

# MAKEIT

## WORKSHOP PLAN



 national science week 2015

## SPECTROSCOPE

See the colours in different sources of light using this simple spectroscope made from a CD.



### AGE GROUP

8+ (scissors and craft knife required)



### METHOD

Group activity

(14:1 participant to facilitator ratio recommended)



### LEVEL

Introductory



### DURATION

20 minutes



### KEY LEARNINGS

Energy transfer through different mediums can be explained using wave and particle models. (Yr9:ACSSU182)

Advances in scientific understanding often rely on developments in technology, and technological advances are often linked to scientific discoveries. (Yr9:ACSHE158)



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# SPECTROSCOPE

## INCLUDED IN THIS WORKSHOP PLAN

- > Materials and equipment list
- > Preparation suggestions
- > Recommendations: General advice, post workshop suggestions and opportunities for further learning
- > Full 20 minute workshop outline

## APPENDIX

- > Spectroscope Template
- > Materials Suppliers List

## MATERIALS AND EQUIPMENT

- Spectrometer template on A4 card (1 per participant)
- Opaque sticky tape (can be shared between a few participants)
- Wedge cut from a CD or DVD (1 per participant)
- Scissors (1 per participant)
- Ruler (can be shared between a few participants)
- Craft knife (can be shared between a few participants)
- Hot glue for fixing wedge, if available (1 per group)
- SPECTROSCOPE TEMPLATE (appendix)
- MATERIAL SUPPLIERS LIST (appendix)

## PREPARATION

- > The facilitator should prepare for this workshop by making their own spectroscope using the instructions and materials provided. Note critical stages in gluing the device together, and making the thin slit, and advise the participants accordingly.
- > If hot glue is used, note how long it takes for the glue to harden enough before final assembly of the spectroscope can be done.
- > Have a rubbish bin ready for the cardboard waste.

## RECOMMENDATIONS

### GENERAL ADVICE

- > Depending on the age and skill levels of the participants, it might be wise to have a couple of extra copies of the template at hand if cutting errors make completion impossible. For this reason, it is a good idea to fix the wedges after cutting out the template. If hot glue is used, assist younger group members when fixing the wedges to the template.
- > CAUTION: Though sunlight can be viewed through the spectroscope, warn participants to never look directly at the sun as it can cause permanent eye damage.

### FURTHER LEARNING

Further learning could occur when participants use the device to view a variety of different light sources. What spectrum do you see when you look at a coloured light, or one filtered through coloured cellophane?



*Required, but not included in pre-packed kits:*

- Ruler
- Scissors
- Craft knife
- Hot glue
- Sticky tape

## WORKSHOP OUTLINE



00:00

### INTRODUCTION

Introduce yourself, welcome participants and cover any housekeeping.

Start the conversation.

Ask participants: Do you know how a rainbow is made?  
Where you have seen a rainbow?

Rainbows are sometimes seen when light passes through fish tanks, thick glass sheets and on feathers, raw meat, gems or shells. In the first examples, the effect is caused by light passing through a prism shape, but natural objects cause this effect because they have many very fine ridges on their surface (like a CD), or inside them (like opals).



00:05

### PREPARING THE TEMPLATE

Distribute template cards, scissors, sticky tape, rulers and craft knives.

Explain that the solid lines represent cuts, and the dotted lines are to be scored with the craft knife, using the ruler as a guide to get a straight line. Supervise as necessary.

Practise folding the spectroscope into shape, and point out that the CD slice will need to be fixed to the inside for it to work (this will avoid later confusion).

Continued...



*When the spectroscope is assembled the lines will be on the outside to take advantage of the scoring.*

*Participants could mark where to fix the CD slice if required.*

00:10

**MAKE THE LIGHT SLIT AND VIEWING HOLE**

Use scissors or the craft knife to make the 1cm viewing hole.

Use the craft knife to cut a very fine slit which will allow the light to enter the device.

The narrower the slit the better the spectrum, but less light also means it will be darker. If the slit gets too big, you can use two pieces of opaque tape fixed side by side on the template to remake a narrow gap.



*The viewing hole is marked on the template as a shaded circle at the bottom.*

*To create the slit, use the shaded circle with a horizontal line as your reference.*

00:15

**FIXING THE CD SLICE AND SEALING THE TUBE**

Distribute the CD wedges, and have participants fix them to the template, making sure it is oriented as indicated.

Hot glue is best, but sticky tape can be used as long as only the edges of the slice are covered.

Make sure the slice is fixed back down (the shiny rainbow side should face up).

Fold the tube closed, and seal it shut with glue or sticky tape, using the tabs in the template.

Now your spectroscope is ready to use: look through the viewing hole while pointing the slit at a light source. You might need to move your line of sight from side-to-side a bit to see the spectrum, and sunlight or an incandescent bulb will produce a continuous rainbow.

Other lights (try an LED, TV or computer screen) will show discrete bands of colour, and some bands may be much brighter than others, showing that different light sources emit different types of light.

If you can find a coloured light have a look at that to see a dramatic difference.

