



Year 11 Physics

Task 1: Kinematics Depth Study

Due Date: Week 9A, Term 1, Friday 26th March 2026

Task Distributed: Monday 23rd February 2026 **Unit:** Module 1 - Kinematics

Task Type: Depth Study **Task Weighting:** 30%

Outcomes: PH11/12-1, PH11/12-2, PH11/12-3, PH11/12-4, PH11/12-5, PH11/12-6, PH11/12-7, PH11-8

Task Description

Galileo published the book "*Discorsi E Dimonstrazioni Matematiche intorno a due nuoue scienze*" in 1638. This translates to "The discourses and mathematical demonstrations relating to two new sciences".

The two new sciences being:

1. the strength of materials
2. the motion of objects

Galileo presents the demonstrations and discussions in a mixture of Latin and Italian, which was unique for the day. He uses three characters to discuss the questions he poses and wishes to answer in the book.

One of the key questions Galileo poses is "how do objects fall"? To answer this question his characters describe the construction of a **large ramp**, which can have its angle of elevation easily adjusted. They describe a very smooth bronze ball that can be rolled repeatedly down the ramp a known distance as well as a **water clock** which could be used to determine the time the ball takes to traverse the known distance.

The characters were able to describe clearly how to use this setup to systematically analyse the motion of the ball for various angles. Galileo was thus able to posit his **law of falling bodies**, which stated that **all objects fall with a constant acceleration**.

Your task is to construct and utilise Galileo's ramp and water clock apparatus to confirm his law of falling bodies.

Details of Submission

The following items are to be submitted:

A typed scientific report, using correct scientific format by **3PM on Friday 26th March 2026**.

The report must be submitted on or before **Friday 26th March 2026** in the following ways:

1. A **hard copy** to your classroom teacher (by 3PM).

AND

2. As an electronic copy on Moodle.

NESA Glossary of Key Words

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

- **Calculate:** Ascertain/determine from the given facts, figures or information.
- **Explain:** Relate cause and effect; make the relationships between things evident; provide the why and/or how.
- **Analyse:** Identify components and the relationship between them; draw out and relate implications.

Check the NESA Glossary of Key Words for further guidance.

Teacher Feedback and Student Self-reflection

- The task will typically be returned within 14 days 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 speaking with their teacher or the assessment marker.
- Students will also receive feedback on their literacy performance based on the criteria in the schools literacy marking rubric. The marks achieved for literacy will account for between 10%-20% of the maximum task value.

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

Assessment Procedures

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

Task Outline

Part A: Planning

A plan of how you are going to structure your research, experiment and report is due at the **beginning of the second week** of the depth study to discuss with your teacher. It should follow the following scaffold:

- Background research (provide references).
- Aim
- Hypothesis
- Identify any independent, dependent and control variables
- Risk Assessment
- Equipment
- Procedure

Not all dot points need to be complete, but you should be able to show some progress and be able to articulate how you will address each point.

Part B: Conducting

Involves the collection of **valid** and **reliable** data. This data should be collected in class time. You will need to explicitly record both **qualitative** and **quantitative** data. You will also need to be explicit with how you will ensure the collection of accurate and reliable data.

Part C: Analysing

Once all data has been gathered and all experimentation conducted, you will need to analyse and evaluate the data gathered. The following (non-exhaustive) list will need to be addressed:

- Description of how reliability is addressed.
- Description of how validity is addressed.
- Explain trends in the data through statistical analysis and the use of appropriate graphs.
- Discussion of how your collected data relates to kinematics.

Part D: Problem Solving

During the conducting of experiments you will likely need to solve various problems, which will require you to use critical thinking skills and the scientific method. You will then need to address the following:

- Identifies problems encountered and discusses how these problems were overcome.
- Links primary and secondary data to make future predictions and suggest future improvements.
- Draws appropriate conclusions consistent with the collected data.

Part E: Communicating

- Use of scientific language/terminology.
- Presentation of the depth study including formatting.
- Selection and use of suitable forms of digital, visual and written communication at a level appropriate to the targeted audience (the scientific community).
- Use of **labelled** images/diagrams (need to be referenced).
- References from a variety of sources (Harvard referencing).

