

Student Sheet

In this practical I will be:

- Making and reporting on findings from my enquiries.
- Using my scientific understanding of mixtures and emulsions, and the properties of light to explain my observations

Introduction:

You wake early one morning and see that there is a lot of fog coming in from the Nile. You can just make out a man on a boat travelling down the river. However, as he moves away from you, the angle of the lamp on the stern of the boat changes, and an interesting phenomenon occurs. Like all good ancient Egyptian science-artists, you decide to investigate further...

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 cm³ glass beaker)
- Water, enough to fill the glasses or jars

Hazard warning:

Do not shine bright lights into the eyes of anyone.

Method:

1. Fill the two glasses or jars with water.
2. Place them next to each other.
3. Take one of the full glasses or jars and, using an eye dropper (or plastic pipette), add drops of milk until it looks cloudy (approx. 10 drops). If using powdered milk add small amounts of the powder (approximately ¼ teaspoon) and stir until the water looks cloudy.
4. With the two glasses or jars (beakers) side by side shine the torch through both of them.
 - What do you observe? Try to explain what happened.



5. Now take the torch place it on the outside of the glass or jar containing the milk mixture and shine it inwards through the milk mixture.
6. Look at the light through the liquid from different angles.
7. Describe the colour of the light from different angles.

Going further:

Think about and research what effect the size of the particles might have on the scattering.

Research Rayleigh scattering; 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>.

Theory:

When the milk is added to the water, the milk particles are suspended in the water. Any light coming through hits these milk particles and is scattered. This means we can see the light coming from the torch beam, because some of the light is scattered in different directions.

This scattering does not occur in the water so the beam cannot be seen in this glass.

When the torch is put to the milk solution and the light is shone through it, the light is scattered. The torch produces a range of different wavelengths of light hence it looks white.

Each wavelength is scattered differently, this separates the different wavelengths, and hence the colours of the light are separated. When we look through the milk mix from different angles we see those colours.

The same light scattering occurs in our atmosphere because of the particles present in the air. This gives us our blue sky, and gives us red and yellow sunsets.

