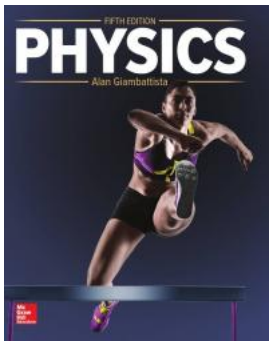
Study Guide: SLE123 Physics for the Life Sciences (2020)

Contents

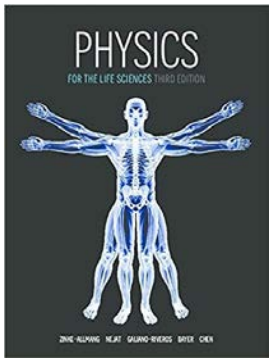
Prescribed textbook



Unless otherwise indicated, all references are those from the prescribed textbook:

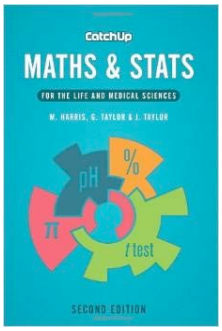
- A. Giambattista, B. M. Richardson and R. C. Richardson, *Physics*, 5th ed, McGraw-Hill, New York, 2018.

Recommended reference book



- M. Zinke-Allmang, R. Nejat, E. Galiano-Riveros, J. Bayer and M. X. Chen, *Physics for the Life Sciences*, 3rd Ed, Nelson, Toronto (ON), 2017.

Recommended reference book



Some of you might already own the SLE115 textbook, which is a recommended reference book for SLE123:

- M. Harris, G. Taylor and J. Taylor, *Catch Up Maths & Stats: For the life and medical sciences*, 2nd Ed, Scion Publishing, Banbury (UK), 2013.

How to study SLE123

The online quizzes and Seminars are designed to give you feedback on your study. Grand Master Jack Rozinszky (footnote [a]) advises

> Practice makes perfect;
> bad practice makes perfectly bad.

"Practice, practice, practice" is not the way to go, because it might be bad practice. **Good practice is guided practice**.

> Practice does **not** make perfect;
> practice makes permanent.

Poor practice (revision) will just reinforce bad habits and make it even harder to fix misunderstandings.

Psychologist Dr K. Anders Ericsson is one of the world's leading authorities on practice. His research shows that the real key is not the *amount* of practice (revision) required but the *type* of practice (revision) required. In other words, just practicing (revising or studying) any old way doesn't cut it. Therefore, it is very important that you should use the feedback from the quizzes and Seminars to guide your revision, and to correct mistakes and misunderstandings. The aim is not to study more, but to spread out your study, and to study more effectively.

[a] Grand Master Jack Rozinszky (9th Dan Black Belt; World Taekwondo Hall of Fame Inductee) is the highest-ranked Australian Taekwondo Grand Master.

Suggested study plan

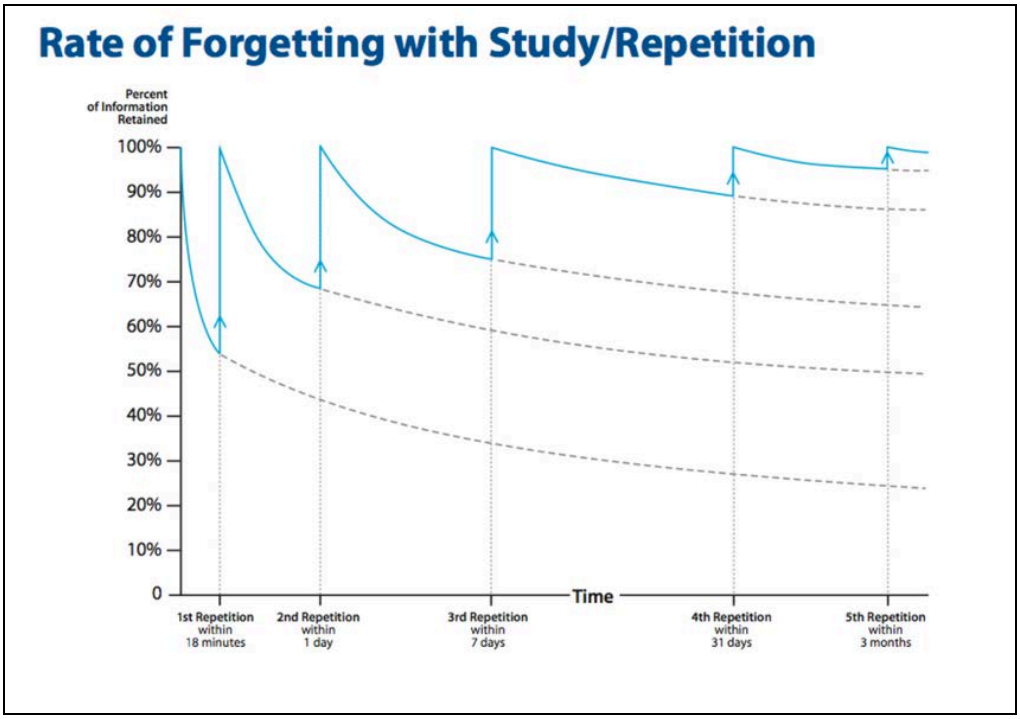
Week 01	• Study Week 01 lecture content	• Quiz 01, attempt 1 • Contact Video Demonstration team members	Seminar 01 revises some prerequisite knowledge
Week 02	• Study Week 02 lecture content • Revise previous week's content	• Quiz 02, attempt 1 • Quiz 01, attempt 2 • Discuss Video Demonstration with team	Seminar 02 revises Week 01 content
Week 03	• Study Week 03 lecture content • Revise previous weeks' content	• Quiz 03, attempt 1 • Quiz 02, attempt 2 • Quiz 01, attempt 3 • Contact Unit Chair about inactive team members	Seminar 03 revises Week 02 content
Week 04	• Study Week 04 lecture content • Revise previous weeks' content	• Quiz 04, attempt 1 • Quiz 03, attempt 2 • Quiz 02, attempt 3	Seminar 04 revises Week 03 content
Week 05	• Study Week 05 lecture content • Revise previous weeks' content	• Quiz 05, attempt 1 • Quiz 04, attempt 2 • Quiz 03, attempt 3	Seminar 05 revises Week 04 content
Intra-trimester break. Non-teaching week. No classes			
Week 06	• Study Week 06 lecture content • Revise previous weeks' content	• Quiz 06, attempt 1 • Quiz 05, attempt 2 • Quiz 04, attempt 3	Seminar 06 revises Week 05 content
Week 07	• Study Week 07 lecture content • Revise previous weeks' content	• Quiz 07, attempt 1 • Quiz 06, attempt 2 • Quiz 05, attempt 3	Seminar 07 revises Week 06 content
Week 08	• Study Week 08 lecture content • Revise previous weeks' content	• Quiz 08, attempt 1 • Quiz 07, attempt 2 • Quiz 06, attempt 3	Seminar 08 revises Week 07 content
Week 09	• Study Week 09 lecture content • Revise previous weeks' content	• Experimental Demonstration Task • Quiz 09, attempt 1 • Quiz 08, attempt 2 • Quiz 07, attempt 3	Seminar 09 revises Week 08 content
Week 10	• Study Week 10 lecture content • Revise previous weeks' content	• Quiz 10, attempt 1 • Quiz 09, attempt 2 • Quiz 08, attempt 3	Seminar 10 revises Week 09 content
Week 11	• Lectures revise unit content • Revise previous weeks' content	• Quiz 10, attempt 2 • Quiz 09, attempt 3	Seminar 11 revises Week 10 content
Study and exam weeks	• Revise unit content	• Quiz 10, attempt 3	

