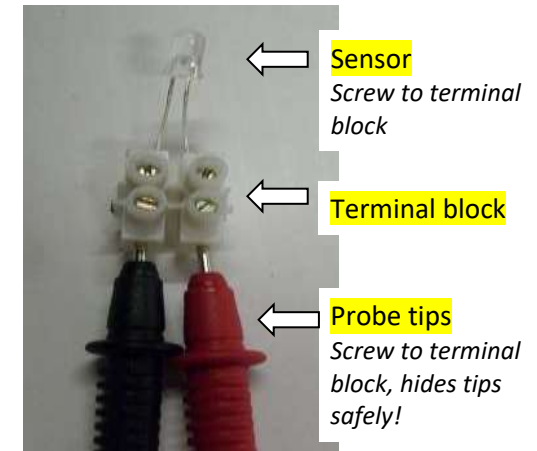


NOTES:

Digital Multimeter (DMM)



- DO NOT put leads into power sockets
- Turn OFF before plugging in OR removing a sensor
- Keep dry
- Rotate center dial SLOWLY to change settings
- Turn OFF when finished

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NZ primary & secondary science & maths activities; student-built equipment ideas; build robots; write computer games...

Demonstrations:

Many sensors are surprisingly cheap and simple to make.

In the first investigation we will see if a signal diode (a crystal that allows electricity to flow in one direction only) could be used to measure temperature.

A) Temperature: what's hot and what's not?

Many sensors are surprisingly simple to make.

We will see if a signal diode (a crystal that allows electricity to flow in one direction only) could be used to measure temperature.

- 1) Insert a signal diode (cost: 18 cents) into the terminal block.
- 2) Rotate the center switch dial to 200k (lower left, Ω setting).
- 2) To convert to degrees Celsius;
multiply the reading by -0.5, then **add** 67
- 3) Investigate objects and the air around you.

Example ideas:

- Are your hands the same temperature?
- Is the air by a window the same as the air further away?
- Are all parts of the room the same temperature?
- Who in your group has the hottest hands?

What did you find out? How does this sensor react to heat?

If there is no air in space, and space is very cold, how does the Sun warm the Earth? (Hint: try the next activity!)

Could you use this as part of a DIY weather station project?

B) Colours that are invisible: Detecting dangerous UV radiation

- 1) Insert an ultra-violet (UV) LED into the terminal block.
- 2) Rotate the center switch dial to 20 (V setting).
- 3) Investigate which light sources give off UV light and what materials block UV light.

Example ideas:

- A torch or lights that use an ordinary incandescent bulb.
- The Sun.
- Do sunglasses really block UV? Test this after finding out about torches and the Sun.
- Do windows or curtains block UV?
- Use a piece of Glad Wrap film as artificial skin to test sunblock

What did you find out? How does this sensor react to UV light?

C) What's your angle?

This sensor circuit is made from a volume control dial, a rotary variable resistor.

- 1) Insert the probe plugs into the angle sensor the right way.
- 2) Rotate the center switch dial to 200 k (lower left Ω setting).
- 3) Investigate how the resistance reading changes as you turn the dial.

Example ideas:

- Record some readings from the angles 0 degrees to 90 degrees.
- Plot this on a graph and observe how angle changes with resistance.
- How might you use this sensor on a weather vane to determine wind direction?

What did you find out? Do you have other ideas for using this sensor?

Could you use this as part of a robot arm position controller? How?

For teachers:

- 1) *What scientific concepts should be explored by students BEFORE attempting this activity?*
- 2) *How does this activity permit students to 'confirm, not just rote learn' science?*
- 3) *Which skills and numerical thinking could be demonstrated by students? (eg, units of measurement? Graph construction? Graph reading?)*
- 4) *What mathematical thinking should be explored by students AFTER attempting this activity?*
- 5) *How does this \$10 meter support doing maths and science at home or in the community?*
- 6) *How does this \$10 meter support doing cross-curricula learning (beating the 'crowded curriculum') in science and maths?*
- 7) *How does this encourage observing Earth and Space and using evidence-based thinking?*
- 8) *How does this activity encourage children to 'make things and develop systems' (part of the Nature of Science strand) as citizen scientists?*
- 9) *Note the Health and Safety guidance here...how well does your school consider issues like this?*