

Heinemann
PHYSICS

11

1ST EDITION

Student Workbook

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VCE Units 1 & 2

- Written for the VCE Physics Study Design (2016–2021)
- Key knowledge, worksheets and practical activities
- Area of Study 2 worksheets and investigations for selected options
- Area of Study 3 investigation model and guide

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INTRODUCTION

To the student

The *Heinemann Physics 11 Student Workbook* has been created to help you achieve your best possible performance in VCE Physics Units 1 and 2. It is designed to be used in conjunction with your textbook and class notes. This workbook will be an important reference document throughout the course and in preparation for the examinations. The workbook is divided into six Areas of Study—three in Unit 1 and three in Unit 2. The workbook has four main sections:

- Key knowledge
- Worksheets
- Practical activities
- Research and practical investigation skills.

KEY KNOWLEDGE

Key knowledge is a set of summary notes that covers the key knowledge set out in each Area of Study of the Study Design. It is useful for highlighting information essential to your understanding of the themes covered in the textbook, and provides a ready reference for completing the worksheets and for exam preparation. As this is your workbook, you are encouraged to make your own notes and highlight key points directly onto the pages as you work.

WORKSHEETS

Each Area of Study includes a range of worksheets designed to consolidate and test your understanding of the essential knowledge required, and to further your understanding of the key concepts. Once completed, the worksheets will become an important part of your revision notes. You can check your answers to these by visiting ProductLink at pearsonplaces.com.au.

WORKSHEET 1

Thermodynamics

1. List the following radiation types in order of increasing wavelength.
gamma infrared radio ultraviolet blue red X-rays microwaves

2. What is the temperature, in degrees Celsius, of melting of W in its boiler?

3. The rank of the vibrations in the table below, down the correct column from the list: conduction, transverse, heating, boiling, convection, melting.

Process	How
Heat through a metal	
Gas changes to liquid	
Heat through a wall	
Heat through air	

4. Of the three methods of heat transfer (conduction, convection and radiation), select the one that describes each situation in the table below.

Process	How
Water around a hot rock in a river	
A brick wall under the sun in summer	
Heat and hot air rising from a heater that warms the room	
A radiator has a panel heater	

5. Complete the following paragraph relating to specific heat capacity and latent heat for the material given. (Give specific heat capacity, energy transferred, temperature, latent energy.)
When heat is added to a mass of m of the material, the temperature of the material rises by ΔT . The energy transferred is Q . The specific heat capacity of the material is c . The energy transferred is $Q = mc\Delta T$. The energy transferred is $Q = mL$.

6. From the Key Knowledge section, your textbook or another suitable source, define each of the following terms of heat transfer.
Conduction
Convection
Radiation

WORKSHEET 2

Temperature scales

1. The diagram below shows a temperature scale with several key points described. Assume that standard sea level pressure applies.
1. Mark each key point, with the corresponding temperature in kelvin (K) and the equivalent temperature in degrees Celsius ($^{\circ}\text{C}$). The zero mark is in a 100 K interval to that scale of the temperature.

2. The triple point of water has particular significance in determining the use of the temperature scales. Define the triple point of water and explain its significance in determining a temperature scale.

3. A temperature of -40°C has no meaning. Show why this is the case.

KEY KNOWLEDGE

Stefan-Boltzmann equation

Leading physicists, Albert Einstein and Joseph Stefan, and Austrian physicist, Ludwig Boltzmann, discovered that the amount of energy radiated by a black body is proportional to the fourth power of its absolute temperature. This is known as the Stefan-Boltzmann law. The Stefan-Boltzmann constant is $\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$.

KEY KNOWLEDGE

Issues related to Thermodynamics

Thermodynamics is the study of energy and its transformation. The first law of thermodynamics states that energy is conserved. The second law of thermodynamics states that the total entropy of an isolated system always increases over time.

Carbon dioxide levels

Carbon dioxide levels in the atmosphere have increased significantly since the Industrial Revolution. This is due to the burning of fossil fuels for energy. The increase in carbon dioxide levels has led to global warming and climate change.

Modelling the Greenhouse Effect

The greenhouse effect is a natural process that warms the Earth's surface. It occurs when the Sun's rays hit the Earth's surface and are reflected back towards the Earth. The greenhouse gases in the atmosphere trap some of this heat, warming the Earth's surface.

