

Design a washing powder

SCHOOL TEXTS often suggest that pupils should compare the activity of biological and non-biological washing powders. However, these formulations differ by more than the presence or absence of enzymes. In this investigation, pupils make and evaluate their own biological washing powders.

Safety

The enzymes used here are identical to those found in washing powders. They are encapsulated in a low melting-point wax and are therefore safe to handle and unlikely to form airborne dust. Unnecessary contact with the dissolved enzyme should be avoided. Wash splashes with plenty of water. Spills of enzyme solution should be wiped up promptly.

Materials

Exposed, developed, photographic film
Encapsulated protease enzymes, Novo Nordisk *Alcalase*[®], Novo Nordisk *Savinase*[®] (available from the NCBE).

NOTE: NCBE also supplies a washing powder enzyme pack, containing an assortment of five different enzymes.

Enzyme-free washing powder
Glass stirring rods, 2
Boiling tubes, 2
Water bath, set to 50°C
Scissors
Stopclock
Balance, accurate to 0.1 g

Further activities

1. Do proteases, added to liquid detergent formulations, degrade other enzymes such as lipases? Can boric acid be used to inhibit proteases and so overcome this problem?
2. Investigate the effect of pH on the activity of the two enzymes.

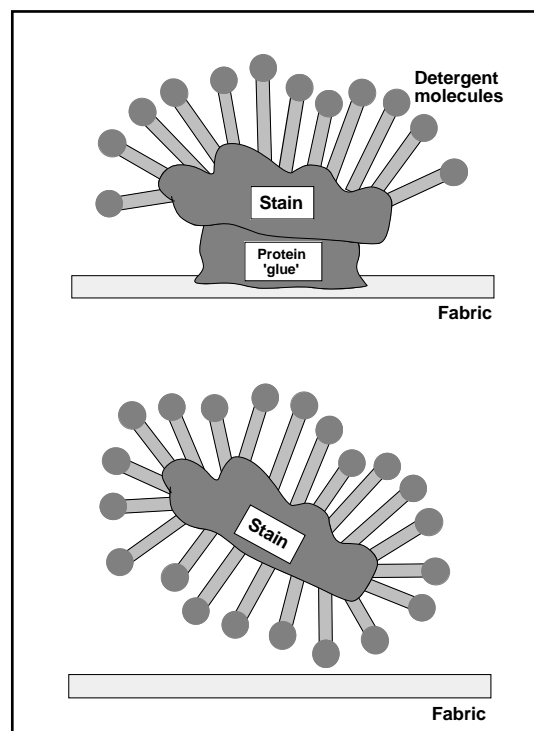


Practical details

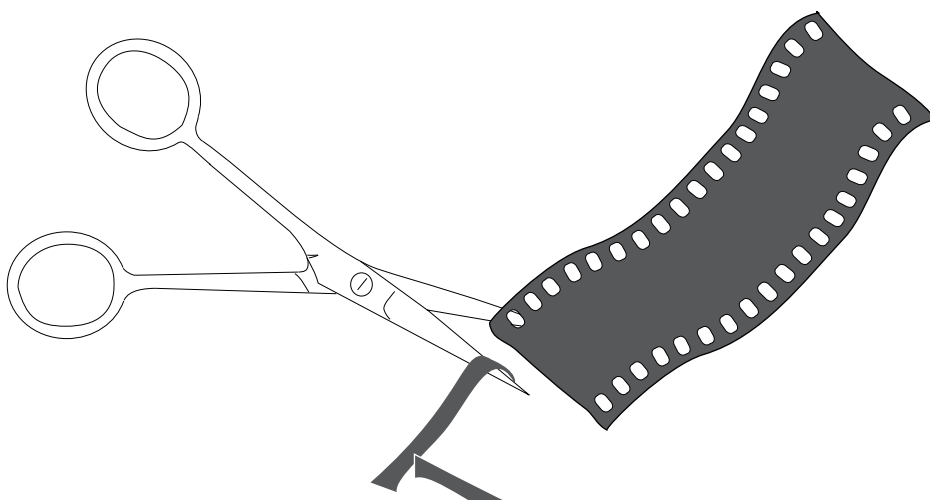
1. Make up a washing powder, adding 1–2 g of protease for every 100 g of enzyme-free powder.
2. Use a 1% solution of the mixture.
3. Add strips of photographic film about 4 mm wide to the washing powder solution.
4. Incubate in a water bath at 50–60°C for 10–20 minutes, or until the film has cleared. Gentle agitation may be needed.
5. Record the time taken to completely clear the photographic film.
6. Remember to carry out suitable 'controls' using enzyme-free washing powder solution alone.

