Guidance AA4.30 Making cosmetics

Part A: Bath salts

Teaching notes

Magnesium sulfate was made in Activity AA4.17 *Making soluble salts*, but probably not in the quantity needed here.

This activity could be extended to into Section 8 and used as a costing exercise, including costing the reaction process to make the magnesium sulfate.

An important part of the cost of bath salts (and many cosmetic preparations) is the packaging and advertising, a point that could be followed up if there is time. Some groups will enjoy the challenge of developing a new cosmetic brand with distinctive packaging, promotion, colour, and perfume. The challenge for each group is to develop the brand, make two or three products, and then promote them to the rest of the class.

Answers to questions

1 The exact proportions of the different salts in the mixture is not important.

2 Cost would be important. Low-grade chemicals could be used as long as the impurities were known and did not include any irritants, insoluble residues, or unpleasant smells or colours.

Requirements *(per group)*

- small beaker for measuring
- large beaker for mixing
- stirring rod or spoon
- screw-topped jar
- large self-adhesive label

access to:

- magnesium sulfate (or Epsom salts)
- sodium hydrogencarbonate (or baking soda)
- sodium chloride (or cooking salt)
- selection of food colours
- selection of perfumes

Guidance AA4.30 Making cosmetics

Part B: Shampoo

Teaching notes

Sodium laureth sulfate is an anionic surfactant widely used for shampoos because it is cheap, skin friendly, and easily thickened with salt. The salt should be added very gradually, with each addition dissolved before the next is added, otherwise the shampoo will get too thick, more like shower gel. If too much salt is added the mixture will collapse and lose its viscosity. The effect of adding an electrolyte such as salt is to change the micelle structure of the surfactant molecules causing the increase in viscosity; eventually the molecular arrangement changes into a lamella structure with low viscosity.

Answers to questions

3 A solution (of salt and detergent in water)

4 Water – solvent; detergent – to remove dirt; salt – to cause the detergent solution to thicken; colour and perfume – to make the product appealing

5 Other ingredients are added to shampoos to make the foam stable, to give a neutral or slightly acidic pH, to prevent contamination by micro-organisms, and to leave a shine on the hair.

Requirements *(per group)*

- beaker, 250 cm^3
- measuring cylinder, 100 cm^3
- stirring rod
- spatula
- screw-topped bottle
- large self-adhesive label

access to:

- detergent solution, 27% solution of sodium lauryl ether sulfate (also known as sodium laureth sulfate or under many trade names)
- sodium chloride
- selection of food colours
- selection of perfumes

Health and safety notes

There is no preservative in the products. As a result they may not last very long. Unskilled use of preservatives is hazardous because the preservatives are powerful killers of microbes.

Guidance AA4.30 Making cosmetics

Part C: Face cream

Teaching notes

This activity provides a good opportunity to revisit the distinction between melting (on heating the stearic acid) and dissolving (which is what happens to the glycerol in the water).

The emulsion is a very fine dispersion of stearic acid in water. The stearic acid does not dissolve in the water but is broken up into very fine droplets.

The resulting emulsion has distinct properties of its own. It is creamy and, at room temperature, neither as runny as the aqueous phase nor as hard as the solid acid.

The emulsifying agent is potassium stearate which forms on mixing the molten acid with the aqueous alkali. It is a kind of soap.

potassium hydroxide + stearic acid → potassium stearate + water

All the potassium hydroxide gets used up because there is a considerable excess of stearic acid.

Molten compounds and solutions are clear because they have no inner surfaces. The emulsion is cloudy because of the boundaries between the water and the droplets of stearic acid which reflect, refract, or scatter light.

Further information

More cosmetics recipes can be found at:

www.makingcosmetics.com/

Requirements *(per group)*

- beakers, 100 or 150 cm^3 (× 2)
- stirring thermometers
- burner, tripod, gauze, and mat
- jar or other container for the product with label
- eye protection

access to:

- balance
- stearic acid, 15 g per group
- glycerol (propan-1,2,3-triol), 8 g per group
- potassium hydroxide solution, 1 g in 100 cm^3, 76 cm^3 per group (solution is IRRITANT, solid is CORROSIVE)
- perfume
- greasepaint
- cotton wool

Technical notes

The perfume and preservative are optional. A suitable preservative is nipagin M.

Health and safety notes

Providing a dilute solution of potassium hydroxide avoids the main hazard and means that there is no danger of students adding an excess of alkali. Potassium hydroxide solution is IRRITANT from 0.1 mol/litre (5.6 g/litre) up to 0.5 mol/litre. Higher concentrations are CORROSIVE.