

Table of contents

Introduction	page 1
Table of contents	page 3
How to use this resource	page 9
Contacts	page 11

1. Setting the Scene

1.1 Dr Tim St Pierre – setting the scene	page 15
--	---------

Suite of short video clips of Dr Tim St Pierre discussing:

Chapter 1 – Why he chose science as a career

Chapter 2 – His current research on human ‘iron overload’ disease and how he uses the synchrotron to assist him

Chapter 3 – The important connection between maths and science

2. The Synchrotron

2.1 Introduction to synchrotrons	page 19
--	---------

PowerPoint presentation for students

a) Entire PowerPoint presentation (all three segments as one presentation)

b) Segment 1 – What is a synchrotron?

c) Segment 2 – The history of synchrotrons

d) Segment 3 – What are synchrotrons used for?

2.2 What is a synchrotron?	page 21
----------------------------------	---------

Background information for teachers

2.3 The Synchrotron	page 33
---------------------------	---------

Worksheet containing information and questions for students

2.4 The Synchrotron – <i>answers to student worksheet</i>	page 43
---	---------

Answers to student worksheet 2.3

3. The Electromagnetic Spectrum

3.1 Electromagnetic spectrum explorer	page 47
---	---------

An online learning object for students

3.2 Investigating the electromagnetic spectrum	page 49
--	---------

Information for teachers

3.3 Investigating the electromagnetic spectrum	page 51
Worksheet containing activities for students	
3.4 Interaction with Matter	page 63
Information for students	
4. Radiation	
4.1 Detecting invisible radiation	page 69
Background information for teachers	
4.2 Detecting invisible radiation	page 71
Worksheet containing experiment instructions and focus questions for students	
4.3 Building a beamline	page 81
Background information for teachers	
4.4 Building a beamline	page 83
Worksheet containing experiment instructions and focus questions for students	
5. Modelling X-ray Diffraction	
5.1 Modelling X-ray diffraction in the classroom	page 93
Background information for teachers	
5.2 Modelling X-ray diffraction in the classroom	page 95
Worksheet containing experiment instructions and focus questions for students	
6. Wavelengths and Trigonometric Graphs	
6.1 Wavelengths and trig graphs	page 105
Background information for teachers	
6.2 The mathematics of the sine function	page 109
Worksheet containing activity instructions and focus questions for students	
6.3 The mathematics of the sine function – <i>answers to student worksheet</i>	page 119
Answers to the student worksheet 6.2	
6.4 The maths/science interface	page 123
Worksheets containing exercises for students	

7. Metric Units Trail

7.1 Metric units trail	page 129
Background information for teachers including assumed student skills	
7.2 Measurement using interference effects	page 133
Background information for teachers	
7.3 Mass	page 137
Worksheet containing activity instructions and focus questions for students	
7.4 Time	page 143
Worksheet containing activity instructions and focus questions for students	
7.5 Length	page 145
Worksheet containing activity instructions and focus questions for students	

8. Synchrotron Research Case Studies

8.1 Task information	page 151
Background information for teachers	
8.2 Case study 1	page 153
Study of respiration and tracheal function in insects	
8.3 Case study 2	page 155
Did heavy metals kill Beethoven?	
8.4 Case study 3	page 157
Ancient warriors and the origin of chinese purple	
8.5 Case study 4	page 159
Revealing the molecular origins of life	
8.6 Case study 5	page 161
Corrosion	

9. Light Intensity

9.1 Light intensity	page 165
Background information for teachers including assumed student skills and example experiment	
9.2 Linearising to find rules	page 169
Worksheet containing activity instructions and exercises for students	
9.3 Linearising to find rules – <i>answers to student worksheet</i>	page 175
Answers to the student worksheet 9.2	

9.4 Light intensity explorer	page 177
An online learning object for students	
9.5 Light intensity sample experiment	page 179
Sample experiment for teachers use	
9.6 Light intensity data set	page 183
Data set for teachers who don't complete light intensity activity in class	
9.7 Light intensity experiment	page 185
Worksheet containing background information, experiment instructions and focus questions for students	

10. Waves

10.1 Standing waves explorer	page 195
An online learning object for students	
10.2 Microwave experiments	page 197
Background information for teachers	
10.3 The efficiency of a microwave oven	page 199
Worksheet containing experiment instructions and focus questions for students	
10.4 Using a microwave oven to measure the speed of light	page 207
Worksheet containing background information, experiment instructions and focus questions for students	

11. Polygonal Paths

11.1 Polygonal paths – electrons and polygons	page 219
Background information for teachers including assumed student skills	
11.2 In the path of the electron	page 221
Worksheet containing exercises and focus questions for students	
11.3 In the path of the electron – <i>answers to student worksheet</i>	page 225
Answers to the student worksheet 11.2	
11.4 So what is this thing called pi?	page 229
Worksheet containing exercises and focus questions for students	
11.5 So what is this thing called pi? – <i>answers to student worksheet</i>	page 235
Answers to the student worksheet 11.4	
11.6 Polygonal paths explorer	page 239
An online learning object for students	

11.7 Relativistic effects on the electron	page 241
Worksheet containing exercises and focus questions for students	
11.8 Relativistic effects on the electron – <i>answers to student worksheet</i>	page 247
Answers to the student worksheet 11.7	
12. High Level Reading Comprehension	
12.1 The Australian Synchrotron reading comprehension	page 255
Reading comprehension for students containing information on the Australian Synchrotron followed by assessment questions	
12.2 The Australian Synchrotron reading comprehension – <i>answers to student worksheet</i>	page 261
Answers to assessment questions 12.1	
12.3 Australian Synchrotron light: X-ray diffraction reading comprehension.....	page 263
Reading comprehension for students containing information on synchrotron light followed by assessment questions	
12.4 Australian Synchrotron light: X-ray diffraction reading comprehension – <i>answers to student worksheet</i>	page 267
Answers to assessment questions 12.3	
13. Acknowledgments	
13.1 Acknowledgements	page 271