ADDITIONAL INFORMATION

Madden, D. (1991) 'Genes in the wash' *NCBE Newsletter*, Spring 1991. pp. 1–4.

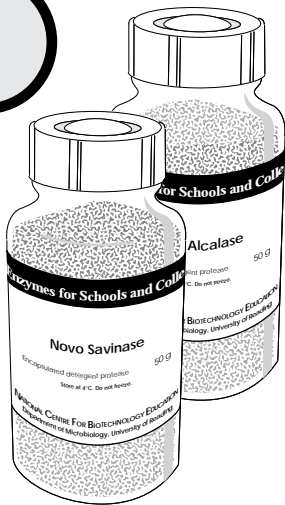


As well as attacking protein stains directly, enzymes degrade the protein 'glue' that sticks other stains to fabric, allowing detergents to lift them free.



Design your own washing powder

1

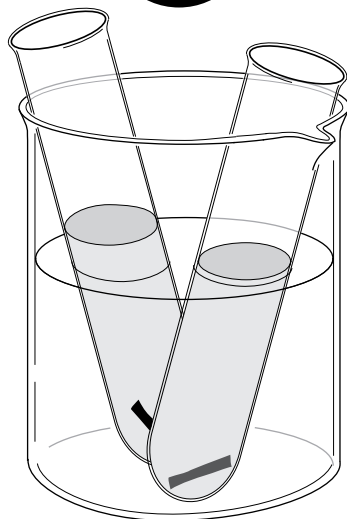


Use a non-biological powder as the base for your new product.

Add different types of protease enzyme to it.

(Use 1–2 g of enzyme for every 100 g of powder.)

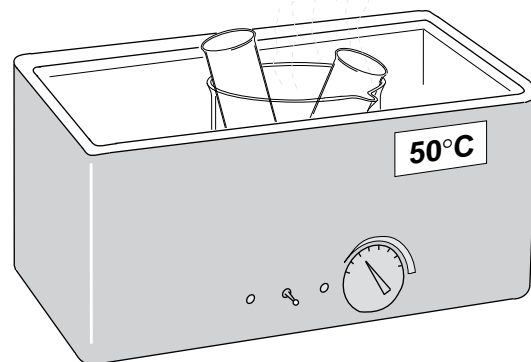
2



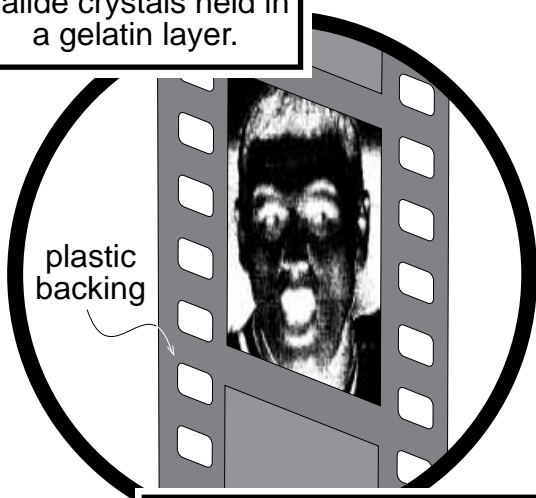
Test your new powder using thin strips cut from old photographic negatives.

3

Place the test tubes in a water bath. Try a range of different temperatures.



The pictures on film are made from silver halide crystals held in a gelatin layer.



Gelatin is a protein. As the protease enzyme breaks down the gelatin, the crystals are released and the picture disappears!

4

Record how long it takes for the picture to disappear from the film.

Which enzyme works best?

What is the best temperature for your new product?

