

## Teacher and Technician Sheet

In this practical students will:

- Carry out the practical, making careful observations.
- Accurately use key terms such as **mixture**, **emulsion**, **emulsifier**, **hydrophilic** and **hydrophobic**.
- Use their observations to draw conclusions about the properties of the liquids used in the practical.
- Suggesting ways of creating an **emulsion** from two non-mixing, based on observations of the experiment.

### Introduction:

This experiment can easily be done in a kitchen as 'making a salad dressing' using oil and vinegar rather than oil and water. You can taste the resulting mixtures as well as observing them. If you do this, do not taste the ones containing raw egg.

Students should never be encouraged to put anything in their mouths when carrying out experiments.

It is strongly advised students should not eat or drink anything in a school laboratory.

This practical can take a long time so the teacher can either split the class into two and one half do the first part and the other half do the second half then the students come together to compare their results.

Time can also be saved by having the oil and water in the bottles for the students.

A **mixture** of oil and water usually separates quickly, but a range of substances act as **emulsifiers**.

### Curriculum range:

This practical can be carried out by primary and younger secondary age students. This practical 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;
- compare and group together everyday materials on the basis of their properties;
- know that some materials will mix, while others will not;
- know that liquids that do not mix can be turned into emulsions;



- build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials.

### Hazard warnings:

Due to salmonella risk, handling raw egg should be kept to a minimum, so provide plastic gloves and use disposable plastic pipettes (or disposable plastic spoons) for students to transfer the egg to the screw top bottles (test tubes).

### Equipment:

- 6 small screw top bottles (100 cm<sup>3</sup>) or test tubes and bungs
- 5 disposable teat pipettes – 1 for the water, 1 for the oil, 1 for the detergent 1 for the egg white and 1 for the egg yolk (it may be easier to use a spoon for the egg yolk)
- 3 teaspoons (or disposable plastic spoons)
- 2 cm<sup>3</sup> any cooking oil
- 2 cm<sup>3</sup> good quality washing up liquid
- 10 g sugar
- 10 g flour
- 10 g mustard powder
- 1 egg
- 2 bowls (or 100 cm<sup>3</sup> glass beakers)
- Egg yolk separator (or separate using the egg shell)
- Plastic disposable gloves

### Technical notes:

- Using small screw top bottles means it is easier to see what is going on and much easier to clean up. The bottles must be very clean and must not be contaminated with detergent. Test tubes and bungs can also be used.
- Corn oil is a good oil to use because of its colour, which is easier to see.
- Use a good quality detergent because cheaper detergents do not usually work very well.
- Colman's mustard powder is good and the powder lasts longer than ordinary mustard.
- Use fresh eggs. It is easier to separate these, and if necessary you can buy an egg yolk separator. Try to make sure no yolk contaminates the white – the other way round is less important.



**Results:**

Students should be able to observe:

Water and oil: Water mixes into oil making a cloudy mixture with a thicker consistency. After 5-10 minutes the oil and water separate into two distinct layers with water on the bottom layer and oil on the top.

Adding detergent: Produces a cloudy mixture with a thin consistency and layer of foam on top. After 5–10 minutes this produces a liquid bottom layer and some foam above that **indicating an emulsifier**.

**N.B. This can give a false reading and separate into distinct layers if a weak detergent (or not enough) is used.**

Adding sugar: Mixes into a thicker paste consistency then separates after 5–10 minutes into two separate layers.

Adding flour: Mixes into a milky substance with some oil globules visible in the liquid. After 5–10 minutes the solid does not dissolve but settles to the bottom, with two distinct layers of liquid and then oil as the top layer.

Adding mustard: This mixes in well producing a yellow liquid with powder particles visible on the walls of the bottle. After 5–10 minutes nothing has changed and the solution remains mixed well. **This should indicate to the student that the mustard is an emulsifier.**

Adding egg white: Mixes into a cloudy gelatinous substance with no visible oil. After 5–10 minutes there are two (less distinct) layers. The bottom layer is a darker cream than the top with the top layer whiter and slightly foamy.

Adding egg yolk: This mixes in completely producing a cloudy yellow liquid that is still the same after 5–10 minutes, indicating an emulsifier.

Overall, this experiment is easy to provide and carry out with results that support the chemistry notes and consolidate the practical learning experience.

