

A Level Science Applications Support Booklet: Physics

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A LEVEL SCIENCE APPLICATIONS SUPPORT BOOKLET: PHYSICS

Introduction

Too often the study of Physics at A level can seem theoretical and abstract. The connections between Physics and real life can seem remote.

In reality, Physics is not a purely abstract subject. Like other science subjects, Physics has a “pure” theoretical side and an applied side. The principles of Physics are applied in a vast range of contexts, from the building of bridges to the design of integrated circuits. Much of the technological revolution has its foundations in applied Physics.

To ensure that the syllabus retains a balance between pure and applied Physics, there is a whole section at the end of the syllabus on Applications of Physics. It is at the end of the syllabus because the theoretical principles have to be learned and understood first if the applications are to be understood.

This booklet has been written to support teachers and students as they follow the Applications of Physics part of the syllabus.

In the booklet, each learning outcome is printed in italics and is followed by a detailed explanation. These explanations have been written by examiners and it is hoped that they will help to illustrate the level of detail that students are expected to master.

It should be stressed that this booklet is not a replacement to the syllabus. While it is hoped that the booklet will help to make the syllabus content clearer to students and teachers, it should not be read as an authoritative guide to what is and is not included in the syllabus. The examination papers will assess the syllabus, not this booklet.

The sections of the booklet are numbered in the same way as the sections of the syllabus, so that the first part of this booklet is (perhaps rather unusually) section 28. The learning outcomes are covered in syllabus order.

The overarching theme of the Applications of Physics part of the syllabus is “Gathering and Communicating Information”. This is in three sections, as follows.

- Section 28, *Direct Sensing*, covers the electronics necessary to measure temperature, light intensity or strain; to detect sound signals; to amplify signals; and to connect sensors to circuits.
- Section 29, *Remote Sensing*, covers some of the ways in which medical physicists obtain information about the inside of the body without surgery, by using X-rays, ultrasound and MR; and how the information can be converted into images of the inside of the body.
- Section 30, *Communicating Information*, covers some of the ways in which information is communicated using radio waves, optic fibres, satellites and mobile phones.

These three sections are interconnected. The information that is communicated from one place to another can come from sensors, microphones or scanners. Communications systems contain amplifier circuits. Ultrasound scanners and microphones both use piezoelectric transducers. The equations for the attenuation of X-rays in matter and the attenuation of a signal in a wire are equivalent. Because of the many links, examination papers will often contain questions assessing more than one section.

It is hoped that this booklet will be used in conjunction with a variety of other sources of information, perhaps including visits to hospitals and communications centres, guest speakers, practical work, the internet, textbooks and videos. Some parts of the applications section are suitable for self-study, but experience shows that students who are left to work through a booklet like this one without support and supervision from a teacher will not perform well in the examination.