PHYSCON 2023

Small Group Discussion Support Material

These are examples of how the supplied templates could be completed. These and the templates done as part of the Small Group Discussion Session, will enable you to design assessment tasks for use in 2024. The examples cover all of the four types of Assessment Tasks. All of the Areas of Study have an example. There are eight examples in total. Your critique of these examples is welcome.

Example of a Small Discussion Report

Assessment Task A: application of physics concepts to explain a model, theory, device, design or innovation

Unit: 3, Outcome: 2

Contexts	Assessment Criteria	Task components
Maglev train, Voltmeter, Ammeter, Motors (Series, Shunt and Compound), Loudspeaker, Mass spectrometer, Velocity selector, Dielectric elastomer (Electrical energy to mechanical work), Electric field sensor, Magnetometer, Pulsed electric field (food preservation)	i) What does it do? (Physics terms and their Accurate use) ii) How does it work? (Explanation, Coherence and Completeness) <u>High level of achievement</u> i) sound knowledge and precise description ii) shows deep understanding, successfully collates and analyses relevant information, constructs a logical, thorough of a device. <u>Minimum level of achievement</u> i) little knowledge and limited relevance ii) shows poor understanding, some sense of structure, but incomplete coverage of information and concepts.	Students select or are allocated a device. They use a log-book in class to research it, which can be retained in class. Then with their log-books under SAC conditions: • Describe the purpose of your chosen device, • Explain its operation using relevant physics concepts, units and typical values for quantities, • Hand-draw a labelled diagram to support the explanation, • Acknowledge references.

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Example of a Small Discussion Report

Assessment Task B: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions.

Unit: 3, Outcome: 3. Two versions: One with secondary data, another with primary data.

<table>
<tr><th>Contexts</th><th colspan="2">Assessment Criteria</th><th>Task components</th></tr>
<tr><td rowspan="2">Induced emf in a coil. (Using secondary data)</td><td>High Level of achievement</td><td>Low level of achievement</td><td rowspan="2">Investigate the magnitude of the emf produced in a solenoid when dropping a permanent magnet through it. Vary the initial height or strength of the falling magnet.
• Identify the purpose of the task.
• Explain the theory underpinning the investigation.
• Select appropriate data and organise it in a meaningful way.
• Interpret the data and relate this to the purpose of the task.
• Comment on any limitations of the data.</td></tr>
<tr><td>• Able to explain the purpose of the investigation.
• Able to interpret the data provided.
• Able to do appropriate calculations.
• systematically collated data, appropriate to the investigation.
• organised and presented data in useful and meaningful ways, including tables and graphs.
• Able to analyse the information from the graph.
• Able to evaluate the data and draw relevant inferences.
• Identifies data limitations.
• used appropriate numbers of significant figures throughout.</td><td>• Can identify the purpose of the investigation.
• Can identify the data that is relevant.
• Able to do some of the calculation and manipulation of the data.
• Limited attempt to collate data
• Attempts to construct a graphical representation of the data.
• Limited attempt to analyse the data.
• Attempted to present data in a meaningful way.
• Occasionally used appropriate numbers of significant figures</td></tr>
</table>

<table>
<tr><th rowspan="2">Contexts</th><th colspan="2">Assessment Criteria</th><th rowspan="2">Task components</th></tr>
<tr><th>High Level of achievement</th><th>Low level of achievement</th></tr>
<tr><td>Induced emf in a coil. (Using primary data)</td><td>
• Able to explain the purpose of the investigation.
• Able to collect all appropriate data over a suitable range of values.
• Able to interpret the data collected.
• Able to do appropriate calculations.
• Organised and presented data in useful and meaningful ways, including tables and graphs.
• Able to analyse the information from the graph.
• Able to evaluate the data and draw relevant inferences.
• Identified data limitations.
• Used appropriate numbers of significant figures throughout.</td><td>
• Can identify the purpose of the investigation.
• Able to collect some appropriate data.
• Can identify the data that is relevant.
• Able to do some of the calculation and manipulation of the data.
• Attempts to construct a graphical representation of the data.
• Limited attempt to analyse the data.
• Attempted to present data in a meaningful way.
• Occasionally used appropriate numbers of significant figures.</td><td>Investigate the magnitude of the emf produced in a solenoid when dropping a permanent magnet through it. Vary the initial height or strength of the falling magnet.
• Identify the purpose of the task.
• Explain the theory underpinning the investigation.
• Design an experiment in order to produce data to address the purpose of the task.
• Organise it in a meaningful way.
• Interpret the data and relate this to the purpose of the task.
• Comment on any limitations of the data.</td></tr>
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Example of a Small Discussion Report

Assessment Task C: problem-solving, applying physics concepts and skills to real-world contexts

Unit: 3, Outcome: 1

Contexts	Assessment Criteria		Task components
	High level of achievement	**Minimum level of achievement**	
Luna Park rides	• Able to explain the sources of the forces on the passenger, their effect and why any may vary. • Able to draw a force diagram. • Able to calculate the value of the forces, given speed and radius. • Able to convert energy changes between GPE and KE at different parts of the rides. • Can identify the driving mechanism in a ride. • Successfully collates and analyses relevant information, concepts and data to analyse and evaluate this real-world context.	• Can describe the experience using physics terms. • Can identify the forces involved acting on the passenger. • Can describe the energy changes.	• Draw a properly labelled force diagram for the Twin Dragon, Enterprise and Scenic Railway. • Calculate the value of relevant quantities, making reasonable estimates of the values of various parameters and dimensions. • Explain the changes in GPE and KE of and the forces on a passenger during each ride. • Identify potential risks and suggest safety protocols.

