Erindale College

UNIT OUTLINE

Mathematics, Science & Information Technology Academy

Science

SEMESTER 1 2020

Course Title	**Physics integrating Australian Curriculum**	**Course Code**	2172
Semester Unit	Unit 1: Linear Motion and Waves	**Unit Code/Value**	21368/1.0
Term Units	Unit 1a: Linear Motion and Waves Unit 1b: Linear Motion and Waves	**Unit Code/Value**	21444/0.5 21445/0.5

Specific Unit Goals

This unit should enable students to:

- understand that Newton's Laws of Motion describe the relationship between the forces acting on an object and its motion
- understand that waves transfer energy and that a wave model can be used to explain the behaviour of sound and light
- understand how scientific models and theories have developed and are applied to improve existing, and develop new, technologies
- use science inquiry skills to design, conduct and analyse safe and effective investigations into linear motion and wave phenomena, and to communicate methods and findings
- use algebraic and graphical representations to calculate, analyse and predict measurable quantities associated with linear and wave motion
- evaluate, with reference to evidence, claims about motion, sound and light-related phenomena and associated technologies
- communicate physics understanding using qualitative and quantitative representations in appropriate modes and genres.

Content

Science Inquiry Skills

- Identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
- Design investigations, including the procedure to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
- Conduct investigations, including the manipulation of devices to measure motion and the direction of light rays, safely, competently and methodically for the collection of valid and reliable data
- Represent data in meaningful and useful ways, including using appropriate SI units and symbols; organise and analyse data to identify trends, patterns and relationships; identify sources of random and systematic error and estimate their effect on measurement results; identify anomalous data and calculate the measurement discrepancy between the experimental results and a currently accepted value, expressed as a percentage; and select, synthesise and use evidence to make and justify conclusions
- Interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments
- Select, construct and use appropriate representations, including text and graphic representations of empirical and theoretical relationships, vector diagrams, free body/force diagrams, wave diagrams and ray diagrams, to communicate conceptual understanding, solve problems and make predictions
- Select, use and interpret appropriate mathematical representations, including linear and non-linear graphs and algebraic relationships representing physical systems, to solve problems and make predictions

- Communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports

Science as a Human Endeavour

- Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility
- Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines
- Advances in science understanding in one field can influence other areas of science, technology and engineering
- The use of scientific knowledge is influenced by social, economic, cultural and ethical considerations
- The use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences
- Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions
- Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability

Science Understanding

- Uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration
- Representations, including graphs and vectors, and/or equations of motion, can be used qualitatively and quantitatively to describe and predict linear motion
- Vertical motion is analysed by assuming the acceleration due to gravity is constant near Earth's surface
- Newton's Three Laws of Motion describe the relationship between the force or forces acting on an object, modelled as a point mass, and the motion of the object due to the application of the force or forces
- Momentum is a property of moving objects; it is conserved in a closed system and may be transferred from one object to another when a force acts over a time interval
- Energy is conserved in isolated systems and is transferred from one object to another when a force is applied over a distance; this causes work to be done and changes to kinetic and/or potential energy of objects
- Collisions may be elastic and inelastic; kinetic energy is conserved in elastic collisions
- Waves are periodic oscillations that transfer energy from one point to another
- Longitudinal and transverse waves are distinguished by the relationship between the direction of oscillation relative to the direction of the wave velocity
- Waves may be represented by time and displacement wave diagrams and described in terms of relationships between measurable quantities, including period, amplitude, wavelength, frequency and velocity
- Mechanical waves transfer energy through a medium; mechanical waves may oscillate the medium or oscillate the pressure within the medium
- The mechanical wave model can be used to explain phenomena related to reflection and refraction (for example, echoes, seismic phenomena)
- The superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings
- A mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred efficiently into systems under these conditions
- Light exhibits many wave properties; however, it cannot be modelled as a mechanical wave because it can travel through a vacuum
- A ray model of light may be used to describe reflection, refraction and image formation from lenses and mirrors
- A wave model explains a wide range of light-related phenomena including reflection, refraction, total internal reflection, dispersion, diffraction and interference; a transverse wave model is required to explain polarisation
- The speed of light is finite and many orders of magnitude greater than the speed of mechanical waves (for example, sound and water waves); its intensity decreases in an inverse square relationship with distance from a point source

