Physics: Light

Whole unit overview

Learning Outcomes		Suggested Teaching Activities	Resources
3.2 (a)	Describe the formation, and give the characteristics, of an optical image by a plane mirror. Use the law angle of incidence = angle of reflection.	Use simple experiments with optical pins to find the position of the image in a plane mirror. Use ray box experiments to investigate angle of incidence = angle of reflection.	How to make a simple periscope. http://www-2.cs.cmu.edu/~rapidproto /students/waynec/project3/periscope.html
	Perform simple constructions, measurements and calculations.	Extend to draw simple ray diagrams.	
3.2 (b)	Describe an experimental demonstration of the refraction of light. Use the terminology for the angle of incidence *i* and angle of refraction r and describe the passage of light through parallel-sided transparent material give the meaning of critical angle. Describe internal and total internal reflection.	Use rectangular transparent blocks (Perspex or glass) with optical pins or ray boxes to investigate refraction. Develop this to experiments with a semicircular transparent block to investigate critical angle and total internal reflection.	Instructions for a demonstration of total internal reflection http://www.learn.co.uk/learnthings click on enter, then KS4 science foundation, then light and colour, then total internal reflection. More details on further experiments related to total internal reflection and much more http://www.phys.virginia.edu/Education/outreach click on 8thgrade Physical Science Sol Activities then PS.9 to find total internal reflection

	Recall and use definition of refractive index *n* in terms of speed. Recall and use the equation sin i/sin *r* = *n.* Describe the action of optical fibres.	Extend the refraction work with the rectangular block to include quantitative use of sin i/sin r. Encourage deeper thought with able candidates by discussing refractive index in terms of the speed of light in different materials. Use inexpensive 'novelty' light items to demonstrate optical fibres.	
3.2 (c)	Describe the action of a thin converging lens on a beam of light. Use the terms principal focus and focal length. Draw ray diagrams to illustrate the formation of a real image by a single lens.	Investigate converging lenses by: forming an image of a distant object (e.g. a tree or building seen from the laboratory window), bringing parallel rays from a ray box to a focus through a cylindrical lens, drawing ray diagrams to scale to show the formation of a real image.	There is a large amount of information and teaching on this site http://www.physicsclassroom.com/Class/refrn/U14L5a.html
	Draw ray diagrams to illustrate the formation of a virtual image by a single lens. Use and describe the use of a single lens as a magnifying glass.	Extend the ray diagram work to include the formation of a virtual image and use a magnifying glass.	

3.2 (d)	Give a qualitative account of the dispersion of light as illustrated by the action on light of a glass prism.	Use a simple experiment, or demonstration, to show that white light from a ray box or slide projector is dispersed by a prism. A single slit can be cut from a piece of stiff card and inserted in the slide carrier of the projector to produce a ray that can be shone through the prism on to a screen. Although not part of the syllabus, students will find it interesting to learn a little about mixing coloured lights at this stage.	Interactive colour mixing (no need for a colour mixing kit or blackout) http://www.phy.ntnu.edu.tw/java/shadow/shadow.html For prism work: http://www.learn.co.uk/learnthings Go to Key Stage 4 Science foundation Go to light and colour, then dispersion </TBODY>