Strategies for more effective study

1. Duration

Keep study sessions limited to a duration that allows you to stay focused. This varies from person to person, but is probably around 45-60 minutes, perhaps as short as 30-45 minutes.

A number of frequent, short study sessions works better than a single long delayed session. German psychologist Hermann Ebbinghaus developed the forgetting curve, which shows how information is lost quickly over time if there is no strategy or effort to retain it.



The rate of forgetting is minimised if you interact (re-read/discuss/write/engage) with your notes within 24 hours. A second repetition for a shorter period of time within a day brings recall back up to 100%. A third repetition within a week for an even shorter time brings recall back to 100%.

2. Timing

Keep track of times during the day when you tend to have the most energy. This may be first thing in the morning, or right before lunch, etc. Try to do your study during these naturally productive periods, as these are the times at which you will be able to focus and think most clearly.

3. Goals

Try using a study notebook. Keep track of your study goals and what you discover during your study sessions. The key to getting into the “zone” when studying is to be constantly striving to have clarity of intention.

When you figure something out, write it down.

If you are constantly stuck on some aspect, write down what you do not understand. This will enable to ask better questions in the Seminars and in consultation sessions.

4. Smarter, not harder

Sometimes if a particular concept is not coming out the way we want it to, it might mean we need to study more. There are also times, however, when we don't need to practice harder, but need an altogether different strategy or technique.

Instead of stubbornly keeping at a strategy or technique that doesn't work for you, you should stop studying this concept altogether. Try to brainstorm different approaches to the problem for a day or so, and write down ideas to try. If that doesn't help, then ask your lecturer after class or during consultations.

5. Problem-solving model

Consider this 6-step general problem-solving model summarized.

- Define the problem (what do I want to do or do I want to find out or do I want to learn?)
- Analyse the problem (what do I already know?)
- Identify potential solutions or approaches (what concepts or approaches or relationships might link what I already know to what I want to achieve?)
- Test the potential solutions to select the most effective one (which potential approach(es) or idea(s) might work best?)
- Implement the best solution. Or if the "best" approach or idea does not seem to work, perhaps try the "second best" approach or idea. Remember, if you are constantly stuck on some aspect, then: stop; think about it; ask classmates on the DeakinSync SLE123 discussion spaces; talk to your lecturer.
- Monitor implementation (which approach or idea works best for me in which situations?)

6. Take notes in longhand using a pen

Taking notes on laptops rather than in longhand is increasingly common, but research in educational psychology has shown that **writing is better for learning** (footnote [b]). Taking notes on laptops usually results in more notes; writing is slower, so you will do more thinking as you summarise and condense what you write. This active learning strategy results in better learning. It is a case of taking notes smarter, not more.

---

[b] Pam A. Mueller, and Daniel M. Oppenheimer (2014), The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking, *Psychological Science*, Vol. **25**(6), pp 1159-1168.

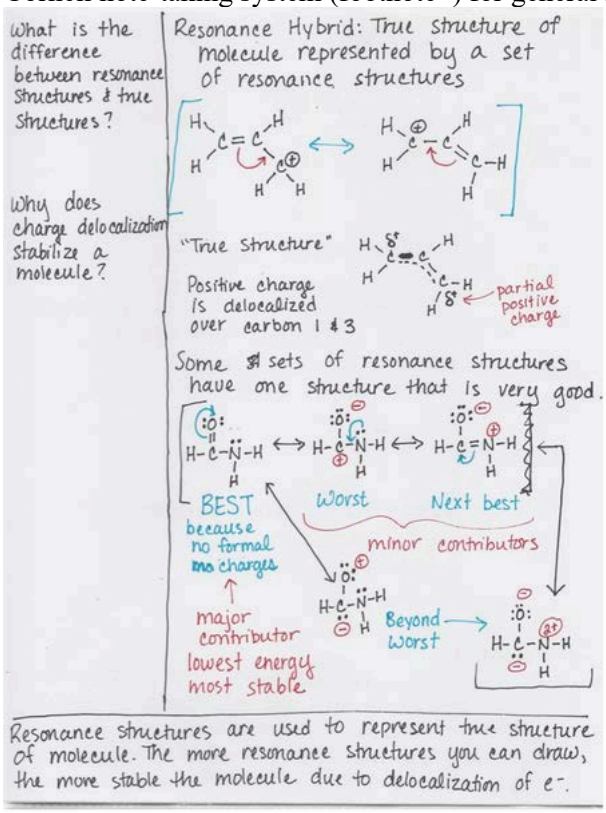
It is suggested that you use the following formats for taking notes:

- Four-column format for new terminology. Divide the page into four columns.

Word or phrase	Everyday meaning	Chemistry meaning	Citation
Nucleus	Central part or thing. Biology - membrane-enclosed organelle found in eukaryotic cell.	Positively charged centre of the atom consisting of protons and neutrons	Blackman textbook, page 1135.

  - Column 1 is for the new words or phrases.
  - Column 2 is for the common everyday meaning. Column 2 should also be used if the word or phrase has a specific meaning in a different subject.
  - Column 3 is for the meaning of the word or phrase in the context of this subject (chemistry). Try to look for the similarities between the common everyday meaning and the chemistry meaning.
  - Column 4 is for citations of where you found the meaning(s) of the word or phrase. This will be important for revision.

- Cornell note-taking system (footnote [c]) for general lecture notes.



It is not how the page is formatted that is critical; the most important part is the **use** of the templates to **review the notes as soon as possible after class**.

7. Numerical calculations are a key part of this unit

Understanding concepts are the most important part of this unit. Numerical calculations are an important part of physics, and a key part of this unit. If you are

[c] Claire Brown (2015), What's the best, most effective way to take notes?; *The Conversation*, 22 May 2015 <https://theconversation.com/whats-the-best-most-effective-way-to-take-notes-41961>.; The Cornell Note-taking System, Cornell University <http://lsc.cornell.edu/notes.html>; Cornell Notes, James Madison University <http://coe.jmu.edu/learningtoolbox/cornellnotes.html>.

less confident about your numerical skills, you should seek help from the **Math Mentoring program** on your campus.

Use the weekly online quizzes for feedback and guidance

This unit is designed to be studied on a 3-week rolling cycle:

Week 1	Study Week 1 content	1st attempt of Quiz 1
Week 2	Study Week 2 content Revise Week 1 content	1st attempt of Quiz 2 2nd attempt of Quiz 1
Week 3	Study Week 3 content Use 1st attempt of Quiz 2 to ask questions online and in seminar; Revise Week 2 content Revise earlier weeks' content	1st attempt of Quiz 3 2nd attempt of Quiz 2 3rd attempt of Quiz 1
Week 4	Study Week 4 content Use 1st attempt of Quiz 3 to ask questions online and in seminar; Revise Week 3 content Revise earlier weeks' content	1st attempt of Quiz 4 2nd attempt of Quiz 3 3rd attempt of Quiz 2

In any general week:

Study content of current week Use 1st attempt of Quiz for previous week to ask questions online and in seminar; Revise content of previous week Revise earlier weeks' content	1st attempt of Quiz for current week 2nd attempt of Quiz for previous week 3rd attempt of Quiz from 2 weeks ago

Experimental Demonstration Task

The Experimental Demonstration Task is intended to be done remotely using electronic communication technology. This assessment task consists of three parts:

1. You will design, conduct and record (video) a physics experiment. The **recording** must be between 3 and 4 minutes in duration and demonstrate the application of physics principle(s) to life science. This is a group task.
2. A **short report** answering a number of questions. This is a group task.
3. **Peer assessment** of how your team worked as a team. This is an individual task.

The task will be done in groups of 3-4.

Part 1: The video

The video must have:

1. An introduction - introducing your team (on camera) and the experiment you will perform.
2. An explanation of the physics principle(s) used in the experiment. The principle(s) must be related to SLE123.
3. An explanation on how the chosen experiment links to biology.
4. An overview of the safety precautions taken to perform the experiment.
5. A demonstration of the experiment in action and the results / outcome of the experiment. The demonstration should clearly show one or more of the students doing the experiment.


Note!

IMPORTANT: Your video/experiment needs to be safely performed - if in doubt please contact the Unit Chair to confirm. You might think about things like lab coats, goggles, shoes, hair ties, clearing space around the experiment, etc. Use common sense as well as science lab safety knowledge.


Note!

IMPORTANT: Your video/experiment must ***NOT*** feature animals, unaware members of the public, explosives, the consumption of alcohol, cigarettes, illicit substances, prohibited weapons, controlled weapons, nor dangerous articles (note [d]). For other things, if you are in doubt about your experiment / video then ask the Unit Chair as soon as you can.

The recording must be between 3 and 4 minutes in duration.

Part 2: The report

The report must give short answers to the following questions:

1. What is the claim or conclusion in your Experimental Demonstration?

[d] Dangerous Articles are ordinary objects which are carried or modified with the intent to be used for violence. This can include things that are otherwise lawful, everyday tools, household items, sports equipment, etc.

- A claim is a statement of a student's understanding about a phenomenon or about the results of an investigation:
  - A one-sentence answer to the question you investigated.
  - It answers, what can you conclude?
  - It should not start with yes or no.
  - It should describe the relationship between dependent and independent variables.

2. What is the evidence in your Experimental Demonstration?
   - The evidence is the scientific data used to support the claim. Evidence must be:
     - Sufficient—Use enough evidence to support the claim.
     - Appropriate—Use data that support your claim. Leave out information that doesn't support the claim.
     - Qualitative, Quantitative, or a combination of both.
3. What is the reasoning in your Experimental Demonstration?
   - The reasoning ties together the claim and the evidence:
     - Shows how or why the data count as evidence to support the claim.
     - Provides the justification for why this evidence is important to this claim.
     - Includes one or more scientific principles that are important to the claim and evidence.
4. List the independent variable(s) in your Experimental Demonstration.
5. List the dependent variable(s) in your Experimental Demonstration. Also briefly explain why these are dependent variable(s).
6. List the controlled variable(s) in your Experimental Demonstration. Also briefly explain why these are controlled variable(s).
7. List the references (books and journal articles) used in preparing your report.
   - The list of references must follow an accepted referencing style (such as the APA style).
   - Lecture notes and websites are not suitable references.

Part 3: Peer assessment

Each member of the group must submit a peer assessment of all other team members.

Submission dates

The group video and report must be submitted following the instructions below by 8 pm Tuesday 15 September 2020 (week 9 of trimester).

Note!

IMPORTANT: Each group only needs to submit one group video and one group report.

The individual peer assessments must be completed by 8 pm Friday 18 September 2020 (week 9 of trimester).


Note!

IMPORTANT: Each person must submit a peer assessment of all other team members.

How to get started

Week 1

You will be randomly allocated to groups of 3-4 members. In the unit site, check which group you are in and make contact with your team members.

Week 2

In collaboration with your team members, decide on the topic of your Experimental Demonstration task. Start planning for completion of the task.

Week 3


Note!

IMPORTANT: Contact the Unit Chair, Kieran Lim <kieran.lim@deakin.edu.au> urgently if one or more team members are inactive.

Weeks 4-8

Carry out the Experimental Demonstration task.

Week 9

One member of the group submits the video, report and a list of all team members.

Each member of the group must submit a peer assessment of all other team members.

Help

There is a discussion forum for you to use to ask questions.

Resources to help you with video production and editing can be found in the **Resources to Help with Experimental Demonstration Assessment** page. Please feel free to share any resources you have used on the discussion forum.

If you need help with deciding on a physics experiment, please contact the Unit Chair, Kieran Lim <kieran.lim@deakin.edu.au>.

Assessment (total 35% of unit)

The Experimental Demonstration video and report will be marked using the attached rubric.

Explanation about marking

There are three components to the marking:

1. A sub-total based on various criteria

2. The maximum possible score based on the maximum possible score is determined by the factual accuracy of the physics content in the video and report.

3. The final score from the rubric will be moderated using the Peer Assessment on FeedbackFruits.

Example 1

- A group submission is well-presented (rubric score 30 out of 40).
- The submission is factually mostly inaccurate (maximum possible score 20 out of 40).
    - The final rubric score is 20 out of 40 (the ***lesser*** of 30 and 20).
- All group members are peer-assessed to have contributed equally to the group submission.

All group members receive a mark of 20 out of 40.

Example 2

- A group submission is mostly good but with some deficiencies (rubric score 28 out of 40).
- The submission is factually accurate (maximum possible score 40 out of 40).
    - The final rubric score is 28 out of 40 (the ***lesser*** of 28 and 40).
- Three group members are peer-assessed to have contributed equally to the group submission, while the fourth is peer-assessed to have contributed nothing.

The first three group members receive a mark of 28 out of 40 while the fourth receives 0 out of 40.

Example 3

- A group submission is excellent but with almost no deficiencies (rubric score 36 out of 40).
- The submission is factually accurate (maximum possible score 40 out of 40).
    - The final rubric score is 36 out of 40 (the ***lesser*** of 36 and 40).
- All group members are peer-assessed to have contributed equally to the group submission.

All group members receive a mark of 36 out of 40.

More information about the Experimental Demonstration Task

Llewellyn, D., & Rajesh, H. (2011). Fostering argumentation skills: doing what real scientists really do. *Science Scope*, *35* (1), 22-28.

- This paper is available in the SLE123 Reading List on the unit site.

Experimental Demonstration Task Marking Rubric

Marking scheme

	Below expectations	Meets expectations	Exceeds expectations	Mark
Video: Introduction	Introduction is not included or is scientifically inaccurate. 0	Introduction is scientifically accurate. 1		
	Introduction is not included or is poorly explained. 0	Introduction is well explained. 1		
Video: Safety	No safety precautions are highlighted. 0	Safety precautions are highlighted. 1		
	No safety precautions heeded during experimental demonstration. 0	Safety precautions are heeded during experimental demonstration. 1		
Video: Application of physics principles	Physics principles are discussed in a way that demonstrates some degree of understanding, yet there remain significant aspects that are discussed incorrectly or misleadingly. 0	A basic grasp of physics principles is conveyed. Some aspects of the theory or experiment is discussed incorrectly or misleadingly. Some information is inaccurate, unclear or rambling. 2	Clear and correct explanation of physics principle(s). Information is accurate, complete and concise. 4	

	Below expectations	**Meets expectations**	**Exceeds expectations**	**Mark**
Video: Use of physics terminology	Use of physics vocabulary is inappropriate for the audience. 0	Use of physics vocabulary is appropriate for the audience. 2		
Video: Experimental Equipment	Appeared to be little thought to the design of the Experimental demonstration. 0	Equipment highlighted and explained. 1		
Video: Experimental design	Appeared to be little thought to the design of the Experimental demonstration. 0	Some thought given to the design of the Experimental demonstration. 1	Design of the Experimental demonstration well thought out. 2	
Video: Experimental action	Experiment poorly performed. 0	Experiment performed adequately 1	Experiment well performed 2	
Video: Experimental outcome	Outcome/result not clearly observed and/or did not correspond to the physics principle stated. 0	Positive outcome/result observed, corresponding to the physics principle stated. 1	Positive outcome/result **clearly observed**, highlighting the physics principle stated. 2	

	Below expectations	**Meets expectations**	**Exceeds expectations**	**Mark**
Video: Link to biology	No link to biology or poor interpretation. Tenuous link demonstrates basic understanding, yet there remain significant aspects that are discussed incorrectly or misleadingly, or missing key information (too basic). 0	Reasonable attempt to link the experiment and physics principles to the biology. Some aspects discussed incorrectly or misleadingly, or missing key information. Some information is inaccurate, unclear or rambling. 2	Clear and correct link the experiment and physics principles to biology. High level of science concept understanding is apparent. Information is accurate and concise. 4	
Video: Use of biology terminology	Use of biology vocabulary is inappropriate for the audience. 0	Use of biology vocabulary is appropriate for the audience. 1		
Video: Presentation	Narrator sounds as if it is read. Delivery interferes with ability to understand the piece. Words often aren't clear and pacing makes it difficult to follow the piece. Grammatical mistakes interfere with ability to understand the piece. The graphics/visuals distract from the science content. 0	Narrator sounds unpractised. Delivery is better in some places than others. Words aren't always clear and/or pacing is uneven. Correct grammar is mostly used in the piece. The graphics/visuals are somewhat helpful in communicating the content. 1	Words are clear and pacing is appropriate. Correct grammar is consistently used. The graphics and images are scientifically accurate 2	
Video: Duration	**Either** over 5 minutes **or** under 3 minutes 0	4 -5 minutes. 1	3 – 4 minutes. 2	

	Below expectations	**Meets expectations**	**Exceeds expectations**	**Mark**
Video: On screen	Some team members not seen on camera (together or individually). **Deduct** 5	All students seen on camera (together or individually).		
Report: claim or conclusion (Note [e])	Claim or conclusion is not stated. 0	Claim or conclusion is unclearly. 1	Claim or conclusion is clearly stated. 2	
Report: evidence (Note [f])	Evidence is either not identified or both unclearly and incorrectly stated. 0	Evidence is either unclearly or incorrectly stated. 1	Evidence is both clearly and correctly stated. 2	
Report: reasoning	Reasoning is either not stated or both unclearly and incorrectly identified. 0	Reasoning is either unclearly or incorrectly stated. 1	Reasoning is both clearly and correctly stated. 2	
Report: independent variable(s)	Independent variable(s) are either not identified or incorrectly identified. 0	Independent variable(s) are correctly identified. 2		
Report: dependent variable(s)	Dependent variable(s) are either not identified or incorrectly identified. 0	Dependent variable(s) are correctly identified. 1		

[e] The scientific accuracy of the claim or conclusion (the physics principles) is assessed in the video criteria. The identification (statement) of the claim or conclusion is assessed in the report criteria.

[f] The scientific accuracy of the evidence is assessed in the video criteria. The identification (statement) of the evidence is assessed in the report criteria.

	Below expectations	Meets expectations	Exceeds expectations	Mark
	Dependent variable(s) are either not or incorrectly explained. 0	Dependent variable(s) are correctly explained. 1		
Report: controlled variable(s)	Controlled variable(s) are either not identified or incorrectly identified. 0	Controlled variable(s) are correctly identified. 1		
	Controlled variable(s) are either not or incorrectly explained. 0	Controlled variable(s) are correctly explained. 1		
Report: References	References are not listed or are mostly irrelevant. 0	References are mostly relevant. 1		
	References do not use accepted citation style. 0	References use accepted citation style. 1		
	Some Lecture notes or websites have been used as references. **Deduct** 5	No Lecture notes or websites have been used as references.		
			Sub-total (out of 40)	

Maximum possible score

The maximum possible score is determined by the factual accuracy of the physics content in the video and report.

	Below expectations	Meets expectations	Exceeds expectations
Factual accuracy	The video and report are mostly factually	The video and report are mostly factually correct, but there are some	The video and report are factually correct.

	incorrect.	inaccuracies.	
Maximum possible score	20	30	40

Final score

The final score is the ***lesser*** of score in the marking scheme and the factual-accuracy maximum possible mark.

Final score (out of 40)	

This final score will be moderated by the peer-assessment.

Online Video Submission: Advice for students

Step 1: Record the video using DeakinAir (Kaltua Capture)

1. Log in to your DeakinAir at <http://video.deakin.edu.au>

2. Click the Add New drop down menu and select Kaltura Capture.

IMPORTANT: Download and install the Kaltura Capture software if you haven't done so earlier.

3. Kaltura Capture should launch automatically, otherwise a popup will appear prompting you to Open Kaltura Capture.

4. Select your desired output/s. By default, all three functions are enabled: Camera, Screen and Audio. You can deselect any output/s you do not want to record by clicking on the icon.

5. To change between Camera and Screen, click the drop down arrow and select either Generic PnP Monitor or Integrated Camera.

6. If selecting Screen, you can choose to record the Full Screen or a Select Area.

7. Click the Record button. A 3 second countdown will begin immediately.

8. You can pause the recording at any time by clicking the red pause button.

9. When you have finished recording, click the Stop button.
   A popup will appear asking Are you sure you want to stop this recording?
   If you are happy to stop recording click Yes stop it.

10. A new screen will appear where you can add a video Title, Description and any Tags. Click Save and Upload.

11. The uploaded video will appear in your My Media.

IMPORTANT: There will be a short delay in your video appearing in My Media. You may have to refresh your browser after several minutes.

Note!

IMPORTANT: Sometimes, it might take a long time to upload. Be persistent and resilient. Call IT support if you are having issues ASAP – do not waste time not knowing!

Step 2: Prepare for sharing and submission

1. Click Edit on the video

2. Under the Details tab, add the following:
   a. Required: The Name of the video

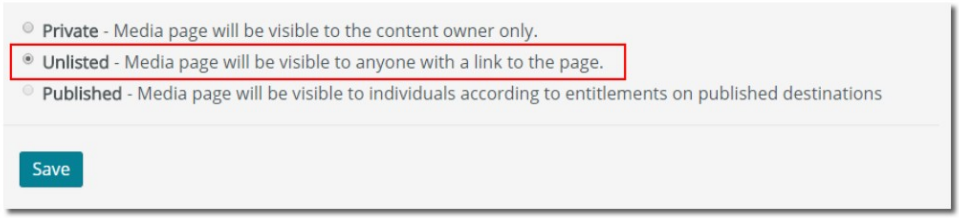
b. Required: A Description
c. Required: One or more Tags each separated by a comma
d. Required: Select the Type of video e.g. Assessment
e. Optional: Select the language

3. Save changes.

4. Click Go to Media.

5. Go to the Actions drop-down list.

6. Ensure the video is set to Unlisted so that the video is accessible by your Unit Chair and marker.
   - Private (default) – Media page will be visible to the content owner only.
   - Unlisted (recommended) – Media page will be visible to anyone with a link to the page.
   - Published – Media page will be visible to individuals according to entitlements on published destinations.



Note!

IMPORTANT: If the video status is listed as 'Private' you will need to change it to Unlisted so that the video is accessible by your Unit Chair and marker.

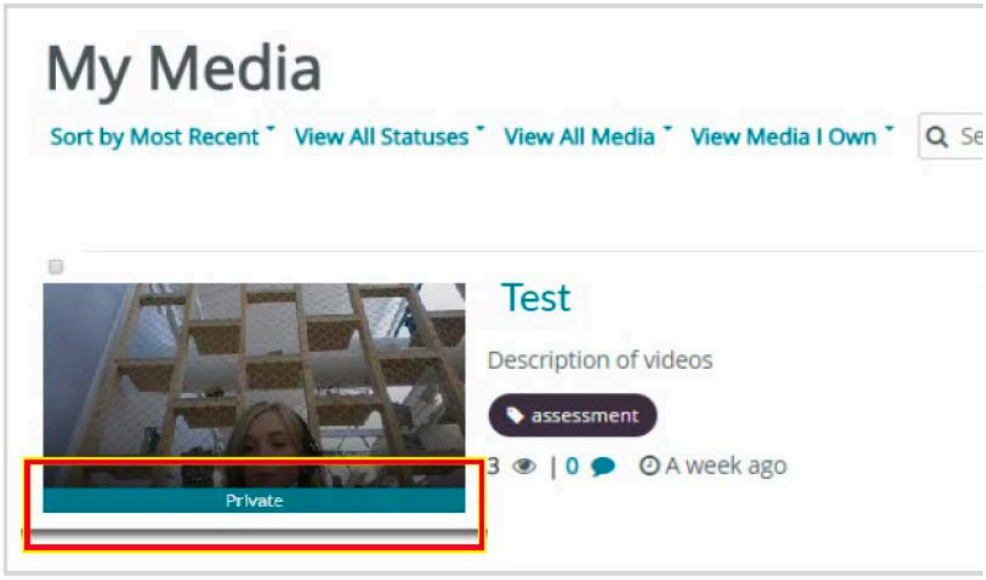
Step 3: Embed & Submit

After uploading or recording your video to DeakinAir, you can provide the video by providing the link in your unit site's assignment submission folder.

