit is correctly present • Axis’ are labelled correctly • Units included on the correct axis’ • Data plotted correctly and at an extensive level (use of x to plot data points). <p>5 marks</p>	<p>Any 4 of the previous at thorough level.</p> <p>4 marks</p>	<p>Any 3 of the previous at sound level.</p> <p>3 marks</p>	<p>Any 2 of the previous at basic level.</p> <p>2 marks</p>	<p>Any 1 of the previous at elementary level.</p> <p>1 mark</p>
<p>11.</p> <p>Discussion – Section 1 (Summary)</p>	<p>An extensive summary of the main findings of the investigation given, including trends. Results are interpreted and specific examples from the data given at an extensive level. Results linked clearly to background research on the topic. Real world applications discussed for the results. Scientific terms used and at an extensive level.</p> <p>5 marks</p>	<p>A thorough summary of the main findings of the investigation given, including trends. Results are interpreted and examples from the data given at a thorough level. Results linked to background research on the topic. Real world applications discussed. Scientific terms used and at a thorough level.</p> <p>4 marks</p>	<p>A sound summary of the findings of the investigation given. Sound interpretation of results. Results linked to background research on the topic. Real world applications identified. Scientific terms used and at a sound level.</p> <p>3 marks</p>	<p>A basic summary of the findings of the investigation given. Attempted interpretation of results. Scientific terms used and at a sound level.</p> <p>2 marks</p>	<p>An elementary summary of the findings of the investigation given. Scientific terms attempted to a basic level.</p> <p>1 mark</p>
<p>12.</p> <p>Discussion – Section 2 (Accuracy)</p>	<p>A judgement about the accuracy of the investigation is given, linked to the investigation. Explanation of what makes the investigation accurate. Specific examples from the investigation to support the assessment of the accuracy of the results given. Scientific terms used and at an extensive level. Explanation of how to improve the accuracy of the investigation extensively given.</p> <p>5 marks</p>	<p>A judgement statement on accuracy given. Explanation of what makes the investigation accurate. An example from the investigation to support the assessment of the accuracy of the results given. Scientific terms used and at a thorough level. Explanation of how to improve the accuracy of the investigation thoroughly given.</p> <p>4 marks</p>	<p>General judgement statement on accuracy given. Explanation of what makes the investigation accurate. Scientific terms used and at a sound level. Identifies how to improve accuracy.</p> <p>3 marks</p>	<p>General judgement statement on accuracy given. Identifies what makes the investigation accurate. Some scientific terms used. Identifies how to improve accuracy.</p> <p>2 marks</p>	<p>General judgement statement on accuracy given. Some scientific terms used.</p> <p>1 mark</p>

<p>13. Discussion – Section 3 (Reliability)</p>	<p>A judgement about the reliability of the investigation is given, linked to the investigation. Explanation of what makes the investigation reliable. Specific examples from the investigation to support the assessment of the reliability of the results given. Scientific terms used and at an extensive level. Explanation of how to improve the reliability of the investigation extensively given.</p> <p style="text-align: center;">5 marks</p>	<p>A judgement statement on reliability given. Explanation of what makes the investigation reliable. An example from the investigation to support the assessment of the reliability of the results given. Scientific terms used and at a thorough level. Explanation of how to improve the reliability of the investigation thoroughly given.</p> <p style="text-align: center;">4 marks</p>	<p>General judgement statement on reliability given. Explanation of what makes the investigation reliable. Scientific terms used and at a sound level. Identifies how to improve reliability.</p> <p style="text-align: center;">3 marks</p>	<p>General judgement statement on reliability given. Identifies what makes the investigation reliable. Some scientific terms used. Identifies how to improve reliability.</p> <p style="text-align: center;">2 marks</p>	<p>General judgement statement on reliability given. Some scientific terms used.</p> <p style="text-align: center;">1 mark</p>
<p>14. Discussion – Section 4 (Validity)</p>	<p>A judgement about the validity of the investigation given, indicating if it was a fair test. Explains if the investigation is valid, including what makes an investigation valid. Explains what variables are controlled and how they were controlled. Problems with the investigation discussed and linked to its validity. Specific examples from the investigation to support the assessment of the validity of the results given and scientific terms used and at an extensive level.</p> <p style="text-align: center;">5 marks</p>	<p>A judgement statement on validity given. Explanation of what makes the investigation valid. An example from the investigation to support the assessment of the validity of the results given. Scientific terms used and at a thorough level. Explanation of how to improve the validity of the investigation thoroughly given.</p> <p style="text-align: center;">4 marks</p>	<p>General judgement statement on validity given. Explanation of what makes the investigation valid. Scientific terms used and at a sound level. Identifies how to improve validity.</p> <p style="text-align: center;">3 marks</p>	<p>General judgement statement on validity given. Identifies what makes the investigation valid. Some scientific terms used. Identifies how to improve validity.</p> <p style="text-align: center;">2 marks</p>	<p>General judgement statement on validity given. Some scientific terms used.</p> <p style="text-align: center;">1 mark</p>
<p>15. Conclusion</p>	<p>Summary statement of the main results from the investigation. Explains how the independent variable affected the dependent variable. Examples given from results. Explains if results support or disprove the hypothesis. Scientific terms used and at an extensive level.</p> <p style="text-align: center;">5 marks</p>	<p>Summary statement of the main results from the investigation. Explains how the independent variable affected the dependent variable. Example given from results. Explains if results support or disprove the hypothesis. Scientific terms used and at a thorough level.</p> <p style="text-align: center;">4 marks</p>	<p>Summary statement of the main results from the investigation. Example given from results. Identifies if results support or disprove the hypothesis. Scientific terms used and at a sound level.</p> <p style="text-align: center;">3 marks</p>	<p>Summary statement of the main results from the investigation. Scientific terms used and at a sound level.</p> <p style="text-align: center;">2 marks</p>	<p>Attempts a summary statement of the results from the investigation.</p> <p style="text-align: center;">1 mark</p>
<p>16. Report – Overall Presentation</p>	<ul style="list-style-type: none"> ● Reference list present and correct (12 or more sources used) ● Minimal spelling, punctuation and grammatical errors (2-3) ● Follows report format extensively <p style="text-align: center;">5 marks</p>	<p>Reference list present, 8 or more sources. 4-7 errors.</p> <p style="text-align: center;">4 marks</p>	<p>Reference list present, 6 or more sources. 8-10 errors.</p> <p style="text-align: center;">3 marks</p>	<p>Reference list present, 3 sources. 11-12 errors.</p> <p style="text-align: center;">2 marks</p>	<p>No Reference list present. More than 13 errors.</p> <p style="text-align: center;">1 mark</p>
<p>17. Appendix</p>	<ul style="list-style-type: none"> ● Appendix supplied and correct raw data included ● Thoroughly labelled <p style="text-align: center;">2 marks</p>			<p>Appendix attempted Raw data included</p> <p style="text-align: center;">1 mark</p>	

Outcomes					
INS11 – 1 (Sections 1,2,3)	INS11 – 2 (Sections 4,5,6,7)	INS11 – 3 (Sections 8,9, 10)	INS11 – 8 & INS11 – 9 (Sections 11, 12, 13, 14)	INS11 – 5 (Sections 15, 16, 17)	
= 13	= 15	= 15	= 20	= 12	
Total = 75					
Total Grade	A 75 – 66	B 65 – 56	C 55 – 20	D 19 – 9	E 8 – 0

Teacher Feedback:
