



# ORANGE HIGH SCHOOL

## ASSESSMENT TASK NOTIFICATION

<b>Subject</b>	Investigating Science
<b>Year</b>	12 (HSC)
<b>Weighting</b>	35%
<b>Teacher</b>	Boardman, Percival and Routh
<b>Head Teacher</b>	Ms Huggett
<b>Date given</b>	December 2023 – Week 10B Term 4
<b>Date and school week</b>	2024 – Week 7B Term 1 (Friday the 15th of March) Must be submitted online on this date, we ask that it is submitted by 3pm to avoid it being submitted late.

### Assessment Outline

#### **PART 1 – Planning and conducting a scientific investigation to gather data**

- To complete this task, you are required to plan and perform a scientific investigation. This can be one of the investigations listed on the next page or one of your own choosing. If you elect to choose your own investigation, you must submit a detailed plan to your classroom teacher for approval.
- The practical investigation will be performed outside of class time individually.

#### **PART 2 – Formal investigation report (6 page limit - not including cover page, reference list and appendix)**

- 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).
- Students will be required to answer a series of questions as part of their analysis (see attached discussion guide sheet).

### 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

- INS12 – 1** Develops and evaluates questions and hypotheses for scientific investigation
- INS12 – 2** Designs and evaluates investigations in order to obtain primary and secondary data and information
- INS12 – 3** Conducts investigations to collect valid and reliable primary and secondary data and information
- INS12 – 5** Analyses and evaluates primary and secondary data and information
- INS12 – 12** Develops and evaluates the process of undertaking scientific investigations

## Year 12 Investigating Science Assessment Task 1

# **PRACTICAL FIRST-HAND INVESTIGATION**

**Weighting: 35%**

## **Topic 5: Scientific Investigations**

**Due Date: Friday 15th of March, 2024 - Week 7 Term 1**

### **Task Overview:**

This task contains two parts.

### **PART 1 – Planning and conducting a scientific investigation to gather data**

To complete this task, you are required to plan and perform a scientific investigation. This can be one of the investigations listed on the next page or one of your own choosing. If you elect to choose your own investigation, you must submit a detailed plan to your classroom teacher for approval.

The practical investigation will be performed outside of class time individually.

### **PART 2 – Formal investigation report (6 page limit - not including cover page, reference list and appendix)**

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). Students will be required to answer a series of questions as part of their analysis (see attached discussion guide sheet).

### **Syllabus Outcomes:**

**INS12 – 1** Develops and evaluates questions and hypotheses for scientific investigation

**INS12 – 2** Designs and evaluates investigations in order to obtain primary and secondary data and information

**INS12 – 3** Conducts investigations to collect valid and reliable primary and secondary data and information

**INS12 – 5** Analyses and evaluates primary and secondary data and information

**INS12 – 12** Develops and evaluates the process of undertaking scientific investigations

### **Content:**

Students:

- Develop a method most appropriate to test a hypothesis following observation
- Justify the type of methodology used to test the hypothesis
- Conduct the planned investigation and collect, record and analyse primary data
- Draw a conclusion or conclusions, and suggest further investigation or research by:
  - analysing the results and interpreting the data
  - explaining the relevance of the findings of the investigation in relation to the inquiry question and hypothesis
- Evaluate the validity of the investigation by determining whether the tests measured what they were intended to measure
- Review a published and peer-reviewed scientific report to determine the conventions of writing a report on a practical investigation
- Prepare a report on the student investigation that was carried out
- Evaluate the design of the student investigation by:
  - explaining the choice of independent, dependent and controlled variables with reference to the research question
  - predicting an achievable time frame to conduct the investigation
  - justifying working individually or collaboratively

**Choose from the following ideas:**

(Please note that these are experiments that you could use as the basis of an experiment. You are expected to change it, make it your own and answer your own inquiry-based question. You should have an independent and dependent variable.)

1. Gregor Mendel's Pea Plant Experiment

<https://www.lovetoknow.com/parenting/kids/gregor-mendels-pea-plant-experiment>

2. Witness the carbon cycle in action

<https://sciencelessonsthatrock.com/carbon-cycle-lab-photosynthesis-and-respiration-html/>

3. Test the effects of disinfectants

<https://www.amybrownsience.com/2012/01/lab-effectiveness-of-antiseptics-and.html>

4. Investigate the efficacy of types of fertilizer

<https://www.education.com/science-fair/article/effect-physical-form-fertilizer-plant/>

5. Measure the calories in various foods

[https://www.sciencebuddies.org/science-fair-projects/project-ideas/FoodSci\\_p012/cooking-food-science/food-calorimeter#summary](https://www.sciencebuddies.org/science-fair-projects/project-ideas/FoodSci_p012/cooking-food-science/food-calorimeter#summary)

## Scientific Report Writing Scaffold:

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

**Abstract** - An abstract summarises, usually in one paragraph of 300 words or less, the major aspects of the entire report in a prescribed sequence that includes (complete this last, once the report is complete):

- 1) The overall purpose of the study and the research problem(s) you investigated;
- 2) The basic design of the study;
- 3) Major findings or trends found as a result of your analysis; and,
- 4) A brief summary of your interpretations and conclusions.

**Aim** – What was the purpose of the investigation?

**Background information** – A paragraph that informs the reader of the science behind the investigation you are undertaking. For example, using the Year 11 investigation (not be used for this task), if you were to conduct an investigation to prove that increasing the amount of water given to a plant would allow the plant to have maximum growth (total height and mass). You would include any information relevant to your investigation in this section, such as the effect of water on plant growth, what nutrients do plants need to grow and how light affects the growth of plants during the process of photosynthesis would have on your investigation, and include any information that would influence your experimental design (method).

**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)

<b>Risk:</b>	<b>Control Measure:</b>
Risk 1	
Risk 2	
Risk 3	

**Method** – Individually create a method to conduct the investigation. You must include the method in your report. 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.

**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 picture of your investigation set up and final products.

## **Discussion question guide sheet**

(use these to support the development of your discussion)

**Section 1:** This is the section in which you interpret your results.

1. What trends can you see in your graphs?
2. Which variable had the highest change (include result)? Why?
3. Which variable had the lowest change (include result)? Why?
4. Describe any links between your results and your background research (This should be at least **TWO** paragraphs, where you connect scientific information to your results).

**Section 2:** This is the section in which you analyse the accuracy and precision of the data you collected.

1. Define the terms accuracy and precision.
2. Describe if your results have a high level of accuracy.
3. Analyse the equipment that you used in this investigation and describe any equipment that you could have used to improve the accuracy of this investigation.
4. Analyse the method/techniques that you used in this investigation and describe how you would improve the method/techniques used.

**Section 3:** This is the section in which you analyse the reliability of the data you collected.

1. Define the term reliability.
2. How many times did you repeat this investigation?
3. Describe if your results have a high level of reliability.
4. Describe how you could improve the reliability of this investigation.

**Section 4:** This is the section in which you analyse the validity of the data you collected.

1. Define the term validity.
2. Does your experimental method actually achieve testing your hypothesis? Discuss.
3. Is your investigation valid? Discuss.
4. How could you improve the overall validity of this investigation?

## Marking Rubric: Practical first-hand investigation

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

Criteria: (mark)	Outstanding (A)	High (B)	Sound (C)	Basic (D)	Limited (E)
1. <b>Title and Aim</b>	<ul style="list-style-type: none"> <li>Sophisticated title given (uses scientific language), detailed scientific aim given, includes the independent and dependent variable</li> </ul> <p style="text-align: center;"><b>3 marks</b></p>		Interesting title given and a scientific aim given, includes either the independent or dependent variable <p style="text-align: center;"><b>2 marks</b></p>		Simple title given and aim given <p style="text-align: center;"><b>1 mark</b></p>
2. <b>Background Information</b>	<ul style="list-style-type: none"> <li>Clear explanation of the project.</li> <li>Detailed and sophisticated explanation of the topic area of study.</li> <li>4 or more relevant pieces of scientific information given. At an extensive level.</li> </ul> <p style="text-align: center;"><b>5 marks</b></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;"><b>4 marks</b></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;"><b>3 marks</b></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;"><b>2 marks</b></p>	Explanation of project given. No scientific information present. At elementary level. <p style="text-align: center;"><b>1 mark</b></p>
3. <b>Hypothesis</b>	<ul style="list-style-type: none"> <li>Predict what you think will happen.</li> <li>State how the changing the independent variable will affect the dependent variable</li> <li><b>If</b> and <b>Then</b> statement could be used (No use of "I" or "we".)</li> </ul> <p style="text-align: center;"><b>3 marks</b></p>		Any two of the previous points <p style="text-align: center;"><b>2 marks</b></p>		Any one of the previous points <p style="text-align: center;"><b>1 mark</b></p>
4. <b>Variable in the investigation</b>	<ul style="list-style-type: none"> <li>Controlled variables – correct (4 or more)</li> <li>Independent variable – correct</li> <li>Dependent variable – correct</li> <li>Scientific language used</li> <li>At an extensive level.</li> </ul> <p style="text-align: center;"><b>5 marks</b></p>	Any 4 of the previous at thorough level. <p style="text-align: center;"><b>4 marks</b></p>	Any 3 of the previous at high level. <p style="text-align: center;"><b>3 marks</b></p>	Any 2 of the previous at basic level. <p style="text-align: center;"><b>2 marks</b></p>	Any 1 of the previous at elementary level. <p style="text-align: center;"><b>1 mark</b></p>
5. <b>Equipment list</b>	<ul style="list-style-type: none"> <li>Sophisticated and completed list of all equipment used</li> </ul> <p style="text-align: center;"><b>3 marks</b></p>		List of most of the equipment used <p style="text-align: center;"><b>2 marks</b></p>		Simple list of some of the equipment used <p style="text-align: center;"><b>1 mark</b></p>
6. <b>Safety</b>	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;"><b>5 marks</b></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;"><b>4 marks</b></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;"><b>3 marks</b></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;"><b>2 marks</b></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;"><b>1 mark</b></p>

<p><b>7.</b></p> <p><b>Method</b></p>	<ul style="list-style-type: none"> <li>• Clear and logical method in third person</li> <li>• Need to be in correct order, detailed and in numbered steps</li> <li>• Include how the dependent variable will be measured, along with any other variables</li> <li>• Include how many times the experiment will be repeated</li> <li>• Scientific terms used and at an extensive level. No use of "I" or "we". (past tense)</li> </ul> <p><b>5 marks</b></p>	<p>Any 4 of the previous at thorough level.</p> <p>No use of "I" or "we".</p> <p><b>4 marks</b></p>	<p>Any 3 of the previous at high level.</p> <p><b>3 marks</b></p>	<p>Any 2 of the previous at basic level.</p> <p><b>2 marks</b></p>	<p>Any 1 of the previous at elementary level.</p> <p><b>1 mark</b></p>
<p><b>8.</b></p> <p><b>Results - Table</b></p>	<ul style="list-style-type: none"> <li>• Presented in an appropriate table</li> <li>• Has appropriate headings and correct units</li> <li>• No units present on the data in the table (in heading only)</li> <li>• Averages included and correct</li> <li>• Neatly presented and at an extensive level (is enclosed and has been drawn with ruler).</li> </ul> <p><b>5 marks</b></p>	<p>Any 4 of the previous at thorough level.</p> <p><b>4 marks</b></p>	<p>Any 3 of the previous at high level.</p> <p><b>3 marks</b></p>	<p>Any 2 of the previous at basic level.</p> <p><b>2 marks</b></p>	<p>Any 1 of the previous at elementary level.</p> <p><b>1 mark</b></p>
<p><b>9.</b></p> <p><b>Results - Graph</b></p>	<ul style="list-style-type: none"> <li>• Presented in an appropriate graph for the data collected</li> <li>• A line of best fit is correctly present</li> <li>• Axis' are labelled correctly</li> <li>• Units included on the correct axis'</li> <li>• Data plotted correctly and at an extensive level (use of x to plot data points).</li> </ul> <p><b>5 marks</b></p>	<p>Any 4 of the previous at thorough level.</p> <p><b>4 marks</b></p>	<p>Any 3 of the previous at high level.</p> <p><b>3 marks</b></p>	<p>Any 2 of the previous at basic level.</p> <p><b>2 marks</b></p>	<p>Any 1 of the previous at elementary level.</p> <p><b>1 mark</b></p>
<p><b>10.</b></p> <p><b>Discussion – Section 1</b></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><b>5 marks</b></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><b>4 marks</b></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><b>3 marks</b></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><b>2 marks</b></p>	<p>An elementary summary of the findings of the investigation given. Scientific terms attempted to a basic level.</p> <p><b>1 mark</b></p>
<p><b>11.</b></p> <p><b>Discussion – Section 2</b></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><b>5 marks</b></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><b>4 marks</b></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><b>3 marks</b></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><b>2 marks</b></p>	<p>General judgement statement on accuracy given. Some scientific terms used.</p> <p><b>1 mark</b></p>



<p><b>12.</b> <b>Discussion – Section 3</b></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;"><b>5 marks</b></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;"><b>4 marks</b></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;"><b>3 marks</b></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;"><b>2 marks</b></p>	<p>General judgement statement on reliability given. Some scientific terms used.</p> <p style="text-align: center;"><b>1 mark</b></p>
<p><b>13.</b> <b>Discussion – Section 4</b></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;"><b>5 marks</b></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;"><b>4 marks</b></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;"><b>3 marks</b></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;"><b>2 marks</b></p>	<p>General judgement statement on validity given. Some scientific terms used.</p> <p style="text-align: center;"><b>1 mark</b></p>
<p><b>14.</b> <b>Conclusion</b></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;"><b>5 marks</b></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;"><b>4 marks</b></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;"><b>3 marks</b></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;"><b>2 marks</b></p>	<p>Attempts a summary statement of the results from the investigation.</p> <p style="text-align: center;"><b>1 mark</b></p>
<p><b>15.</b> <b>Report – Overall Presentation</b></p>	<ul style="list-style-type: none"> <li>● Reference list present and correct (10 or more sources used)</li> <li>● Minimal spelling, punctuation and grammatical errors (2-3)</li> <li>● Within the 6 page limit</li> <li>● Appendix supplied and correct</li> <li>● Follows report format extensively</li> </ul> <p style="text-align: center;"><b>5 marks</b></p>	<p>Reference list present 8 or more sources. 4-7 errors. Within the 6 page limit</p> <p style="text-align: center;"><b>4 marks</b></p>	<p>Reference list present 6 or more sources. 8-10 errors. Within the 6 page limit</p> <p style="text-align: center;"><b>3 marks</b></p>	<p>Reference list present 3 sources. 11-12 errors.</p> <p style="text-align: center;"><b>2 marks</b></p>	<p>No Reference list present. More than 13 errors.</p> <p style="text-align: center;"><b>1 mark</b></p>

<b>Outcomes</b>					
<b>INS12 – 1</b> (Sections 1, 2, 3)	<b>INS12 – 2</b> (Sections 4, 5, 6, 7)	<b>INS12 – 3</b> (Sections 8, 9)	<b>INS12 – 5</b> (Sections 10, 11, 15)	<b>INS12 – 12</b> (Sections 12, 13, 14)	
= 11	= 18	= 10	= 15	=	= 15
<b>Total = 69</b>					
<b>Total Grade</b>	<b>A</b> 69 – 60	<b>B</b> 59 – 50	<b>C</b> 49 – 20	<b>D</b> 19 – 9	<b>E</b> 8 – 0

**Feedback**

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