PRACTICAL ACTIVITIES

Each Area of Study includes a range of activities related to the various themes covered in this course. These investigations include several practical activities designed to satisfy the requirements of the Area of Study Outcomes. The activities offered help you develop the skills of scientific enquiry outlined in the Study Design. They give you practice in designing, conducting and evaluating scientific investigations, as well as gathering and analysing data. Discussion, results and conclusions can be recorded directly into your workbook. The activities in this section of your workbook support and extend the key skills relevant to Units 1 and 2, and the key concepts within each Area of Study.



This symbol indicates that the activity includes hazards and your teacher will discuss these with you.



This symbol indicates that you should wear safety glasses.

In other practical activities your teacher may require you to complete the risk assessment yourself. In this case you will be required to sign the risk assessment data sheet, to indicate that you have read and understood it, before completing each activity.

INTRODUCTION

To the teacher

The *Heinemann Physics 11 Student Workbook* has been created wholly with a view to meeting the requirements of the Study Design in this subject, and is designed to be used in conjunction with the textbook. This workbook helps students check their understanding of key knowledge, consolidate ideas, extend their thinking, address technologies, apply key skills, and undertake practical activities and assessment tasks.

KEY KNOWLEDGE

These summary notes cover the key knowledge in each Area of Study and so offer a convenient and succinct set of study notes. They are highly illustrated and written in a straightforward and easy-to-understand style to assist students of all reading abilities.

WORKSHEETS

The multiple intelligence worksheets cater for a range of learning styles. The worksheets provide opportunities to revise, consolidate and extend the student's knowledge and understanding of the key physics principles prescribed in the VCE Units 1 and 2 Study Design. Answers can be found at ProductLink.pearsonplaces.com.au.

PRACTICAL ACTIVITIES

The activities and investigations included here offer a range of opportunities for exploration of the themes covered in Units 1 and 2 of this course. The practical activities represent the most popular and effective activities relevant to the VCE Physics course. They provide students with an opportunity to develop and demonstrate skills of scientific enquiry and method, including experimental design and evaluation, constructing and testing hypotheses, and gathering and analysing data, as well as opportunities to consider technological advances in Physics. The range of tasks deliberately illustrates different kinds of approaches to assessment items. Each activity has been carefully designed for completion within the suggested timeframes for this course. Risk assessment advice, as well as teacher notes to support each practical activity, are available on the Pearson Reader. The practical investigations focus on the key knowledge outlined in the Study Design with a view to contributing to the assessment requirements of the course.

OPTIONS

There are two options available within this book for Unit 2 Area of Study 2. These include 2.1 What are stars? and 2.11 How can performance in ball sports be improved? Key knowledge, worksheets and practical activities are available for these options. A further four options are available on the *Heinemann Physics 11 eBook*, and experiments and investigations can also be found on Productlink.

RESEARCH AND PRACTICAL INVESTIGATION SKILLS

The screenshot shows a worksheet titled "Crumple zones and collisions—how can impulse be utilised to improve the safety of vehicles?". It is divided into several sections: **INTRODUCTION**, **DISCUSSION**, **MATERIALS**, **PURPOSE**, **RISK ASSESSMENT**, **METHODOLOGY**, **RESULTS**, and **CONCLUSION**. The **RESULTS** section contains a table with columns for "Average force (N)", "Average time (s)", and "Average impulse (Ns)", and a graph with a grid for plotting data. The **CONCLUSION** section has a table for recording findings. The worksheet is from the *Heinemann Physics 11* Student Workbook, Unit 2 Area of Study 2.

The Study Design for Area of Study 3 in Unit 2 focuses on developing crucial scientific skills around research and practical investigation.

A suggested template for the presentation of a research investigation as well as a practical investigation has been provided for the students. Throughout the *Heinemann Physics 11 Student Workbook* there are also skill-development worksheets to assist students in beginning to develop or consolidate the skills of analysing sources and conducting practical investigations. The templates and worksheets provided are designed to be used multiple times to allow students to practise developing these skills using different sources and practical investigations.

PRODUCTLINK

Heinemann Physics 11 4e ProductLink supports all Heinemann Physics texts and resources, including *Heinemann Physics 11* (4th edition) and *Heinemann Physics 12* (4th edition) and the student workbooks *Heinemann Physics 11 Student Workbook* (1st edition) and *Heinemann Physics 12 Student Workbook* (1st edition). It includes:

- course advice and a week-by-week work program that integrates the text and student workbook
- practical notes and advice
- additional practical activities
- risk assessments
- chapter tests and solutions
- answers to the student worksheets contained in the student workbook
- assessment advice.