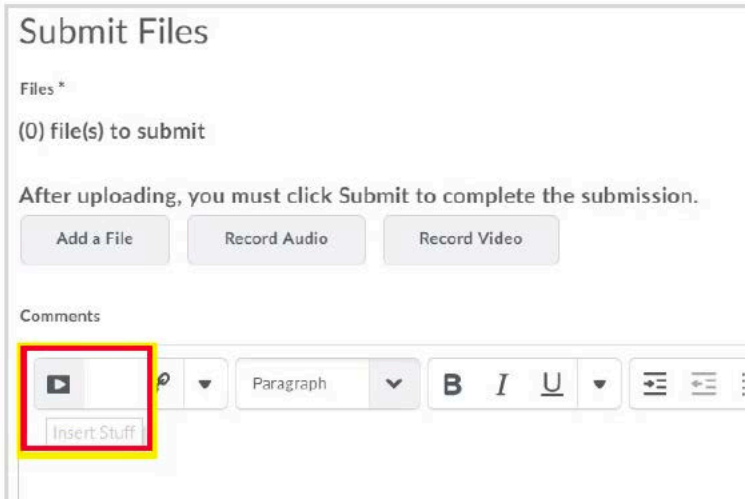
1. Log in to your DeakinAir My Media at http://video.deakin.edu.au

2. Click My Media

3. Locate your video and check its status (located in the bottom banner of the thumbnail image)



4. Click on the video title
5. Click Share below the video
6. Click Embed
7. Select the player size
8. Select and copy all the embed code
9. Navigate to the assignment submission folder in your unit site
10. Under Submit Files, click on the Insert Stuff icon in the comments field



11. Click on Enter Embed Code
12. Paste the copied embed code
13. Click Next

14. If everything is okay when previewing your video, click Insert
15. Save.

Step 4: Other things in your submission

1. Under Submit Files, include all the names of all team members in the comments field.
2. Under Submit Files, attach the group report.
3. Save.
4. Use FeedbackFruits to submit the individual peer assessments.


Note!

IMPORTANT: Please remember to submit the group report!


Note!

IMPORTANT: Please remember to also submit the individual peer assessments.

Seminar Week 1

This is a revision of material from previous study, including, but not limited to the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 1.3 The Use of Mathematics;
- Section 1.4 Scientific Notation and Significant Figures;
- Section 1.5 Units;
- Section 1.9 Graphs.

If you are less confident about your numerical skills, you can also seek help from the **Math Mentoring program** on your campus.

Suggested textbook revision questions and problems

The suggested revision questions and problems are from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Chapter 1: End-of-chapter conceptual questions 4, 12, 13, 14.
- Chapter 1: End-of-chapter problems 4, 6, 11, 13.
- Chapter 1: End-of-chapter problems 16, 18, 23, 83.
- Chapter 1: End-of-chapter problems 26, 28, 36, 37.
- Chapter 1: End-of-chapter problems 57, 58, 59, 62.
- Chapter 1: End-of-chapter problem 75.

You might also try other questions and problems.

Week 1

Prerequisite knowledge

Please revise the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 1.3 The Use of Mathematics;
- Section 1.4 Scientific Notation and Significant Figures;
- Section 1.5 Units;
- Section 1.9 Graphs.

Detailed learning goals

By completing this topic, you should be able to:

- Define and distinguish between position, displacement, distance, and distance travelled.
- Calculate displacement and distance given initial position, final position, and the path between the two.
- Define and distinguish between scalar and vector quantities.
- Explain the use of the particle model of motion.
- Explain speed and velocity and the relationship between them.
- Calculate velocity and speed given initial position, initial time, final position, and final time.
- Determine velocity from a graph of position versus time.
- Derive a graph of velocity versus time given a graph of position versus time.
- Define and distinguish between acceleration and deceleration.
- Calculate acceleration given initial time, initial velocity, final time, and final velocity.
- Determine acceleration from a graph of velocity vs. time.
- Determine the sign of acceleration.
- Calculate displacement of an object that is not accelerating, given initial position and velocity.
- Calculate final velocity of an accelerating object, given initial velocity, acceleration, and time.
- Calculate displacement and final position of an accelerating object, given initial position, initial velocity, time, and acceleration.
- Apply problem-solving steps and strategies to solve problems of one-dimensional motion.
- Apply strategies to determine whether or not the result of a problem is reasonable, and if not, determine the cause.
- Explain the concepts of free fall and free-fall acceleration.
- Solve free fall problems using the kinetic equations.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 2.1 Position and Displacement.
- Section 2.2 Velocity: Rate of Change of Position.
- Section 2.3 Acceleration: Rate of Change of Velocity.
- Section 2.4 Visualising Motion Along a Line with Constant Acceleration.
- Section 2.5 Kinematic Equations for Motion Along a Line with Constant Acceleration.
- Section 1.7 Problem-Solving Techniques.
- Section 1.8 Approximation.
- Section 2.6 Free Fall.

Preparation for Experimental Demonstration task

You will be randomly allocated to groups of 3-4 members.


Note!

IMPORTANT: In the unit site, check which group you are in and make contact with your team members.

Seminar Week 1

The Seminar in Week 1 will focus on revision of material from previous study, including, but not limited to revision of mathematical skills.

Week 2

Detailed learning goals

By completing this topic, you should be able to:

- Define inertia.
- Explain Newton's first law of motion.
- Define the properties of a force
- Explain common forces
- Define mass
- Define net force and the SI unit for force
- Explain Newton’s second law of motion
- Represent forces acting on an object using force vectors
- Explain and use a free-body diagram to find the net force acting on an object
- Describe static and kinetic friction
- Calculate the magnitude of static and kinetic friction
- Calculate weight force
- Explain drag force
- Define terminal speed and explain the factors that contribute to it
- Explain Newton's third law of motion
- Use Newton's third law to solve problems of motion.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 4.2 Inertia and Equilibrium: Newton's First Law of Motion.
- Section 4.1 Interactions and Forces.
- Section 4.3 Net Force, Mass and Acceleration: Newton's Second Law of Motion.
- Section 4.4 Interaction Pairs: Newton's Third Law of Motion.
- Section 4.6 Contact Forces.
- Section 4.11 Air Resistance.

Planning of Experimental Demonstration task

Note!

IMPORTANT: In collaboration with your team members, decide on the topic of your Experimental Demonstration task. Start planning for completion of the task.

Seminar Week 2

The Seminar in Week 2 will focus on revision of material from Week 1.

