Gymea Technology High School

Year 12, Physics

Task 1: Depth Study

Due Date: Week 9, Term 4, Monday 8th December 2025

Task Distributed: Monday 13th October **Unit**: Module 5: Advanced Mechanics **Task**

Type: Depth Study (Research) **Task Weighting**: 30%

Outcomes: PHY11/12-1, PHY11/12-3, PHY11/12-4, PHY11/12-5, PHY11/12-6, PHY11/12-7, PH12-12

Task Description

This assessment addresses the syllabus requirement for students to complete a Depth Study. A depth study is any type of investigation that allows the student to gain knowledge in an area of their individual interest. It includes secondary-source research, data analysis and a written report.

Kinematics plays a vital role in society regarding transport, exploration, security, and leisure. Understanding how the motion of objects works allows us to create efficient and effective solutions to solve many issues. These solutions must be evaluated to ensure the solution is viable and that all workings with function as intended. However, for entertainment purposes some laws of Physics are not followed in different media.

During this depth study you will answer the inquiry question: "*Is kinematics correctly used in media?*" You will analyse motion in film and develop a report describing the motion involved, how it works/does not work, and evaluating the motion. You will also construct a report on the use of circular motion in a recent scientific discovery. This will be done in three parts:

1. A partly guided discussion on the accuracy of the movie "True Lies" regarding a scene involving projectile motion. The clip will be shown, and students will be instructed on how various measurements can be made. Students will analyse a similar scene from a movie of their own choosing for comparison (subject to teacher approval). Students will then write a 1–
   3-page report, including a mathematical analysis, to determine the accuracy of the film.
2. Students, using a movie of their own choice (subject to teacher approval), will write a 1–3-page analysis of a scene involving circular motion and/or simulated gravity in the film. This will again require a mathematical analysis and evaluation of the scene's accuracy.
3. Students will research the use of circular motion in a recent scientific discovery. Three possible examples include:
   a. James Webb telescope orbit.
   b. Genzel and Ghez and the discovery of the supermassive black hole.
   c. Vera Rubin and Kent Ford and the evidence for dark matter based on galaxy rotational speeds.

These three are examples only and students are encouraged to explore and choose their own.

Students will write a 1–3-page report that summarises the discovery with explicit analysis of how circular motion was involved.

Your report should also include a reference list formatted according to school guidelines (Harvard style referencing).

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 given facts, figures or information
- **Explain**: Relate cause and effect; make the relationships between things evident; provide 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 https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/hsc-student-guide/glossary-keywords

Details of Submission

As per NESA requirements, the depth study will be conducted during class time in your Physics lessons (15 hours) and at home. During these lessons, a logbook must be used (either electronic or hardcopy) to log all the work you cover during these lessons, regardless of whether all the information is used in your final report.

The report and logbook must be submitted on or before the due date in one of the following ways:

- A hard copy to your class teacher or,
- As an electronic copy on a thumb drive on or before the due date or,
- Email your work to your class teacher or,
- Upload your task online

Teacher Feedback and Student Self-Reflection

- The task will typically be returned to students 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.
- 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.

At the time students receive their assessment mark and teacher feedback, students 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 our performance, as well as areas that have been identified to strengthen in future tasks.

How does this link to my learning?

Student's knowledge, skills and understanding in the following modules will be assessed within this skills assessment task:

- Module 5: Advanced Mechanics

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 off the school website under the Learning Tab for each year group.

Appendix

Class checklist

Date/Period	Section/Area of Depth Study Completed	Teacher Check

Marking Guidelines

Outcome/Indicator	Experiencing Difficulty	Developing	Competent	Outstanding	Mark
Mark	**0**	**1**	**2**	**3**	
Projectile Motion **PH:** **12-12** **11/12-1** **11/12-3** **11/12-4** **11/12-5** **11/12-6** **11/12-7**	No qualitative analysis present.	Qualitative analysis is present but may be weak or not relevant to the background information.	Qualitative analysis is mostly correct with some mistakes. Some usage of technical terms/scientific language.	Accurately and concisely analyses the motion in the scene with high-level use of technical terms/scientific language	
	No qualitative analysis present.	Quantitative analysis is present but may be weak or not relevant to the background information	Quantitative analysis is mostly correct with some mistakes. Some usage of technical terms/scientific language.	Accurately and concisely analyses the motion in the scene with high-level use of technical terms/scientific language	
	No evidence of wider reading in conducting the analysis	Includes incomplete data and information	Some evidence of research into how scene was filmed, and any effects used.	Strong evidence of much wider reading in conducting investigation with wide range of reliable sources	

