

MATHEMATICS, SCIENCE AND IT ACADEMY

Term 1 2019

Course Title	Physics <i>integrating Australian Curriculum and Cambridge International</i>	Course Code	2172
Semester Unit	Unit 5a: Materials and Wave Applications	Unit Code, Value	21678, 0.5

GOALS

The specific goals of this unit are for students to:

- recall the SI base quantity amount of substance and its unit (mol)
- understand that the Avogadro constant N_A is the number of atoms in 0.012 kg of carbon-12 and use molar quantities where one mole of any substance is the amount containing a number of particles equal to the Avogadro constant N_A
- use techniques for the measurement of length, volume, angle, mass, time, temperature and electrical quantities appropriate to the ranges of magnitude implied by the relevant parts of the syllabus. In particular, candidates should be able to:
 - measure lengths using calipers and micrometers, and measure time intervals using the calibrated time-base of a cathode-ray oscilloscope (c.r.o.)
 - use a calibrated Hall probe
- apply the principle of conservation of momentum to solve simple problems, including elastic and inelastic interactions between bodies in two dimensions (knowledge of the concept of coefficient of restitution is not required)
- recognise that, for a perfectly elastic collision, the relative speed of approach is equal to the relative speed of separation
- define and apply the moment of a force
- understand that a couple is a pair of forces that tends to produce rotation only and define and apply the torque of a couple
- state and apply the principle of moments and understand that, when there is no resultant force and no resultant torque, a system is in equilibrium
- define and use density and pressure
- use the equation $\Delta p = \rho g \Delta h$ and derive it from the definitions of pressure and density
- calculate the work done in a number of situations including the work done by a gas that is expanding against a constant external pressure: $W = p\Delta V$
- appreciate that deformation is caused by a force and that, in one dimension, the deformation can be tensile or compressive
- describe the behaviour of springs in terms of load, extension, elastic limit, Hooke's law and the spring constant (i.e. force per unit extension)
- define and use the terms stress, strain and the Young modulus, and describe an experiment to determine the Young modulus of a metal in the form of a wire

- distinguish between elastic and plastic deformation of a material
- understand that the area under the force-extension graph represents the work done and deduce the strain energy in a deformed material from the area under the force-extension graph
- recall and solve problems using the equation of state for an ideal gas expressed as $pV = nRT$, where n = amount of substance (number of moles)
- infer from a Brownian motion experiment the evidence for the movement of molecules and state the basic assumptions of the kinetic theory of gases
- explain how molecular movement causes the pressure exerted by a gas and hence deduce the relationship $pV = \frac{1}{3} Nm \langle c^2 \rangle$, where N = number of molecules. [A simple model considering one-dimensional collisions and then extending to three dimensions using $\frac{1}{3} \langle c^2 \rangle = \langle c_x^2 \rangle$ is sufficient.]
- recall that the Boltzmann constant k is given by the expression $k = \frac{R}{N_A}$
- compare $pV = \frac{1}{3} Nm \langle c^2 \rangle$ with $pV = NkT$ and hence deduce that the average translational kinetic energy of a molecule is proportional to T

CONTENT SUMMARY

Further elaboration on the content of this unit is available at:

<https://www.cambridgeinternational.org/programmes-and-qualifications/cambridge-international-as-and-a-level-physics-9702/>

COST OF MATERIALS

There are no costs associated with this unit of study.

ASSESSMENT

TASK	DUE DATE	WEIGHTING
Practical Assignment	Week 5	40%
Test	Week 9	60%

Specific Entry & Exit Requirements for Term Units

This is a term unit.

ASSESSMENT CRITERIA FOR ASSESSMENT AND REPORTING OF STUDENT ACHIEVEMENT

Students will be assessed on the degree to which they demonstrate:

- knowledge and understanding
- critical thinking
- investigative skills
- communication skills
- effective work practices.

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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> demonstrates general and basic knowledge and understanding of scientific concepts is able to use knowledge in different areas to solve problems 	<ul style="list-style-type: none"> demonstrates a limited knowledge of scientific concepts displays emerging awareness of strategies to solve problems
Critical Thinking	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> identifies and describes patterns in data, observations and investigations and makes simple inferences describes connections between scientific concepts, draws conclusions and proposes improvements 	<ul style="list-style-type: none"> identifies patterns in data, observations and investigations identifies connections between scientific concepts
Investigative Skills	<ul style="list-style-type: none"> demonstrates logical and coherent investigations, acknowledges information using referencing conventions and operates equipment highly effectively and safely 	<ul style="list-style-type: none"> demonstrates well considered investigations, acknowledges information using referencing conventions and operates equipment effectively and safely 	<ul style="list-style-type: none"> demonstrates considered investigations, acknowledges information using referencing conventions and operates equipment safely with some general effectiveness 	<ul style="list-style-type: none"> outlines investigations, inconsistently acknowledges information using referencing conventions and mostly operates equipment effectively and safely 	<ul style="list-style-type: none"> displays emerging skills in investigations, attempts to acknowledge information and operates equipment with limited awareness of safety procedures
Communication	<ul style="list-style-type: none"> presents highly complex concepts accurately and coherently in a wide range of written and non written formats using appropriate terminology with flair 	<ul style="list-style-type: none"> presents concepts clearly and logically in a range of written and non written formats using appropriate terminology with confidence 	<ul style="list-style-type: none"> presents general concepts clearly in a range of written and non written formats using appropriate terminology generally using terminology appropriately 	<ul style="list-style-type: none"> presents basic concepts in a narrow range of written and non written formats using terminology inconsistently 	<ul style="list-style-type: none"> presents some basic concepts in a limited range of written & non written formats using minimal terminology
Work practices	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> demonstrates limited organisation of time & resources to work with an emerging awareness of safety demonstrates an emerging awareness of risks, developing approaches to investigations

Teachers will consider, when allocating grades, the degree to which students demonstrate their ability to complete and submit tasks within a specified time frame.

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 classwork. 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.

Achievement in Accredited Courses is reported to the Board of Senior Secondary Studies and students with a Grade A-E. Late work submitted without approval will have an impact on the grade awarded to a student.

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.

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

Class Teacher: James Hall

Date: February, 2019