ELECTRICITY AND MAGNETISM

AC Circuits

LRC Black Boxes
Black Box circuits for 4B lab

Location: Electromagnetism: Electric Circuits 1

Capacitance

Capacitor Demo
Demonstrate how capacitance changes changes with gap

Location: Electromagnetism: Electric Circuits 2

DC Circuits

Series-Parallel Demo
Large series/parallel demo for the classroom

Location: Electromagnetism: Electric Circuits 2

Temp and Resistance
Demonstrate the effect of temperature on resistance

Location: Electromagnetism: Electric Circuits 2

Series/Parallel Black Boxes
Series/Parallel lab

Location: Electromagnetism: Electric Circuits 1

Series and Parallel Circuits

Location: Lab Room Cabinets

Electric Fields and Potential

E-Field Mapping
Map the electric field and equipotential lines created via different geometries

Location: Electromagnetism: Electric Field Mapping

Electromagnetic Induction

Nested Coils
Demonstrates induced current

Location: Electromagnetism: Lenz's Law/Induction
Mic-Speaker Demo
Open speaker and a microphone model

Location: Electromagnetism: Electric Circuits 2

Helmholtz Coils

Location: Electromagnetism: e/m Tubes

Faraday's Law Accessory
Demonstrates current direction in coil depending on direction of motion via a colored LED

Location: Electromagnetism: Lenz's Law/Induction

Electrostatics

Separating Charges
Produce separate charges with rod and fur or with the trboelectric kit

Location: Shelf 3; Rod and Fur Drawer

Electrostatic Voltage Sources
Static Voltage Source with 1000 - 3000 Volt output

Location: Electromagnetism: Electrostatics

Electrosopes
Numerous styles of electrosopes for observing charge

Location: Electromagnetism: Electrostatics

Small Tesla Coils
Small Tesla Coils

Location: Electromagnetism: Electrostatics

Van De Graaff
Electrostatic demos with a Van De Graaff generator

Location: Electromagnetism: Van De Graaff

Magnetic Fields And Forces

Magnet in Tube
Lenz's Law is demonstrated by a magnet falling down through a metal tube

Location: Electromagnetism: Lenz's Law/Induction

Ring Launchers
A metal ring launcher with various types of rings to demonstrate $F = (v) \times (B)$

Location: Electromagnetism: Lenz's Law/Induction
Electromagnets
U-shaped electromagnets with bars to attach various masses to

Location: Electromagnetism: Magnets

Induced Magnetic Field Mapping
Magnetic fields are induced by a current carrying wire that is shaped into different geometries.

Location:

New e-m Tube
Newer e/m cathode tube with measurement card inside tube

Location: Electromagnetism: e/m Tubes

Magnaprobe
3-D magnetic mapping tool

Location: Electromagnetism: Magnetic Field Mapping

Compass
Compasses of various sizes

Location: Electromagnetism: Magnetic Field Mapping

Mapping Around Wire
Map the magnetic field around a current carrying wire

Location: Electromagnetism: Magnetic Field Mapping

TV with Magnet
Distort a television image with a magnet

Location: Electromagnetism Aisle (TV is on bottom shelf)

Hanging Rings
Lenz's Law is observed by passing a magnet through the metal rings

Location: Electromagnetism: Lenz's Law/Induction

Dip Needle
Allows angular measurement of magnetic field at any point

Location: Electromagnetism: Magnetic Field Mapping

Induction Paddles
Lenz's Law observed by swinging these "paddles" through a magnetic field

Location: Electromagnetism: Lenz's Law/Induction

Force On Wire
Force on a current carrying wire in a magnetic field F = (v) x (B)

Location: Electromagnetism: Lenz's Law/Induction
Ferro-magnetic Fluid

*Location:* Electromagnetism: Magnetic Field Mapping

Iron Filings
Visualize various magnetic fields with iron filings.

