Teacher and Technician Sheet

In this practical students will:

- Make and report on findings from their enquiries.
- Using their scientific understanding of mixtures and emulsions, and the properties of light to explain their observations.

Introduction:

Start with a discussion on the colour of the sky prompted by photographs of beautiful blue skies and lovely sunsets.

Why does the sky appear to be that colour on one day and another on a different day?

A good example to look at would be Claude Monet's painting of the *Thames at Westminster* (National Gallery) painted along with others during his stays in London.

These paintings have generally the same size and viewpoint, Monet's window overlooking the Thames. They were painted at different times of the day, in different weather conditions, and some from memory back in France.

What is striking is the range of colour in the paintings. Now, choice of colour is always an artist's prerogative and is not always a representative colour. So, that poses a question for discussion 'What could have influenced Monet's choice of colour?'

Curriculum range:

Secondary age students to investigate materials. It links with:

- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions;
- using straightforward scientific evidence to answer questions or to support their findings;
- comparing and grouping together everyday materials on the basis of their properties;
- knowing that some materials will mix, while others will not;
- know that some liquids that do not mix can be turned into emulsions;
- building a more systematic understanding of materials by exploring; and comparing the properties of a broad range of materials.

Hazard warnings:

Care needs to be taken with the laser pointer and the beam should not be pointed into the eyes of anyone.

Many laser pointers are unclassified. Their power output can vary significantly depending on the batteries fitted. Indeed, we have heard of some that are nine times more powerful than they ought to be. Also, laser pointers may be picked up by pupils and waved around. A Class 2 laser pointer may be used by a teacher to highlight something on a board, but laser pointers should not be used for experiments.

Laser diode modules (LDMs) are a safer option than laser pointers. They can be clamped in a boss head. Many of them also have automatic power control circuitry built in, so they do not exceed the appropriate power output.

It might also be possible to use a torch that has quite a narrow beam.

Equipment:

- Milk or powdered milk about 20 g
- 1 teaspoon (if using powdered milk)
- 1 eye dropper (or plastic pipette)
- 1 small torch or light
- 2 clear straight-sided glasses or jars (or 250 cm^3 glass beakers)
- Water, enough to fill the glasses or jars

Technical notes:

An optimum amount of milk (or milk powder) works with this experiment (10 drops of milk or ¼ teaspoon of milk powder).

Small narrow beam torches work best to observe the light beam.

Results:

The students should be able to observe that the light beam isn't visible in the clear water but is visible in the milky water because the light is hitting particles of milk in the water.

The torch light beam is visible in the milky water.

The torchlight is observed as a wide, whitish beam of light. When observed from different angles the torch light appears yellow at the source with blue colours subtly apparent away from the source of the light when viewed at the different angles.

Students could be reminded that they are only to observe the torch light at many angles and not the laser light.

Going further:

Research Rayleigh scattering (the following get progressively more difficult); http://www.sciencemadesimple.com/sky_blue.html, http://www.atoptics.co.uk/atoptics/blsky.htm or http://hyperphysics.phy-astr.gsu.edu/hbase/atmos/blusky.html.