

Physics: Electronics

Whole unit overview

Recommended Prior Knowledge: This unit should be studied after the units Electricity 1 & 2, Electromagnetism and Waves.

Context: This unit builds on some basic concepts in electricity and electromagnetism leading to applications in the field of electronics.

Outline: The unit begins with a study of cathode rays, their production and properties and this leads to use of the cathode ray oscilloscope and some electronic devices.

Learning Outcomes		Suggested Teaching Activities	Resources
4.6 (a)	<p>Describe the production and detection of cathode rays.</p> <p>Describe their deflection in electric fields and magnetic fields.</p> <p>Deduce that the particles emitted in thermionic emission are negatively charged.</p> <p>State that the particles emitted in thermionic emission are electrons.</p>	<p>Use a demonstration diode to show thermionic emission.</p> <p>Use a deflection tube and Helmholtz coils to demonstrate deflection of cathode rays in magnetic and electric fields.</p>	
	<p>Distinguish between the direction of flow of electron current and conventional current.</p>	<p>Refer back to the work on current electricity and the concept of free electrons.</p>	

<p>4.6 (b)</p>	<p>Describe in outline the basic structure, and action, of a cathode-ray oscilloscope (detailed circuits are <i>not</i> required).</p> <p>Use and describe the use of a cathode-ray oscilloscope to display waveforms.</p>	<p>Lead on from the deflection tube (see above) to the c.r.o. and demonstrate its use (e.g. in displaying frequency and amplitude of sound waves, as in Waves unit).</p>	<p>This site enables students to control a wave on an oscilloscope screen.</p> <p>http://www.phy.ntnu.edu.tw/~hwang/oscilloscope/oscilloscope.html</p>
	<p>Use and describe the use of a c.r.o. to measure pd's and short intervals of time (detailed circuits are <i>not</i> required).</p>	<p>Extension students can develop the c.r.o. work further, for example, measuring alternating p.d.s. produced by electromagnetic induction (refer to the Electromagnetism unit – this will provide a useful revision exercise).</p>	
<p>4.6 (c)</p>	<p>Describe the action of a variable potential divider (potentiometer).</p> <p>Describe the action of thermistors and light dependent resistors and show understanding of their use as input transducers.</p> <p>Describe the action of a capacitor as an energy store and show understanding of its use in time delay circuits.</p> <p>Describe the action of a reed switch and reed relay. Show understanding of the use of reed relays in switching circuits.</p> <p>Recognise and show understanding of circuits operating as light sensitive switches and temperature operated alarms (using a reed relay or other circuits).</p>	<p>A series of straightforward circuits should be used here so that students become familiar with the various components. The circuits could model the action of temperature sensors, light sensors, alarms, etc.</p>	<p>Students interested in electronics and related fields may like to design their own robots on line.</p> <p>http://www.tcm.org/html/galleries/robots/teachers.html</p> <p>This site gives instructions on how to build a relay.</p> <p>http://www.schoolnet.ca/general/electric-club/e/page22.html</p>