*Location:* Electromagnetism: Magnetic Field Mapping

2-D Field Mapper
2-D magnetic field mapping

*Location:* Electromagnetism: Magnetic Field Mapping

Old e-m Tube
Older e/m tube useful for qualitative demos

*Location:* Electromagnetism: e/m Tubes

Motors And Generators

Pasco Generator
Magnet between two coils that is connected to a pulley and can be spun to induce a current

*Location:* Electromagnetism: Electric Motors and Generators

Genecon Generator
Hand-held generator for observing work, load, and electromotive force

*Location:* Electromagnetism: Electric Motors and Generators

Motor Generator
Demo motor generator

*Location:* Electromagnetism: Electric Motors and Generators

Hand Generator
Large hand generators

*Location:* Electromagnetism: Electric Motors and Generators

Flashlight Generator
LED flashlights that are powered via induced current by shaking a magnet through a coil

*Location:* Electromagnetism: Electric Motors and Generators
## EQUIPMENT

**UV lamp**
UV lamp with long and short wavelength settings.

*Location:*

**Electronic**

**Strobe Lights**
Used to observe oscillations and wave motion

*Location: Waves and Oscillation Demos 3*

**Power Supplies**

*Location: Electromagnetism: Power Supplies*

**Galvanometers**

*Location: Electromagnetism: Galvanometers*
FLUID MECHANICS

Archimedes

Helium and Balloons
Helium tank with inflator nozzle.

Location: Fluids 1

Cartesian Diver

Location: Fluids

Welch Bouyancy Apparatus
Antique precision device to measure fluid density.

Location: Fluids 3

Dynamics of Fluids / Bernoulli / Lift

Ping Pong Ball in Funnel
Ping Pong Ball stays in funnel attached to air blower.

Location:

Bernoulli Light Bulbs
Demonstrate Bernoulli effect by blowing air between the two light bulbs

Location: Fluids: Fluids 2

Wind Bag
Inflate large bag with one breath.

Location: Fluids

Beach Ball in Air Stream
Beach ball stays suspended in stream of air.

Location: Fluids top shelf

Pressure In Air Stream
Shows pressure in air streams passing over differently shaped surfaces.

Location: Fluids

Bernoulli Water Stream
Water flows out 2 holes in tank. Lower one has a higher velocity.

Location: Fluids (suction cup box)

Gas Pressure / Fluid Statics
Mercury Barometer
atmosphere pressure vacuum
Location: Optics: Optics Demo 1

Balloon in Nitrogen
A balloon deflates when cooled down by LN2
Location: balloons and pump in balloon drawer

Crush the Can
A soda can full of steam implodes on cooling.
Location: The Boiler is in thermo section. Cans in fluids and recycling bins.

Magdeberg Hemispheres
Location: fluids

Atmospheric Pressure Rod
Location:

Suction Cups
Various suction cups and rubber sheets
Location: fluids

Weight of air
Weigh the air in a cylinder
Location:

Inside Out Balloon
A balloon in a flask stays inflated even when not tied shut.
Location: fluids
MECHANICS

Various Balls
Tennis balls, golf balls, basketballs, foam balls, bowling balls, etc.

Location:

Chaos

Double Pendulum

Location: Physics Lab Wall; near front entrance

Magnetic Pendulum
Pendulum moves chaotically around field of small magnets.

Location: mechanics demos

Pachinko Machine
Ball bearings fall through nails toward unpredictable destination.

Location: mechanics demos

Gravity

SparkTimer Free Fall Experiment

Location: spark timer and spark tape on shelf above clamps.

Vacuum Chamber
Penny and feather fall at the same rate in the absence of air resistance

Location: Mechanics Demos 4

Motion In One Dimension

Fan Cart
Fan provides constant force on Pasco Cart

Location: mechanics demos 1

Strobe Camera

Location:

Newton's First Law
Hover Craft
Glides across the floor with almost no friction

Location: Mechanics Demos 2

Newton's Second Law

Accelerometer, Floating Cork
Cork moves in the same direction as the bottle's acceleration

Location: Mechanics Demos 4

Hanging Newton Scales
Measures weight in Newtons

Location: Mechanics Demos 2

Rotational Dynamics

Centripetal Sliding Penny Experiment
Demonstrate centripetal acceleration

Location: Motor in Mechanics Aisle; Turntable in Lab in Cabinet 17; Motion Sensor in Lab in

Rotational Inertia Tubes
Same sized tubes with different mass distribution experience different inertias.

Location: Mechanics Demos 4

Tops, Gyroscopes, Yoyos
Various spinning objects including yoyos, gyroscope, and spinning tops.

Location: Mechanics Demos 2

Bicycle Wheels
Free standing bike wheel can spin quickly and be held by side handles

Location: Cords and Wheels

Spinning Puzzle
Goal is to get both the balls to sit in the grooves simultaneously.

Location: Mechanics Demos 2

Hover Copter
Copter hovers in the air controlled be a remote gun

Location: Mechanics Demos 2

Spinning Plate
Plate is swung in vertical loop, upside down with something placed on it.