Part A: Planning

Criterion	Descriptors	Marks
Background Research	<p>0 — No background research provided.</p> <p>1 — Minimal research; few relevant facts with little context.</p> <p>2 — Some relevant background; limited sources.</p> <p>3 — Adequate background covering Galileo’s experiment and kinematics; sources listed.</p> <p>4 — Thorough, well-explained background linking historical experiment to modern physics; multiple Harvard-formatted references.</p>	/4
Aim	<p>0 — No aim stated.</p> <p>1 — Aim attempted but vague or incomplete.</p> <p>2 — Clear, concise aim that specifically states the purpose of the experiment.</p>	/2
Hypothesis	<p>0 — No hypothesis stated.</p> <p>1 — Hypothesis attempted but not testable or scientifically justified.</p> <p>2 — Testable hypothesis with scientific reasoning linking to Galileo’s law of falling bodies.</p>	/2
Variables	<p>0 — No variables identified.</p> <p>1 — One or two variables identified with minimal explanation.</p> <p>2 — Independent, dependent, and at least two control variables correctly identified.</p> <p>3 — All variable types clearly identified with thorough justification for controls.</p>	/3
Risk Assessment	<p>0 — No risk assessment provided.</p> <p>1 — One or two hazards identified with limited controls.</p> <p>2 — Multiple hazards with appropriate risk ratings and practical control measures.</p>	/2
Equipment List	<p>0 — No equipment list provided.</p> <p>1 — List present but incomplete or missing quantities/specifications.</p> <p>2 — Complete, specific list with appropriate quantities and units.</p>	/2
Procedure	<p>0 — No procedure provided.</p> <p>1 — Basic steps present but insufficient to replicate the experiment.</p> <p>2 — Mostly complete; some steps unclear or missing.</p> <p>3 — Detailed, logical, step-by-step procedure that could be independently replicated; references control of variables.</p>	/3
Part A Subtotal		/18

Part B: Conducting

Criterion	Descriptors	Marks
Quantitative Data	0 — No quantitative data recorded. 1 — Some numerical data recorded but poorly organised or missing units. 2 — Data recorded in a structured table with units; multiple trials present. 3 — Comprehensive data in well-formatted tables; sufficient trials for reliability; units and uncertainties included.	/3
Qualitative Data	0 — No qualitative observations recorded. 1 — Some observations noted; limited detail. 2 — Clear, relevant, detailed qualitative observations directly linked to the experiment.	/2
Reliability & Validity	0 — No attempt to address reliability or validity. 1 — Limited mention of how reliability or validity was addressed. 2 — Explicit description of how reliability (repeated trials) and validity (controlled variables) were ensured.	/2
Part B Subtotal		/7

Part C: Analysing

Criterion	Descriptors	Marks
Statistical Analysis	0 — No statistical analysis performed. 1 — Basic calculations present (e.g. averages) but incomplete or with errors. 2 — Appropriate measures calculated (e.g. mean, range, percentage error) with correct working. 3 — Thorough analysis including uncertainty calculations and significant figures; working clearly shown.	/3
Graphs	0 — No graphs produced. 1 — Graph(s) present but incorrect type, poorly labelled, or missing key features. 2 — Appropriate graph(s) with labelled axes, units, and line of best fit. 3 — Well-constructed graph(s); axes fully labelled; best-fit line used to determine acceleration; graph referenced in discussion.	/3
Link to Kinematics	0 — No connection to kinematics concepts. 1 — Superficial reference to kinematics without explanation. 2 — Data discussed with reference to relevant kinematic equations (e.g. $s = ut + \frac{1}{2}at^2$). 3 — Thorough analysis explicitly linking data to kinematic theory; acceleration calculated and compared to expected values with error analysis.	/3
Part C Subtotal		/9

Part D: Problem Solving

Criterion	Descriptors	Marks
Problems Identified & Resolved	<p>0 — No problems identified or discussed.</p> <p>1 — At least one problem identified but resolution is vague.</p> <p>2 — Multiple problems identified with clear descriptions of how each was overcome.</p> <p>3 — Thorough identification of challenges with detailed, logical solutions; demonstrates application of the scientific method.</p>	/3
Predictions & Improvements	<p>0 — No predictions or improvements suggested.</p> <p>1 — A general suggestion made but not linked to evidence.</p> <p>2 — Evidence-based predictions made and/or specific, practical improvements linking primary and secondary data.</p>	/2
Conclusion	<p>0 — No conclusion provided.</p> <p>1 — Conclusion attempted but does not relate to the hypothesis or data.</p> <p>2 — Conclusion addresses the hypothesis and refers to data; some discussion of limitations.</p> <p>3 — Clear, evidence-based conclusion directly addressing the hypothesis; quantitative results referenced; limitations and sources of error discussed.</p>	/3
Part D Subtotal		/8

Part E: Communicating

Criterion	Descriptors	Marks
Scientific Language	<p>0 — No use of scientific language; terminology absent or incorrect.</p> <p>1 — Some scientific terms used but inconsistently or incorrectly.</p> <p>2 — Scientific language used consistently and correctly throughout.</p>	/2
Report Format	<p>0 — No recognisable scientific structure.</p> <p>1 — Some sections present but structure is incomplete or inconsistent.</p> <p>2 — Follows standard scientific format (title, introduction, method, results, discussion, conclusion, references); neat and legible.</p>	/2
Diagrams & Images	<p>0 — No diagrams or images included.</p> <p>1 — Diagrams or images included but unlabelled or unreferenced.</p> <p>2 — Labelled, relevant diagrams that enhance understanding; all images sourced and referenced.</p>	/2
References	<p>0 — No references provided.</p> <p>1 — References listed but not in Harvard format or from a single source type only.</p> <p>2 — Variety of source types correctly formatted in Harvard style throughout.</p>	/2
Part E Subtotal		/8

Part	Mark
Part A: Planning	/18
Part B: Conducting	/7
Part C: Analysing	/9
Part D: Problem Solving	/8
Part E: Communicating	/8
Total	/50