Science Unit Grade Descriptors for T courses

	A student who achieves an **A** grade typically	A student who achieves a **B** grade typically	A student who achieves a **C** grade typically	A student who achieves a **D** grade typically	A student who achieves an **E** grade typically
Knowledge and Understanding	• demonstrates thorough and extensive knowledge and understanding of scientific concepts • justifies and applies knowledge to familiar and unfamiliar contexts and across different concept areas and experiences, displays originality and lateral thinking in problem solving	• demonstrates broad and in-depth knowledge and understanding of scientific concepts • applies knowledge to familiar and unfamiliar contexts and across different concept areas and experiences, displaying originality and effective thinking in problem solving	• demonstrates broad and general knowledge and understanding of scientific concepts • is able to apply knowledge in a variety of contexts and different concept areas to solve problems	• demonstrates general and basic knowledge and understanding of scientific concepts • is able to use knowledge in different areas to solve problems	• demonstrates a limited knowledge of scientific concepts • displays emerging awareness of strategies to solve problems
Critical Thinking	• evaluates, synthesises and analyses patterns and trends in data, observations and investigations and makes valid and perceptive inferences • applies highly effective analytical and evaluative skills, makes perceptive connections between scientific concepts, draws accurate conclusions and proposes appropriate improvements	• analyses and synthesises patterns and trends in data, observations and investigations and makes valid inferences • applies effective analytical skills, makes insightful connections between scientific concepts, draws mostly accurate conclusions and proposes appropriate improvements	• describes and explains patterns and trends in data, observations and investigations and makes general inferences • describes and explains general connections between scientific concepts, draws conclusions and proposes improvements	• identifies and describes patterns in data, observations and investigations and makes simple inferences • describes connections between scientific concepts, draws conclusions and proposes improvements	• identifies patterns in data, observations and investigations • identifies connections between scientific concepts
Investigative Skills	• demonstrates logical and coherent investigations, acknowledges information using referencing conventions and operates equipment highly effectively and safely	• demonstrates well considered investigations, acknowledges information using referencing conventions and operates equipment effectively and safely	• demonstrates considered investigations, acknowledges information using referencing conventions and operates equipment safely with some general effectiveness	• outlines investigations, inconsistently acknowledges information using referencing conventions and mostly operates equipment effectively and safely	• displays emerging skills in investigations, attempts to acknowledge information and operates equipment with limited awareness of safety procedures
Communication	• presents highly complex concepts accurately and coherently in a wide range of written and non written formats using appropriate terminology with flair	• presents concepts clearly and logically in a range of written and non written formats using appropriate terminology with confidence	• presents general concepts clearly in a range of written and non written formats using appropriate terminology generally using terminology appropriately	• presents basic concepts in a narrow range of written and non written formats using terminology inconsistently	• presents some basic concepts in a limited range of written & non written formats using minimal terminology
Work practices	• organises time and resources to work in a highly productive and safe manner both independently and in a team • evaluates and analyses risks, acts highly appropriately in all investigations	• organises time and resources to work in a productive and safe manner both independently and in a team • analyses and explains risks and acts appropriately in all investigations	• organises time and resources to work in a generally productive and safe manner both independently and in a team • identifies and describes risks and acts appropriately in all investigations	• demonstrates inconsistent organisation of time & resources, works with occasional productivity & some awareness of safety independently or in a group • identifies risks and acts mostly appropriately in investigations	• demonstrates limited organisation of time & resources to work with an emerging awareness of safety • demonstrates an emerging awareness of risks, developing approaches to investigations

ASSESSMENT

TASK	DUE DATE	WEIGHTING
Assignment 1	**Week 6**	**20 %**
Test 1	**Week 8**	**30 %**
Assignment 2	**Week 14**	**20 %**
Test 2	**Week 18**	**30 %**

Specific Entry & Exit Requirements for Term Units
This is a Semester Unit.

POLICIES AND PROCEDURES
All students are encouraged to read and understand the full policies and procedures available from the BSSS website http://www.bsss.act.edu.au/__data/assets/pdf_file/0010/313777/PandPManual_2015_Version_19.pdf. The following items are of particular relevance to many students.