	No comparison to other media	Includes a basic qualitative comparison to other media	A qualitative and quantitative comparison included with some errors.	Strong qualitative and quantitative comparison with no errors included	
	No diagram included.	Basic/incorrect diagram included	Correctly labelled diagram included	NA	
Circular Motion **PH:** **12-12** **11/12-1** **11/12-3** **11/12-4** **11/12-5** **11/12-6** **11/12-7**	No qualitative analysis present.	Qualitative analysis is present but may be weak or not relevant to the background information.	Qualitative analysis is mostly correct with some mistakes. Some usage of technical terms/scientific language.	Accurately and concisely analyses the motion in the scene with high-level use of technical terms/scientific language.	
	No quantitative analysis present.	Quantitative analysis is present but may be weak or not relevant to the background information.	Quantitative analysis is mostly correct with some mistakes. Some usage of technical	Accurately and concisely analyses the motion in the scene with high-level use of technical terms/scientific	

			terms/scientific language.	language.	
	No evidence of wider reading in conducting the analysis	Includes incomplete data and information.	Some evidence of research into how scene was filmed and any effects used.	Strong evidence of much wider reading in conducting investigation with wide range of reliable sources.	
	No diagram or illustrations included.	Basic/incorrect diagram or illustration included	Correctly labelled diagram or illustration included.	NA	
Recent Discovery PH: **12-12** **11/12-1** **11/12-3** **11/12-4** **11/12-5** **11/12-6** **11/12-7**	No qualitative analysis included.	Qualitative analysis is present but may be weak or not relevant to the background information.	Qualitative analysis is mostly correct with some mistakes. Some usage of technical terms/scientific language.	Accurately and concisely analyses the motion in the scene with high-level use of technical terms/scientific language.	
	No quantitative analysis included.	Quantitative analysis is present but may be weak or not relevant to the background information.	Quantitative analysis is mostly correct with some mistakes. Some usage of	Accurately and concisely analyses the motion in the scene with high-level use of technical	

			technical terms/scientific language.	terms/scientific language.	
	No evidence of wider reading.	Includes incomplete data and information.	Some evidence of research into how scene was filmed, and any effects used.	Strong evidence of much wider reading in conducting investigation with wide range of reliable sources.	
	No description of the discovery and application of the data is attempted.	Description of discovery and application is attempted but may be weak or incomplete.	There is clear, concise and extensive description of discovery and the application of data.	NA	
	No discussion of significance to scientific community.	Some discussion about significance of discovery.	There is an evaluation of the discovery, including benefits, limitations, and costs but some may be covered insufficiently.	Strong evaluation with well-chosen benefits, limitations and cost analysis of discovery. Evaluation includes insight into future applications or implications of discovery.	
	No diagram or illustrations included.	Basic/incorrect diagram or illustration included	Correctly labelled diagram or illustration included.	NA	
Conclusion **PH:** **12-12** **11/12-1**	There are no statements to link back to the answer to the inquiry question.	There are some statements that link back to the answer to the inquiry question.	There is a conclusion that provides some answer to the inquiry question, making some	There is an insightful conclusion that provides a meaningful answer to the inquiry question, distilling key	

11/12-3 **11/12-4** **11/12-5** **11/12-6** **11/12-7**			reference to information from prior sections.	information from prior sections.	
	There are no statements about the importance and future of kinematics in real-world applications.	There are some statements about the importance of kinematics.	Provides a good statement of the importance of kinematics with reference to examples.	Includes a strong statement about the importance and future implications of kinematics with strong references to real world-examples.	

Communication and referencing (across whole report) **PH:** **11/12-3** **11/12-7**	Report is very brief with sections missing and with incorrect information.	Report is brief AND/OR difficult to read. Sections miss key information or contain incorrect information.	Uses appropriate language on the whole for a specific audience and displays good written communication but it does contain areas that are unclear or hard to understand.	Uses appropriate language proficiently for a specific audience and displays very high quality written communication which is clear and concise.	
	Most of the report is grammatic ally incorrect.	Spelling, grammar, and formatting have many errors.	Spelling, grammar, and formatting of report is to a good standard but contains some errors.	Spelling, grammar, and formatting of report is to a very high standard and adds to clarity of writing. There are very minor or no errors.	
Referencing	No reference list.	The reference list is missing or contains many mistakes and missing.	There is a reference list that contains all sources used in text. The sources are referenced with a few mistakes and inconsistencies.	There is a reference list that contains all sources used in text. The sources are consistently and correctly referenced with minor or no mistakes.	
	No discussion.	There is some discussion of how the inquiry question has been evaluated, revised or modified after initial research and evaluation. But it may be brief or flawed.	There is a discussion of how the inquiry question has been evaluated, revised, or modified after initial research and evaluation.	There is strong evidence of how the inquiry question has been thoughtfully evaluated, revised or modified after initial research and evaluation.	
	No evaluation of secondary sources.	There are some comments as to the relevance OR accuracy OR validity OR reliability of secondary sources. This may be weak.	There is an evaluation of secondary sources including relevance, accuracy, validity and reliability. Some aspects may be missing.	There is a very well developed evaluation of secondary sources for relevance, accuracy, validity and reliability.	

Total: /