Location: Mechanics Demos 2
Work And Energy

Bouncers, Poppers, Astroblasters
Objects interact with various degrees of elasticity during a collision.

Location: Mechanics Demos 2

Hanging Bowling Ball
Bowling ball with hook and rope (hanging accessories)

Location: Mechanics Demos 4

Loop Track
Powered by gravity, the ball rolls down the track and around the loop.

Location: Mechanics Demos 3
MODERN PHYSICS

Nuclear Physics

- **Short-lived Radioisotopes**
  Measures the half-life of short-lives radioisotopes
  
  **Location:** Radioactivity Closet

- **Table Model Geiger Tube and Counter**
  Calculates rate of decay of radioactive materials
  
  **Location:** Radioactivity Closet

Quantum Effects

- **Photoelectric effect experiment, Pasco**
  make Quantitative measurements of work function and h/e.
  
  **Location:** photoelectric effect shelf, in optics section

- **Photoelectric Effect Demo**
  Knock Electrons out of charged metal plate with UV lamp.

  **Location:**
OPTICS

Lasers, HeNe
Helium Neon Lasers
Location: Optics - Lasers

Laser Pointers
Various red and green laser pointers.
Location: Optics, Lasers

Spectrometers, old
Old Cast Iron Spectrometers
Location: Optics, Spectrometers and Interferometers

Color

Color Subtraction Transparencies
Looking at color subtraction with 4 color separation transparencies.
Location: colored objects drawer

Monochromatic Light Demo
Location:

Continuous Spectra
Look at incandescent spectrum with a grating
Location: gratings in gratings and slits drawer, Lamps in gas-spectra

Absorption Spectra
Grating for viewing absorption lines in solar spectrum
Location: Gas- Spectra

Color Reflection
Colored objects look different when illuminated with colored light.
Location: Objects in “colored objects” drawer, Slide projector in Optics demos 3.

Gas Discharge Tubes
Gas lamps that produce emission spectra
Location: Gas-Spectra
Color Addition Projector
Slide Projector shines moveable red, green and blue circles on wall.

*Location:* optics demos 2

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**Diffraction**

**Diffraction Gratings, Small Black Laboratory**
Mounted gratings for quantitative experiments.

*Location:* Gratings drawer.

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**Diffraction Grating, Large**
Large Demo Diffraction Grating, about 5 inches square

*Location:* Mounted one on Optics demos 2, spares in gratings drawer

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**Diffraction Gratings, hand held slide mounted**
Slide mounted gratings

*Location:* Gratings drawer

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**Spectrometers, Project Star**
Blue plastic calibrated Spectrometers

*Location:* Optics, Gas - spectra

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**Geometrical Optics Misc**

**Ray Boxes, Pasco**
various lenses and mirrors with light source

*Location:*

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**Ray Box, Laser**
A laser ray box with 5 beams.

*Location:* Optics Lasers, Laser Pointers Box

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**Blackboard Optics**
Various Large Lenses, Mirrors, and light sources for the whiteboard.

*Location:* Blackboard Optics, lower shelf of Optics

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**Interference**

**Michelson Interferometer**
Interference fringes can be viewed or projected on screen.

*Location:*
Interference Transparencies
Transparencies with circular "wave fronts" show interference patterns.

**Location:** Optics demos 2

Magnetic Fields And Forces

**Oscilloscope with Magnet**
Deflect oscilloscope "dot" with a magnet to test \( F = (v) \times (B) \)

**Location:** Electromagnetism Aisle (oscilloscopes on bottom shelf)

Misc Illusions

**Einstein Mask**
Mask faces away, but looks like its facing you and follows as you move.

**Location:** Optics demos 2

Reflection

**Optical Illusion Piggy Banks**
Two different coin banks use mirrors to create nice illusions.

**Location:** Optics demos 2

**Internal Reflection**
Various Total Internal Reflection Toys and water tank

**Location:** Flask in Optics tanks and boxes, toys in Fiber Optics Drawer

**Parabolic mirror illusion**
Two parabolic mirrors, makes a "floating penny" illusion at hole in mirror.

**Location:** Optics demos 2

**Optical Sound Transmission**
Laser light transmits microphone signal to detector and is amplified.

**Location:** Demo Drawers

**Corner Cube Reflectors**
Large and small Corner cube reflectors

**Location:** Optics demos 1

**Phantom Light bulb**
A real image of a light bulb is projected over a socket.

**Location:** Mirror in optics demos 1, box in Optics Boxes and tanks
Mirrors, Concave and Convex Large
Large demo mirrors.

