**5.3 Determining frequency and amplitude of a wave using an oscilloscope**

**Introduction**

In this experiment students will be determining the frequency and amplitude of a signal using an oscilloscope.

They are expected to be familiar with the terminology of “volts per centimetre” and time-base as the descriptors for the scales of the display.

They are also expected to be able to interpolate between markings to determine the most precise value.

They should also be familiar with the formula linking frequency and period.

**Aims and skills covered**

* To be able to use an oscilloscope

**Links to Specification**

**Physics A**

* 4.4.1(b)(i) displacement, amplitude, wavelength, period, phase difference, frequency and speed of a wave
* 4.4.1(b)(ii) techniques and procedures used to use an oscilloscope to determine frequency
* 4.4.1(c) the equation 

**Physics B**

* 3.1.2(v) ν = fλ including the use of *f = 1/T*
* 4.1b(i) make appropriate use of the term amplitude
* 4.1d(i) using an oscilloscope to determine frequencies

**Practical Skills**

* 1.2.1(b) safely and correctly use a range of practical equipment and materials
* 1.2.1(c) follow written instructions
* 1.2.1(d) make and record measurements
* 1.2.1(e) keep appropriate records of experimental activities
* 1.2.1(f) present information and data in a scientific way
* 1.2.1(i) correctly cite sources of information (in the extension activity)
* 1.2.1(j) use a wide range of experimental and practical instruments, equipment and techniques appropriate to the knowledge and understanding included in the specification
* 1.2.2(a) use appropriate analogue apparatus to record a range of measurements and to interpolate between scale markings
* 1.2.2(f) correctly constructing circuits from circuit diagrams using DC power supplies, cells, and a range of circuit components, including those where polarity is important
* 1.2.1(h) use of a signal generator and oscilloscope, including volts/division and time-base
* 1.2.1(i) generating and measuring waves, using microphone and loudspeaker

**CPAC**

* (1) Follows written procedures
* (3) Safely uses a range of practical equipment and materials
* (4) Makes and records observations

**Mathematical skills**

* M0.1 recognise and make use of appropriate units in calculations
* M0.2 recognise and use expressions in decimal and standard form
* M1.1 use an appropriate number of significant figures
* M1.5 identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined by addition, subtraction, multiplication, division and raising to powers
* M2.3 substitute numerical values into algebraic equations

**Equipment**

* signal generator
* oscilloscope, picoscope or other equivalent instrument
* leads
* microphone
* loudspeaker
* musical instrument

**Health and safety**

Oscilloscopes should have been PAT tested recently in line with departmental or centre policy.

Before carrying out any experiment or demonstration based on this guidance, it is the responsibility of teachers to ensure that they have undertaken a risk assessment in accordance with their employer’s requirements, making use of up-to-date information and taking account of their own particular circumstances. Any local rules or restrictions issued by the employer must always be followed.

**Notes**

* These practical activities are not controlled assessments, should not be carried out in exam conditions and can be adapted by the centre. Students can collaborate during the activities which should take place as part of the normal teaching sequence. They are intended to be formative with students acquiring and practising skills throughout the course.
* To achieve a pass in the Practical Endorsement each student is required to demonstrate competence in all the skills, apparatus and techniques listed in section 1.2 of the specification and assessed against the Ofqual Common Practical Assessment Criteria (CPAC) at the end of the course.
* The skills, apparatus and techniques can be demonstrated during any practical work undertaken during the A Level course whether an OCR practical activity or not.
* There are numerous teaching resources available on the internet which address this topic for example: <http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Measurements/Scope1.htm>
* Simulation software does not fulfil the competence requirement for use of an instrument.

**Recording**

* Learners should not need to re-draft their work but rather keep all their notes as a continuing record of Practical Activity.
* As evidence for the Practical Endorsement learners should have the data collected in a clear and logical format.
* In addition, to support the assessment of practical work in the written examinations learners should have used their measurements to calculate frequency and amplitude