Internal Assessment Resource

Achievement Standard Physics 91169: Demonstrate understanding of physics relevant to a selected context

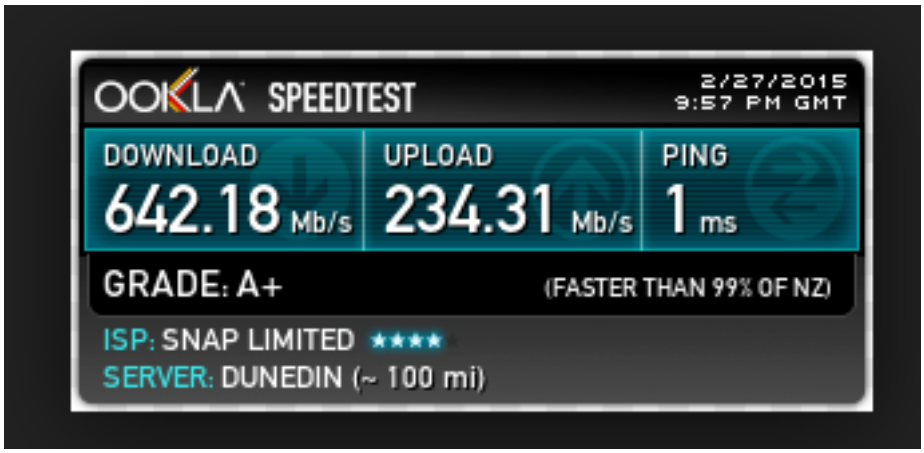
Resource reference: Physics 2.2

Resource title: Optical Fibre

Credits: 3

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of physics relevant to a selected context.	Demonstrate in-depth understanding of physics relevant to a selected context.	Demonstrate comprehensive understanding of physics relevant to a selected context.

Student instructions



[1]

Introduction

Just imagine... Never having to wait online…

Downloading a high-definition movie in minutes, or uploading an entire photo album in a few seconds!

Fibre-based ultra-fast broadband delivers all this and much more. It's the most exciting technological advancement to happen to New Zealand since the introduction of the mobile phone, and it will benefit every Kiwi.

Right now, optical fibre is being rolled out across the country.

In this assessment task, you will research the physics of optical fibre and then prepare a report that explains the relevant physics principles.

This is an individual assessment task; you will do your own research and write your own report.

[1] image obtained from http://www.gpforums.co.nz/threads/497274-Gigatown-Dunedin-Speeds

Task

Process your research information and use it as the basis for a report in which you use physics principles to **explain how optical fibre works.**

Your report should include the following key points:

- why **refractive index is an important factor** in the functioning of optical fibre;
- a rationale, in terms of physics theory, for the **choices that were made in the design of, and materials used in**, optical fibre;
- an explanation, in terms of physics theory, for the **transmission of the signal**;
- why **angle of acceptance and aperture of cable** are important in optical fibre;
- how **attenuation occurs** and how **it can be minimised**.

The report will be assessed on how well you describe the relevant physics and integrate it into the context of optical fibre. In your report, you should aim to **elaborate, justify, evaluate, compare** and **contrast**, or **analyse** the physics that underpins the context. The report will also be assessed on how well you **gather** and **reference** your information.

As a guideline, written reports should not be more than 1000 words and should include illustrations, diagrams and graphs, where appropriate (note: this page has a word count of 300 words).

The report could be modified to accommodate other formats such as:

- poster display (including supporting notes)
- video

All sources of information, images, diagrams (those not generated by the student) and data must be acknowledged and recorded in a traceable format (which means someone else could go straight to where the information came from).

Well documented evidence of how your information has been gathered will need to be shown by providing a complete formal bibliography.

For achievement at Merit or Excellence level, it will be expected you will be able to verbally answer questions relating to your report.

The report or agreed format and all research documentation will need to be handed in to your teacher by _____.

Assessment Schedule AS91169 (Physics 2.2): Optical Fibre

Part A: Research Content

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
The student: • identifies and describes the characteristics of the physics related to the given context • describes how and/or why the physics applies to this context. For example, they provide the following information: • *How total internal reflection is related to critical angle;* • *How the refractive index of cladding region compares with the refractive index of the core region;* • *How a decrease in energy transmitted is caused by scattering and absorption;* • *The significance of the size of the angle of incidence of the light entering the optical cable;*	The student: • identifies and describes in depth the characteristics of the physics related to the given context • provides reasons how and/or why the physics applies to this context. For example, they provide the following information: • *Snell's law and the principle of total internal reflection;* • *How fibre composition affects the conditions for total internal reflection;* • *How and why acceptance angle is controlled;* • *Why scattering occurs and how it affects the quality of the signal;* • *How bending the fibre affects the quality of the signal;* • *How the materials used for the fibre can affect the quality of the signal;*	The student: • comprehensively identifies and describes the characteristics of the physics related to the given context • elaborates how and/or why the physics applies to this context • justifies why the particular physics is well-suited to this context, and/or compares alternatives. For example, they provide the following information: • *Snell's law, refractive indices and the principle of total internal reflection;* • *a comprehensive description of the design of optical fibres including multimode fibre;* • *a detailed explanation for acceptance angle and its relation with numerical aperture;* • *Why scattering occurs, how it is affected by wavelength and how it affects the quality of the signal;* • *How and why bending the fibre affects the quality of the signal;* • *How and why the materials used for the fibre can affect the quality of the signal;*