Location: Optics demos 1

Refraction

Disappearing Test Tube
Glass test tube is invisible when immersed in oil of similar index of refraction.

Location: Optics demos 1

Fresnel Lenses
Flat glass and plastic sheets that work as lenses.

Location: optics demos 1

Scattering

Sunset Demo
Blue light is scattered more, leaving reddish light to go through fish tank.

Location: fish tank is in optics lower shelf
OSCILLATIONS AND WAVES

Air Canons
Shoots condensed packets of air across the room.

Location: Dewars and Air Canons

Oscillations

Magnetic Damped/Driven Oscillator Demo
Produces random or simple oscillations in metal disc.

Location: Wave Machines 1

Sound

Organ Pipes
Full set of wooden organ pipes

Location: Waves and Oscillations 1

Doppler Rocket
Noise-making rocket flies to and away demonstrating the doppler effect.

Location: Waves and Oscillations Demo 2

Guitar
Acoustic guitar with case

Location: Waves and Oscillations Demo 2

Bell in a Vacuum
Bell in vacuum chamber gets quiet when air is pumped out

Location: Vacuum Stuff (in thermodynamics area)

Noise Makers
Random noise makers

Location: Waves and Oscillations Demos 2

Microphones
noise amplifier

Location: Waves and Oscillations Demos 2

Noise-Cancelling Headphones
Uses sound wave interference to cancel out background noise.

Location: Waves and Oscillations 2
Tuning Forks
large and small w/ malletts included
Location: Waves and Oscillations Demos 2

Wave Motion

Transverse Standing Waves
Location:

Variable Medium Wave Machine
Tapered rods show waves as they move through different mediums
Location: Wave Machines 2

Bubble Wave Demo
Creates a standing waves on surface of thin soap film
Location: Waves and Oscillations Demos 3

Chladni Plate
Creates standing waves on square or circular plate.
Location: Waves and Oscillations Demos 3

Wave Machine
Demonstrates waves moving through a constant medium
Location: Waves Machines 1

Slinkys and Tubing
Demonstrates the motion of longitudinal waves
Location: Waves and Oscillations Demos 2
THERMODYNAMICS

Stirling Engine
Good example of an engine driven by the exchange of energy between a hot and cold reservoir

Location: Heat and Wave Stuff: Heat / Thermo 2

Change Of State

Freezing Liquid Nitrogen
Liquid N solidifies when pumped down to low pressure.

Location: vaccuum stuff (thermodynamics area)

Fuel Cell
Pasco demo of how a fuel cell works. Solar powered and drives a small propeller.

Location: Heat and Wave Stuff: Heat/Thermo 2

Gas Law

Heat Engine, Pasco
Heat Engine that gives quantitative data of pressure and volume.

Location: Heat/Thermo 4

Adiabatic Gas Law Apparatus, Pasco
Measures Pressure, Temp and Volume in adiabatic compression

Location: Adiabatic Compression Apparatus

Constant Volume Gas Thermometer
A water manometer is used to show the pressure in a flask of air.

Location: thermodynamics upper shelf

Crush the Can
Demonstrate the relationship between pressure and temperature

Location: Heat and Wave Stuff: heat / Thermo 4

Manometer

Location: Heat and Wave Stuff: Heat / Thermo 3

Molecular Speed

Location:

Heat And The First Law
Mechanical Equivalent of Heat
Measure the heat generated by a specific amount of mechanical work.

Location: Heat and Wave Stuff: Heat / Thermo 3

Thermal Properties Of Matter

Space Shuttle Tiles
Location: Heat and Wave Stuff: Heat / Thermo 2

Heat Conduction Experiment
PLC activity
Location: Heat and Wave Stuff: Heat / Thermo 3

Ice Melting Blocks
Location: Heat and Wave Stuff: Heat / Thermo 2

Heat Absorbtion Cans
Show how dark colors "absorb" more heat than lighter colors
Location: Heat and Wave Stuff: Heat / Thermo 2

Liquid Crystal Sheets
Heat sensitive. Shows areas of specified heat range via color variations
Location: Heat and Wave Stuff: Heat / Thermo 2

Thermal Expansion
Demonstrate and measure the thermal expansion of copper tubing
Location: Heat and Wave Stuff: Heat / Thermo 1