

# Reflection and Refraction

The activities are related to the work in the KS4 Waves and Radiation topic. Module names and content may vary from syllabus to syllabus.

It covers the following National Curriculum statement: SC4.3a pupils should be taught about the reflection, refraction and diffraction of waves.



## Organisation of the Materials

The SMART Notebook™ file is saved as “KS4 reflection and refraction.notebook”. It consists of ten pages, the first of which is a title page. There are seven pages to support the activity.

These can be used as lesson starters, lesson plenaries or to support the main part of the lesson. Page 9 contains links to some useful websites and page 10 contains teachers notes.

The materials can also be used as part of a revision lesson.

## Activity 1

**Keyword Bingo**

1. Draw a 3 x 3 grid

2. Choose 9 of these words, and add them to your grid

amplitude	polarised
wavelength	crest
frequency	trough
longitudinal wave	reflection
transverse wave	refraction
volume	diffraction

3. Then go to the next page

Page 2

This activity provides a fun lesson starter that reinforces some of the key words that pupils need to know as part of this unit of work. Begin by asking the pupils to draw a large 3x3 grid on a piece of paper.

Each square needs to

be large enough to fit one or two words in it. They then select nine of the 12 key words from the list shown on page 2 and write them at random in their grid. Eventually they should have each box filled with a different word.

where waves spread out

height of a wave

where a wave is bounced back

Remove the red boxes at random

If you have the word in your bingo grid. Cross it off

Who will be the first to get three in a row? Who will be the first to get a full house?

Page 3

Once each pupil has their bingo grid set up, move to page 3. Remove/delete one square from the page to reveal a word definition. Pupils need to work out what key word it is describing and, if they have that word in their grid, they

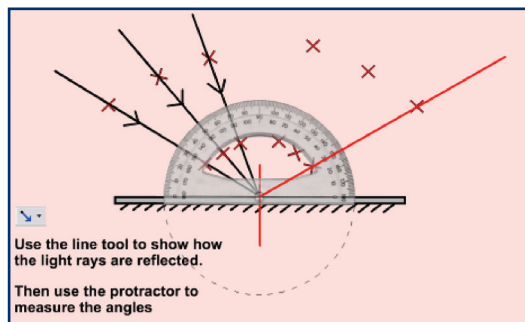
can cross it off. Once this is done, remove another random box and repeat. You can choose to give a small reward for the first pupil who gets three in a row and then carry on to see who gets a 'full house'.

## Activity 2

This activity can be used to supplement a practical session of using ray boxes and mirrors to measure reflection. It can also be used to revise this work at a later stage.

Use the 'Straight Line' tool to join up the red crosses back to the Normal. Then use the protractor to measure the two angles. Repeat for the other two pairs of crosses.

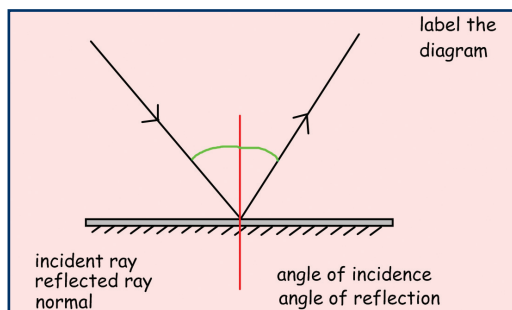
The Protractor can be easily resized for clarity and can also be rotated. It is slightly transparent so the lines can be seen through it.



Page 4

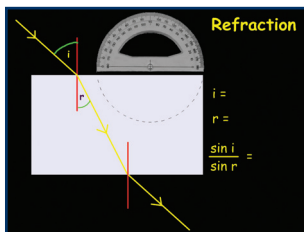
## Activity 3

This activity provides a simple revision activity. Ask the pupils to consider where the labels should go on this diagram. Give them some time to label their own versions, then ask one pupil to come up and drag the labels to the correct places.



Page 5

## Activity 4



Page 6

This activity can be used to supplement a practical session using ray boxes and glass blocks to measure refraction. It can also be used to revise this work at a later stage.

Use the protractor to measure the angles of incidence and refraction. Write these numbers

onto the Notebook page. You can then use a calculator to calculate the refractive index of the material.

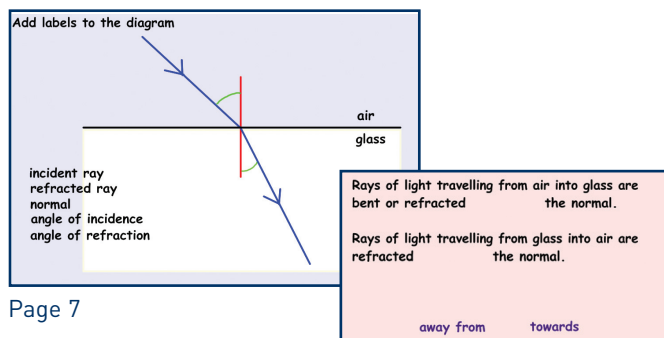
You can use the Microsoft® Windows calculator for this – it is usually found in Start/Programs/Accessories/Calculator.

## Activity 5

Pages 7 and 8 provide a simple revision task.

Ask the pupils to consider where the labels should go on this diagram and give them some time to label their own versions. Then ask one to come up and drag the labels to the correct places.

On page 8 there is a simple summary of refraction. Ask the pupils which words fit which spaces. Ask a pupil to drag the words to the correct space.



Page 7

Page 8



## Other Notes

### Notes

- Photographs make good source material when looking at reflections - you and/or pupils can use a digital camera, scan images from books and magazines or find images on the Internet or CD
- You can write and draw over any image to add annotations and labels. Draw ray lines quickly using the straight line tool
- You can find a useable protractor in the Mathematics section of the Gallery. You can drag this to your own area of the gallery for ease of use in the future
- Glass blocks can be drawn using the square shape tool. Lock it in place (right click, lock in place) to stop it accidentally moving when adding ray lines to the diagram

Page 10

The SMART Notebook Gallery has an Education area, within which is a Science and Technology area and within that a Physics section. Within the Light category there are some useful images and diagrams that you can drag into a Notebook page, resize and manipulate.

Google is a great source of images to use with your Notebook files. Use the camera tool to capture images and bring them into your notebook.

Simulation software such as Crocodile Physics can be used to good effect on the SMART Board™ interactive whiteboard. You can set up reflection and refraction experiments and demonstrate them to the whole class. Use the camera tool to capture different experiments and bring them into a Notebook page so that you can annotate over the top.

You can modify the "KS4 reflection and refraction.notebook" Notebook file in any way you like – but it would be a good idea to save it with a different name in case you want to access the original again in the future.

[www.smartboard.co.uk](http://www.smartboard.co.uk)

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