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Example of a Small Discussion Report

Assessment Task C: problem-solving, applying physics concepts and skills to real-world contexts.

Unit: **4**, **Outcome: 1**

Contexts	Assessment Criteria		Task components
	High Level of achievement	**Low level of achievement**	
Cosmic ray showers	• Able to explain the limitation of classical physics in explaining this phenomenon. • Able to explain that time dilation (or length contraction) occurs for the particles. • Able to correctly apply mathematical models for time dilation (or length contraction) to the particles. • Can justify why more particles are detected than predicted by classical physics. • Consistently used appropriate physics terminology, representations, and conventions • used clear, coherent and concise expression to communicate.	• Can identify the limitation of classical physics in explaining this phenomenon. • Can identify that time dilation (or length contraction) occurs. • Attempts to apply mathematical models for time dilation (or length contraction), but with limited success. • Attempts to compare classical prediction with experiment results. • Attempted to use appropriate physics terminology. • Occasionally used clear expression to communicate.	Investigate the observational evidence for the special theory of relativity. • Describe both the 'classical and relativistic' physics interpretations of this phenomena. • Identify key differences between the two. • Model the distance travelled by the particles in both a 'classical and relativistic' scenarios. • Explain the real world findings.

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Example of a Small Discussion Report

Assessment Task D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.

Unit: 3, Outcome: 1

Contexts	Assessment Criteria		Task Components
	High Level of achievement	**Minimum level of achievement**	
Travelling by vehicle around a corner – banked versus non-banked solutions	• Correctly apply physics of circular motion to differentiate between the two cases • Able to quantitatively compare the two cases • Able to justify the use of banking and any relevant constraints • Consistently use appropriate terminology and effective representations of physical concepts. • Select key data and information to compare the two solutions. • Successfully apply evidence based argument to analyse and evaluate the two solutions.	• Identify appropriate formulae for modelling the two situations • Indicate the direction of overall force on a cornering vehicle • Identify that friction between the tyres and the road enables the car to turn • Identify that a banked road enables a car to turn with less reliance on friction than a non-banked road, for the same cornering speed. • Label basic elements of diagrams representing the two solutions • Identify relevant information needed to compare the two solutions. • Attempt to use the information to compare the two solutions	• Describe each method of cornering, including using labelled diagrams identifying forces involved and direction of motion • Compare relative sizes of relevant forces • Model effect of speed on the requirements of road surface and wheels • Evaluate benefits of each method • Comment on limitations of each solution • Identify key design parameters in the solution to this problem

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Example of a Small Discussion Report

Assessment Task D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.

Unit: **3**, **Outcome: 2**

Contexts	Assessment Criteria		Task Components
	High Level of achievement	Minimum level of achievement	
Some objects are attracted to each other: electrical versus gravitational explanations	• Correctly apply physics of electric and gravitational fields to differentiate between the two cases • Able to quantitatively compare the two cases • Able to give examples of where electrical and gravitational attractions are used to accelerate objects • Consistently use appropriate terminology and effective representations of physical concepts. • Select key data and information to compare the two solutions. • Successfully apply evidence based argument to analyse and evaluate the two solutions.	• Can draw the gravitational field around a point mass and the direction of force experienced by a mass placed in the field. • Can draw the electric field around a point charge and the direction of force experienced by a charge of opposite sign placed in the field • Can describe how the strength of the attraction depends on the amount of mass and charge. • Identify relevant information needed to compare the two solutions. • Attempt to use the information to compare the two solutions	• Describe the features of attraction between two masses • Describe the features of attraction between two charged particles • Compare form and relative sizes of relevant forces • Comment on the range of conditions when electrical attraction dominates gravitational attraction and vice versa • Identify key differences between electrical and gravitational interactions • Explore examples of the use of electrical and gravitational attraction to accelerate objects

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Example of a Small Discussion Report

Assessment Task D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.

Unit: 3, Outcome: 3

Contexts	Assessment Criteria		Task Components
	High Level of achievement	**Minimum level of achievement**	
Some appliances require DC power: compare production of DC using a generator versus PV cells	• Correctly apply physics of induction to quantitatively model the power produced by a DC generator • Able to quantitatively compare the a DC generator with a PV array • Able to quantitatively and qualitatively justify use of a particular solution for a given scenario • Consistently use appropriate terminology and effective representations of physical concepts. • Select key data and information to compare the two solutions. • Successfully apply evidence based argument to analyse and evaluate the two solutions.	• Can relate power output to product of voltage and current output • Can describe how a generator produces a potential difference • Can relate the strength of the potential difference to properties of the generator such as rotational speed and magnetic field strength. • Label basic elements of a diagram representing the two solutions • Identify relevant information needed to compare the two solutions. • Attempt to use the information to compare the two solutions	• Describe the features of DC power produced by PV cells – current and voltage • Describe the features of DC power produced by DC generator – current and voltage • Compare form and relative sizes of typical currents and voltages • Investigate examples of application of each solution • Justify use of particular type of DC power supply for a given scenario eg measurement of the magnetic field around a current carrying wire