

## What is the most cost-effective brand of bleach?

Note: When reviewing the different types of bleach it is quite often better to use those that do not contain thickeners and perfumes as these make it more difficult for assaying their concentration.

### REQUIREMENTS

Eye protection



2 micropipettes®, syringes (+ silicone tubing) and tips; microspatula®

Comboplate®

3 propettes®

Microstand® + 2 arms

10cm<sup>3</sup> measuring cylinder

2 50 cm<sup>3</sup> beakers - one for the diluted bleach and one for the sodium thiosulfate

1% starch solution

Sulfuric acid 1 mol dm<sup>-3</sup>



Potassium iodide solution 10%

Sodium thiosulfate solution 0.100 mol dm<sup>-3</sup>

Range of different household bleaches plus price information



'Magic marker'

Distilled water in wash bottle

A4 paper preferably laminated

### Procedure

1. Fill the measuring cylinder up to the 10cm<sup>3</sup> mark with distilled water and then using one of your propettes accurately remove 0.5 cm<sup>3</sup> of the water. Using your 'magic marker' mark the level of the water on then propette. **Make sure there are no bubbles in the propette®!**
2. Repeat '1' using on of your other two propettes and then label the two marked propettes as KI and A (for the sulfuric acid).
3. Take your Comboplate and get stores of KI, acid and starch from your teacher and put these solutions in wells of your Comboplate as follows:-

WELL	F4	F5	F6
SOLUTION	Starch solution (about 1/3 full)	KI solution (near to the top)	H <sub>2</sub> SO <sub>4</sub> solution (near to the top)

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4. Take one of your Micropipettes® and rinse out with the bleach solution supplied by your teacher. Pipette 1 cm<sup>3</sup> of the bleach into the 10 cm<sup>3</sup> measuring cylinder and make up to 10 cm<sup>3</sup> using distilled water.
5. Wash the Micropipette® and rinse with the diluted bleach. Pipette 0.5cm<sup>3</sup> samples of the diluted bleach into Wells E1, E2 and E3 of your Comboplate®.
6. Using your labelled Propettes® add 0.5cm<sup>3</sup> of potassium iodide solution and 0.5cm<sup>3</sup> of the sulfuric acid to each of your bleach samples.
7. Take your second Micropipette® and rinse with the sodium thiosulfate solution. Draw the sodium thiosulfate solution up to the zero mark and place in the Microstand. Position the Microstand so that the Micropipette is above Well E1.
8. Add 0.10 cm<sup>3</sup> of the sodium thiosulfate at a time and stir with the Microspatula®. When the brown colour of the iodine solution formed turns to a pale straw colour, stop adding the sodium thiosulfate solution and add a few drops of starch solution using one of your Propettes®. You will see a dark-blue almost black colour in the well.

You can try and deliver less than 1 drop by gently pushing down the piston of the syringe so that a small droplet of solution is visible on the tip of the Micropipette. Hold the thin arm of the Microspatula next to the droplet so that it is transferred onto the Microspatula and stir this droplet into the reaction mixture.

9. Continue adding the sodium thiosulfate solution a drop-at-a-time until the blue-black colour disappears to give a colourless solution. You may get some black solid in the bottom of the well but vigorous stirring will disperse this.
10. Record your result in your results table.
11. Repeat the titration (steps 7-9) but when you get to 0.10 cm<sup>3</sup> of your rough titration result. Then start adding 1 drop (or less - see text insert) at a time until the end-point is reached.
12. Again record your results and repeat the titration until you get 2 titres within 0.10 cm<sup>3</sup> of each other.

## RESULTS

Name of bleach \_\_\_\_\_

Titration	ROUGH	1 <sup>st</sup> accurate	2 <sup>nd</sup> accurate	3 <sup>rd</sup> accurate
Final Micropipette reading/cm <sup>3</sup>				
Initial Micropipette reading/cm <sup>3</sup>				
Titre/cm <sup>3</sup>				

Repeat with the other brands of bleach.

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Name of bleach \_\_\_\_\_

Titration	ROUGH	1 <sup>st</sup> accurate	2 <sup>nd</sup> accurate	3 <sup>rd</sup> accurate
Final Micropipette reading/cm <sup>3</sup>				
Initial Micropipette reading/cm <sup>3</sup>				
Titre/cm <sup>3</sup>				

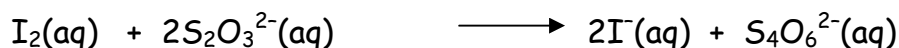
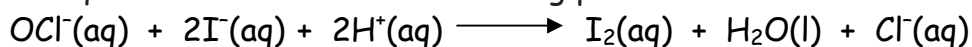
Name of bleach \_\_\_\_\_

Titration	ROUGH	1 <sup>st</sup> accurate	2 <sup>nd</sup> accurate	3 <sup>rd</sup> accurate
Final Micropipette reading/cm <sup>3</sup>				
Initial Micropipette reading/cm <sup>3</sup>				
Titre/cm <sup>3</sup>				

## Conclusions

The active ingredient in the bleach is the  $\text{OCl}^-$  ion.

The ionic equations for the reactions taking place are as follows:—



From these equations

1 mol  $\text{OCl}^-$  forms \_\_\_\_\_ mol of  $\text{I}_2$  which react(s) with \_\_\_\_\_ mol of  $\text{S}_2\text{O}_3^{2-}$

- From this work out the number of mol of  $\text{OCl}^-$  ion that are equivalent to 1 mol of thiosulfate ions.
- Work out the number of mol of thiosulfate ions added for each bleach sample.
- Hence work out the number of mol of  $\text{OCl}^-$  in  $0.5\text{cm}^3$  and the concentration.



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