Week 3

Detailed learning goals

By completing this topic, you should be able to:

- Define and explain some of the many forms of energy
- Explain the concept of a system
- Explain energy transformations within a system
- Explain work as a transfer of energy and net work as the work done by the net force
- Explain the work-energy theorem
- Explain how an object must be displaced for a force on it to do work
- Explain how relative directions of force and displacement determine whether the work done is positive, negative, or zero
- Calculate the kinetic energy of an object moving at a constant velocity
- Explain gravitational potential energy in terms of work done against gravity
- Calculate the gravitational potential energy of an object of mass at height on Earth
- Use knowledge of the potential energy to simplify calculations and explain physical phenomena
- Explain the potential energy of a spring in terms of its compression when Hooke's law applies
- Calculate the elastic potential energy stored in an ideal spring
- Explain the law of the conservation of energy
- Use the work-energy theorem to solve problems involving mechanical energy
- Calculate power by calculating changes in energy over time
- Calculate power consumption and the cost of energy consumed.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 4.4 Interaction Pairs.
  - just the sub-section on Defining a System.
- Section 6.1 The Law of Conservation of Energy.
- Section 6.2 Work Done by a Constant Force.
- Section 6.3 Kinetic Energy.
- Section 6.4 Gravitational Potential Energy and Mechanical Energy.
- Section 6.7 Elastic Potential Energy.
- Section 6.8 Power.

Planning of Experimental Demonstration task


Note!

IMPORTANT: Contact the Unit Chair, Kieran Lim <kieran.lim@deakin.edu.au> urgently if one or more team members are inactive.

Seminar Week 3

The Seminar in Week 3 will focus on revision of material from Week 2.

Week 4

Detailed learning goals

By completing this topic, you should be able to:

- Explain the three main states of matter
- Define a fluid
- Define and calculate density
- Define pressure
- Explain the relationship between pressure and force
- Do calculations that involve force, pressure, and area
- Define fluid pressure in terms of weight
- Explain the variation of pressure with depth in a fluid
- Do calculations that involve pressure, density and depth
- Explain Pascal's principle
- Define gauge pressure and absolute pressure
- Explain the working of manometers and barometers
- Define buoyant force
- Explain Archimedes' principle
- Explain why objects float or sink
- Explain the relationship between density and Archimedes' principle.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 9.1 States of Matter.
- Section 9.2 Pressure.
- Section 9.3 Pascal's Principle.
- Section 9.4 The Effect of Gravity on Fluid Pressure.
- Section 9.5 Measuring Pressure.
- Section 9.6 The Buoyant Force.

Seminar Week 4

The Seminar in Week 4 will focus on revision of material from Week 3.

Week 5

Detailed learning goals

By completing this topic, you should be able to:

- Define and explain waves.
- Explain waves moving through a medium
- Explain what transverse and longitudinal waves are and how they differ
- Explain how wave speed is dependent on the wave medium
- Calculate and understand the linear density of a medium
- Calculate the velocity of a wave on a string
- Explain the difference between a snapshot and a history graph
- Define the wave terms amplitude, wavelength, frequency and period
- Explain the fundamental relationship for sinusoidal waves
- Define and understand the principle of superposition
- Explain constructive and destructive interference
- Explain and predict interference with waves on a string
- Define standing waves.
- Explain the relationship between superposition and standing waves
- Explain the movement of a reflected wave
- Calculate the frequency and wavelength of standing waves
- Explain and calculate the fundamental wave and higher harmonics.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 11.1 Waves and Energy Transport.
- Section 11.2 Transverse and Longitudinal Waves.
- Section 11.3 Speed of Transverse Waves on a String.
- Section 11.4 Periodic Waves.
- Section 11.5 Mathematical Description of a Wave.
- Section 11.6 Graphing Waves.
- Section 11.7 Principle of Superposition.
- Section 11.10 Standing Waves.

Seminar Week 5

The Seminar in Week 5 will focus on revision of material from Week 4.

Intra-Trimester Break

There are no university classes during the Intra-Trimester Break, ***between*** teaching weeks 5 and 6.

Week 6

Prerequisite knowledge

Please revise the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 11.1 Waves and Energy Transport.
- Section 11.2 Transverse and Longitudinal Waves.
- Section 11.3 Speed of Transverse Waves on a String.
- Section 11.4 Periodic Waves.
- Section 11.5 Mathematical Description of a Wave.
- Section 11.6 Graphing Waves.
- Section 11.7 Principle of Superposition.
- Section 11.10 Standing Waves.

Detailed learning goals

By completing this topic, you should be able to:

- Describe sound waves.
- Explain pitch and how animals including humans use it
- Explain that sound waves travel at different speeds in different media
- Explain that sound waves travel in spherical waves from a source.
- Calculate the intensity of a sound wave
- Use the intensity to calculate the loudness of a sound wave
- Explain the movement of sound waves in tubes of differing configurations.
- Calculate the wavelength and frequencies of standing sound waves in different tubes
- Explain the Doppler effect from the point of view of the observer and the source of sound waves.
- Explain what happens when the source of sound waves moves faster than the waves
- Calculate Doppler shifts in frequency.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 12.1 Sound Waves.
- Section 12.3 Amplitude and Intensity of Sound Waves.
- Section 12.4 Standing Sound Waves.
- Section 12.8 The Doppler Effect.

Seminar Week 6

The Seminar in Week 6 will focus on revision of material from Week 5.

Week 7

Detailed learning goals

By completing this topic, you should be able to:

- Explain electric charge, and describe how the two types of charge interact with each other and with neutral objects
- Explain the law of conservation of charge
- Define and explain conductor and insulator
- Describe methods for charging an object
- Explain what happens to an electrical force as you move farther from the source
- Define and explain charge polarisation
- Explain Coulomb's law in terms of how the electrostatic force changes with the distance between two objects
- Calculate the electrostatic force between two charged point forces, such as electrons or protons
- Describe a force field and calculate the strength of an electric field due to a point charge
- Calculate the force exerted on a test charge by an electric field
- Explain the relationship between electrical force on a test charge and electrical field strength
- Define electric potential and electric potential energy
- Describe the relationship between potential difference and electrical potential energy
- Determine electric potential energy given potential difference and amount of charge
- Use the law of conservation of energy to understand the change of energy in a charge
- Explain point charges and express the equation for electric potential and electrical potential energy of point charges
- Explain the electron volt unit.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 16.1 Electric Charge.
- Section 16.2 Electric Conductors and Insulators.
- Section 16.3 Coulomb's Law.
- Section 16.4 - The Electric Field.
- Section 17.1 Electric Potential Energy.
- Section 17.2 Electric Potential.
- Section 26.7 Mass and Energy.
    - focus on the electron volt.