*Turning the slice will stop it from working.*

*Note that the slice is fixed inside the tube, and the diagram on the template is there to show the correct orientation only.*

*The edges and corners must be completely sealed to prevent any stray light from entering the tube.*

*Try covering a torch with coloured cellophane*

00:20

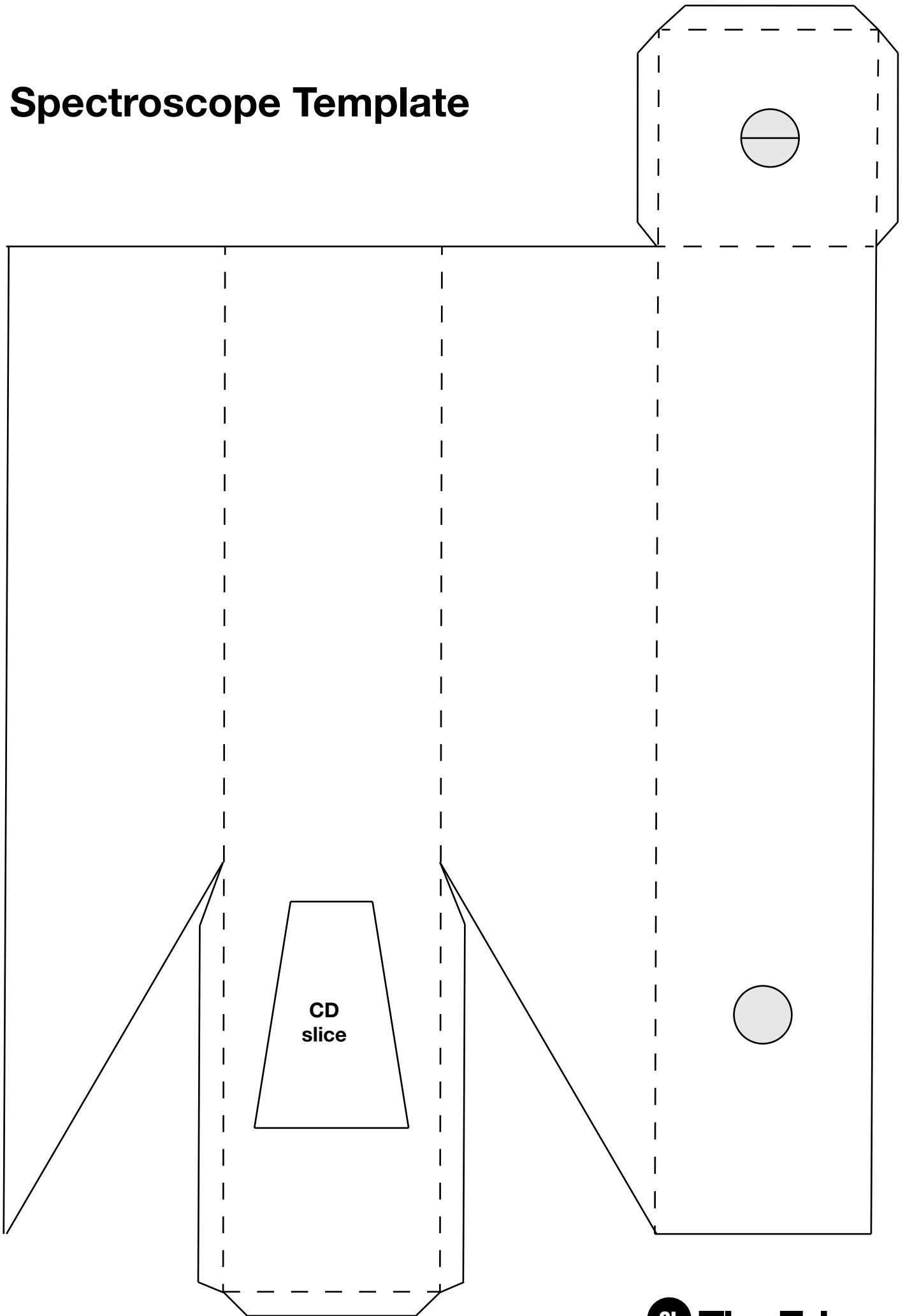
**THE END**

# APPENDIX

SPECTROSCOPE TEMPLATE

MATERIALS SUPPLIERS LIST

# Spectroscope Template



## SPECTROSCOPE MATERIALS SUPPLIERS

MATERIAL	QTY	SUPPLIER	COST	LINK
<b>A4 card for Template (15 per kit)</b>	100 (A3)	Officeworks	\$10.98 + \$5.95 shipping <\$55	<a href="http://www.officeworks.com.au/shop/officeworks/p/quill-a4-board-200gsm-white-50-pack-qubxlawe">http://www.officeworks.com.au/shop/officeworks/p/quill-a4-board-200gsm-white-50-pack-qubxlawe</a>
<b>Brown Tape (6 per kit)</b>	6 x 75m	Staples	\$8.73 + \$5.95 shipping <\$55	<a href="http://www.staples.com.au/main-catalogue-search?Ntt=brown+tape&amp;submit=Search&amp;searchtrigger=globalsearch">http://www.staples.com.au/main-catalogue-search?Ntt=brown+tape&amp;submit=Search&amp;searchtrigger=globalsearch</a>
<b>CD wedge (2 CDs per group)</b>	50	Officeworks	\$18.00+ \$5.95 shipping <\$55	<a href="http://www.officeworks.com.au">http://www.officeworks.com.au</a>

### ABOUT THIS LIST

We've put this list of suppliers together to help make the planning and preparation process a little easier. We don't receive any kick-backs or benefits from sharing this list with you.

If you've downloaded this workshop plan from [edgeqld.org.au](http://edgeqld.org.au) then you'll require all the materials and equipment listed at the beginning of this document (and above).

If you've received this workshop plan through the National Science Week kits distributed by your public library, then all the above materials are supplied in the kit.



# The Edge

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Tell us what you think, and what you'd change.

Take the 2 minute questionnaire:

[goo.gl/yBV2uw](http://goo.gl/yBV2uw)