

Emulsifiers

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Acknowledgements

This resource was originally amended and adapted by the University of Reading to support outreach work delivered as part of the Chemistry for All project.

To find out more about the project, and get more resources to help widen participation, visit our Outreach resources hub: rsc.li/3CJX7M3.

Guidance notes

This session should take approximately one hour to complete in full. It was initially created for 11–14 year-old learners but can be adapted for other age groups.

Download the PowerPoint presentation, technician notes and student workbook that accompany this resource from rsc.li/3cpvP4k.

Read our health & safety guidance, available from rsc.li/3IAmFA0, and carry out a risk assessment before running any live practical.

The safety equipment suggested is in line with CLEAPSS requirements. For non-hazardous substances, wearing lab coats can help to protect clothes. The safety rules might be different where you live so it is worth checking local and school guidance.

Be aware of any allergies before carrying out the activities.

Learning objectives

Learners will be able to:

- Explain how soap acts as an emulsifier in cleaning.
- Explain how emulsifiers are used to make hand creams.

Introduction: what is soap?

Use **slide 3** of the PowerPoint to introduce soap and its history.

Career link

Senior scientist, household goods

Highlight chemistry careers, such as senior scientist in household goods Phillip. His job profile, available on **slide 4** and from rsc.li/3kfmIRF, explains how he leads a team of researchers to improve the quality and performance of household products such as soaps and shampoos.

Demonstration: why does soap clean?

Slide 5 introduces the demonstration on the effect of emulsifiers.

Fill a large plastic bottle to about one third full of water and add five drops of food colouring. Explain how oils and water normally don't mix and then add an equal amount of vegetable oil carefully so that it forms a distinct layer. Gently shake the bottle and show how the layers do not mix. Even when they do, they will separate out again, given time.

Add a small amount of washing-up liquid and shake the bottle. The oil and water will now mix. Show the answers on **slides 6 and 7** to explain how soap cleans by forming an emulsion.

Slide 8 explains how the washing-up liquid acts as an emulsifier in this demonstration.

Answers

- (a) The oil and water do not mix. The oil forms an upper layer on top of the coloured water.

(b) The oil and water do not mix. The oil is less dense than water so will float on top of the water.
- (a) When the washing-up liquid was added, the oil and water were able to mix together.

(b) The washing-up liquid allows the water and oil to mix by acting as an emulsifier. An emulsion is formed, where the oil is dispersed as small droplets throughout the water.
- An emulsion is formed when one liquid is dispersed through another liquid in the form of small droplets.
- An emulsifier is an agent which allows two liquids to mix to form an emulsion.

Career link

Consumer products technician

Use the video job profile on **slide 9**, also available from rsc.li/3HR7C31, to discuss careers such as Robert's, a consumer products technician. He develops materials to improve the properties of household products such as washing-up liquids and soaps.

Activity 1: making hand cream

Use **slide 11** to introduce hand creams and their uses. In this activity, learners will work in pairs or small groups of three to produce their own hand cream using the method provided in the student workbook and **slides 12 and 13** of the PowerPoint.

Safety

Remind learners not to use the hand cream they make. Be aware of any allergies prior to completing the activity.

Answer

(a) Lecithin is the emulsifier, which allows the oil and water to mix to make a cream.

Activity 2: analysing hand cream using a microscope

Learners examine their hand cream under a microscope. Learners may need support in using a microscope, depending on whether they have used a microscope before. It is probably worth preparing a slide and microscope with some hand cream you made earlier in case you run out of time. Tell learners they will use a microscope to look at the sample of hand cream they made in greater detail. They should be able to see how the oil droplets are spread throughout the mixture.

In case learners have not used a microscope recently, provide the following advice to help them:

- If you cannot see the sample clearly, turn up the light.
- When focusing, raise the stage until it is as high as it will go, then lower it slowly using the coarse focus. That way there is less risk of breaking the slide.
- Make sure you are focused on the lowest setting (usually $\times 10$) before increasing to $\times 40$. It will then be easier to focus on high power as it should be close to the optimum focus already.

Answers

- (a) Learner drawing of their hand cream sample, with oil and water labels.
- (b) Hand cream is an emulsion as it is made up of oil droplets suspended in a watery solution.