

Experiment number	Topic	Data logger	Description	Key bits of kit	Notes
1	Waves & Optics	Lux meter + voltage logger	Malus' Law. Determine ratio of light flux through crossed polaroids mounted in a petri-dish.	Lux meter data-logger. Corresponding angle measuring device. Perhaps use the turn of the petri-dish to drive a potentiometer and data-log the voltage? Petri-dish. Polaroids.	
2	Rotational mechanics	Smart pulley	Record angle of rotation vs time for flywheel experiment.	New flywheels, smart pulley, masses, string.	
3	Mechanics	Ultrasonic position sensor and force measuring pad.	Vertical object drop. Drop a ball onto a hard surface from just below the sensor. Use a tube to constrain motion to 1D. Record displacement vs time.	Ultrasonic position sensor, tube, balls to drop.	Variants could include drop of magnet in aluminium tube, variation of ball density etc, to model effects of drag.
4	Thermal physics	Pressure sensors + voltage data logger	Record pressure and temperature inside a piston, with a potentiometer setup to measure the amount of compression. Similar to Boyle's Law screw system, but with option of more rapid compression, decompression. Tes of ideal gas laws.	Pressure, voltmeter setup.	
5	Electromagnetism	USB oscilloscope (Picoscope?)	Resonance in an LCR circuit. Record input and output sinusoids for a variety of input frequencies. Perhaps an autoated MATLAB programme to ingest the data and automatically determine amplitude and phase vs frequency curves.	Tone generator, inductor, capacitor, resistor, dual input digital CRO.	To include circuit variants which describe notch filters.
6	Electromagnetism	Hall probe	Log magnetic field vs polar angle round a neodymium magnet. Hall probe moved around a vertical circular guide. Position round the guide logged via voltage using a potentiometer.	Neodymium magnet, hall probe B field data logger, circular guide with potentiometer connected position measurement.	
7	Electricity	Voltage and Current sensors	Classic I,V curves for green boards - but super quick!	Green boards. I,V datalogger.	
8	Waves & Optics	Lux meter + voltage logger	Fraunhofer diffraction pattern. Mount lux meter on a circular arc. Position logged using some form of potentiometer. Grating (potential for a hot-swap) illuminated by a laser beam. Since near-field is very close to grating (fractions of a mm), arc doesn't need to have a huge radius.	laser, arc-potentiometer, lux meter, grating.	
9	Thermal physics	Temperature sensor	Temperature vs time curves for the heating and cooling of metal cylinders.	Standard metal cylinder kit (brass, aluminium, steel), thermocouple attached to data logger.	
10	Radioactivity	GM tube	Decay of Protactinium. Classic experiment. Record the activity vs time for about five minutes. Half life is about 70s.	GM tube, protactinium generator kit.	
11	Kinematics	Digital camera on a tripod.	Kinematic analysis using motion capture. Use Quicktime + Excel and AF's MATLAB move2xyt software.	Accerometer, soft ball casing. Tripod, digital camera.	
12	Waves	Spectrograms of sound sources	Record five seconds of sound for a variety of sources. Determine the spectrogram using AF's MATLAB software SoundAnalyser. Idea is to determine pulse shape and frequency vs time profile, to analyse harmonics.	Bell(s), whoopie cushion, bongo drum, rasp, flexible ruler. DI box, mic.	
13	Mechanics	Force-meter	High data rate recording of the thrust from a balloon. Inflate balloon, place in special cradle, jet of air impacts upon thrust plate.	Balloon cradle rig, (similar to rocket rig but less messy), 6000 points per minute PASCO data logger	Could simply use rocket rig but without water!
14	Electromagnetism	MATLAB timing system	Capacitor charge and discharge I,V vs time curves. Record for different load resistances.	Capacitor. Large ammeters and voltmeters (analogue). MATLAB timing system. dial-a-resistor.	