ATTENDANCE AND PARTICIPATION
Students are expected to submit all assessment items and attend all classes, participate in a positive manner and seek support whenever it is required. Excursions, simulations and presentations by visitors (including lunchtime) may form part of class work. It is your responsibility to catch up on missed work when absent from class.

Any student whose attendance falls below the 90% of the scheduled classes/contact time and has not provided substantial documentary evidence to cover the absence will be awarded a V grade. This means that 4 unexplained absences in a term or 8 unexplained absences in a semester could mean that a V grade may be awarded. However, the Principal has the right to exercise discretion in special circumstances if satisfactory documentation is supplied.

LATE SUBMISSION OF WORK
Students are encouraged to submit work on time as it is a valuable organisational skill. Students are also encouraged to complete work even if it is late, as there are educational benefits in doing so.

Late work will receive a penalty of 5% (of possible marks) per calendar day late, unless an extension is granted by the class teacher prior to the deadline. This means that 5% is taken off the possible marks that could have been achieved eg. If a student achieved a score of 75/100, and the item is one day late, then five marks (5% of 100) would be taken from 75, which leaves the score as 70/100. 'Per calendar day late' means each day late whether it be a weekend or public holiday. Items due on any date must be submitted to the class teacher, faculty staff room, or front office at the college by 3.30pm on that day. After 3.30pm, the item will attract the late penalty. Submission of work on a weekend or public holiday is not acceptable. If you do not submit your work to your class teacher, make sure that it is signed and dated by either another member of staff in the faculty staffroom, or a member of the front office staff.

After 7 days, late work will be awarded the Notional Zero. Calculation of a Notional Zero is based on genuine scores, (items submitted on time or with an extension). The Notional Zero will be a score that lies between 0.1 of the standard deviation below the lowest genuine score for that item and zero. If the lowest genuine score is zero, then the notional score is zero.

No work will be accepted after marked work has been returned, or accepted after the unit has completed. Computer and/or printer failure will not be accepted as a valid reason for late work. Make sure you backup, keep hard copies and rough notes.

Unless prior approval is granted, any student who fails to submit assessment tasks worth in total 70% or more of the assessment for the unit will be considered to be unassessable and will receive a V grade. The Principal

has the right to exercise discretion in the application of the late penalty in special circumstances where satisfactory documentation is supplied.

CHEATING AND DISHONEST PRACTICE

The integrity of the College's assessment system relies upon all involved acting in accordance with the highest standards of honesty and fairness. Any departure from such standards will be viewed very seriously. Accordingly:

- Plagiarism - claiming authorship of someone else's work (intentionally or otherwise) - is a serious misdemeanour, and attracts severe penalties.
- Students are required to acknowledge the source of all material that is incorporated into their own work.
- Students may not submit the same item for assessment in more than one unit, unless specific agreement has been reached with the class teacher.

MODERATION

Throughout the semester, moderation in the form of common marking schemes, cross marking and joint marking occurs across all units in the Moderation Group to ensure comparability of standards. Moderation is a process whereby student's work is compared so that student performance can be graded fairly and consistently. Moderation takes some time, and so students may not receive their work back until ACT wide moderation of grades across all colleges has occurred. Small Group Moderation is carried out in courses with small class sizes.

UNIT SCORES

- Raw scores are calculated by adding Z scores according to the weightings in the assessment table.
- All raw unit scores are then combined into two rank order lists, one for each cohort Year 11 and 12. Each list is reviewed by the Executive Teachers concerned to identify any anomalies.
- Each of the rank order lists is then standardised for each semester using historical parameters or back scaling.

RIGHT TO APPEAL

You can appeal against your assessment if you feel that the result you obtained is not fair. You should first talk to your class teacher, and if you are not satisfied with the explanation you must discuss the situation with the Executive Teacher of the faculty concerned. If you still do not feel that your result is fair you should talk to the Deputy Principal Programs for further advice on the 'appeal process'.

Executive Teacher: Ruth Edge **Date 11/02/2020**

Class Teacher: Ruth Edge