Seminar Week 7

The Seminar in Week 7 will focus on revision of material from Week 6.

Week 8

Prerequisite knowledge

Please revise the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 11.1 Waves and Energy Transport.
- Section 11.2 Transverse and Longitudinal Waves.
- Section 11.3 Speed of Transverse Waves on a String.
- Section 11.4 Periodic Waves.
- Section 11.5 Mathematical Description of a Wave.
- Section 11.6 Graphing Waves.

Detailed learning goals

By completing this topic, you should be able to:

- Explain the wave character of light
- Identify and explain the changes when light enters a medium - the index of refraction
- Explain the ray model of light including the ideas and assumptions we need to make to use it
- Explain reflection of light from polished and rough surfaces
- Determine the index of refraction, given the speed of light in a medium
- Calculate the distance to either the image or the object when viewed through a different material
- Explain the difference between converging lenses and diverging lenses
- Explain and demonstrate the rules for ray tracing for thin converging lenses.
- Demonstrate the formation of images using the technique of ray tracing
- Determine magnification of a lens given the focal length
- Explain and demonstrate the rules for ray tracing for thin diverging lenses.
- Demonstrate the formation of images for thin diverging lenses using the technique of ray tracing.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 22.3 The Electromagnetic Spectrum.
- Section 22.4 Speed of EM Waves in Vacuum and Matter.
- Section 23.1 Wavefronts, Rays, and Huygens's Principle.
- Section 23.2 The Reflection of Light.
- Section 23.3 The Refraction of Light: Snell's Law.
- Section 23.7 Plane Mirrors.
- Section 23.9 Thin Lenses.

Seminar Week 8

The Seminar in Week 8 will focus on revision of material from Week 7.

Week 9

Prerequisite knowledge

Please revise the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 23.1 Wavefronts, Rays, and Huygens's Principle.
- Section 23.2 The Reflection of Light.
- Section 23.3 The Refraction of Light: Snell's Law.

Detailed learning goals

By completing this topic, you should be able to:

- Explain with ray diagrams the formation of an image using spherical mirrors
- Determine focal length and magnification given radius of curvature, distance of object and image
- Explain the mathematical expression that relates focal length of a lens or mirror, the object distance, and the image distance
- Use this Thin-Lens equation to solve thin-lens and mirror problems
- Explain the workings of a basic camera
- Explain the image formation by the eye.
- Calculate refractive power
- Analyse and explain the accommodation of the eye for distant and near vision
- Explain corrections for near-sightedness and far-sightedness
- Explain angular and apparent size.
- Calculate angular magnification
- Explain how a simple magnifier works
- Calculate angular magnification of a simple magnifier
- Explain how an image is formed in a compound microscope.
- Calculate the angular magnification of the microscope
- Explain the 'power' of a microscope.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 23.8 Spherical Mirrors.
- Section 23.9 Thin Lenses.
- Section 24.2 - Cameras.
- Section 24.3 The Eye.
- Section 24.4 - Angular Magnification and the Simple Magnifier.
- Section 24.5 Compound microscopes.

Seminar Week 9

The Seminar in Week 9 will focus on revision of material from Week 8.

Week 10

Prerequisite knowledge

Please revise the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 11.10 Standing Waves.
- Section 12.4 Standing Sound Waves.

Detailed learning goals

By completing this topic, you should be able to:

- Describe the structure of the atom in terms of protons, neutrons, electrons and nuclei.
- Describe the contributions of various people to the modern understanding of the structure of the atom.
- Perform calculations associated with the size of atoms and nuclei.
- Describe the link between wave-like behaviour and quantisation.
- Explain why and how quantisation can be used to explain atomic spectra.
- Draw and use an energy-level diagram for the Bohr and Schrödinger models of the atom.
- Perform calculations associated with the Bohr and Schrödinger models of the electron structure of atoms.
- Explain isotopes.
- Explain the difference between an element and an isotope.
- Explain how some elements might have different isotopes.
- Describe and use isotopic notation.
- Explain stable and radioactive isotopes.
- Interpret and use a Segrè chart of stable and radioactive isotopes.
- Explain and perform calculations involving radioactive decay.
- Describe nuclear reactions.
- Identify common particles involved in nuclear reactions.
- Write and balance nuclear equations.
- Describe typical radiopharmaceuticals and their uses.
- Describe and perform simple calculations involving radiation exposure, absorbed dose, equivalent dose, and effective dose.

Prescribed readings for SLE123 content

Please read the following sections from Giambattista *Physics* (5th ed.). New York: McGraw-Hill:

- Section 27.6 Spectroscopy and Early Models of the Atom.
- Section 29.1 Nuclear Structure

  focus on size of nucleus in second half of section.

- Section 27.7 The Bohr Model of the Hydrogen Atom: Atomic Energy Levels.
- Section 28.5 Wave Functions for a Confined Particle.
    - focus on the concept of how use of wave equations results in wave functions with quantised energies.
- Section 28.6 The Hydrogen Atom: Wave Functions and Quantum Numbers.
    - focus on the concept of how use of wave equations results in wave functions with quantised energies.
- Section 29.1 Nuclear Structure.
- Section 29.2 Binding Energy.
    - focus on the Segrè chart of number of protons plotted as a function of number of neutrons.
- Section 29.3 Radioactivity.
- Section 29.4 Radioactive Decay Rates and Half-Lives.
- Section 29.5 Biological Effects of Radiation.
- Section 29.6 Induced Nuclear Reactions.
- Section 29.7 Fission.
    - focus on nuclear reactions at start of Section only.
- Section 29.8 Fusion.
    - focus on nuclear reactions at start of Section only.

Please read ARPANSA (no date). Units of ionising radiation measurement <www.arpansa.gov.au/understanding-radiation/what-is-radiation/radiation/measurement>.

Seminar Week 10

The Seminar in Week 10 will focus on revision of material from Week 9.

Week 11

There is no new content discussed in week 11. This week will revise the entire trimester's content, while the seminar will focus on the week 10 content.

Learning outcomes

In this week you will have the opportunity to achieve the following learning outcomes:

•To consolidate the learning outcomes from previous weeks

Seminar Week 11

The Seminar in Week 11 will focus on revision of material from Week 10.