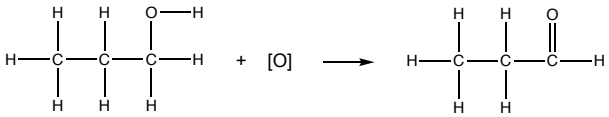
AS PRACTICAL 17

Preparation of propanal (Instructions)

Aim

You are going to make some propanal by oxidation of propan-1-ol using acidified potassium dichromate(VI) and then distill it off from the reaction mixture. You are then going to test that you have made an aldehyde.



Safety

Propan-1-ol is flammable and harmful.

Propanal is flammable and an irritant.

Potassium dichromate(VI) is toxic.

Sulfuric acid is an irritant.

Silver nitrate is an irritant.

Ammonia is corrosive.

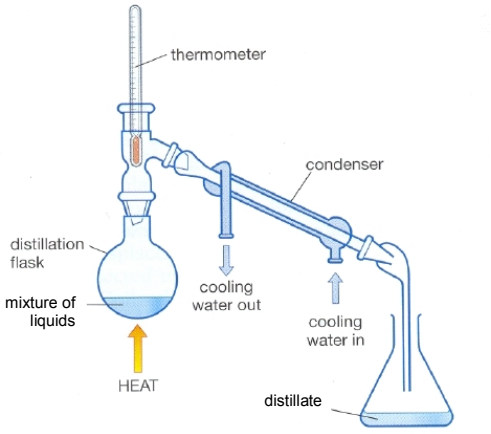
Sodium hydroxide is corrosive.

Residues from Tollen's reagent must be washed with lots of water down the fume cupboard sink as soon as possible after use.

Method

Oxidation of propan-1-ol to propanal

1) Set up apparatus as shown in the diagram, including **anti-bumping granules** in the flask.
2) Using a 25 cm^3 measuring cylinder, carefully measure out 15 cm^3 of acidified potassium dichromate solution. Pour this into a pear-shaped flask
3) Using a 10 cm^3 measuring cylinder, carefully measure out 5 cm^3 of propan-1-ol.
4) Using a test pipette, slowly add the propan-1-ol to the flask, shaking the tube gently to mix the contents.
5) Heat the flask gently to slowly distil off approximately 5cm^3 of liquid distillate into a test tube which is **immersed in cold water** in a beaker. Keep the test tube cool to avoid loss of any propanal which is volatile.
6) Find the mass of the propanal you have made.



Testing the propanal

7) Prepare a sample of Tollens' reagent by adding 5 drops of sodium hydroxide solution to 2 cm^3 of silver nitrate solution in a test tube. Then add just enough dilute ammonia solution to dissolve the brown precipitate completely.
8) Add 10 drops of the distillate to the about 5 cm^3 of Tollens' reagent in the test tube. Gently warm in a beaker of hot water (50-60^oC) to see if a silver mirror forms.

Questions

1) Write a balanced equation, using skeletal formulae, for the oxidation of propan-1-ol in this reaction.
2) What happened in the test with Tollen's reagent? What does this tell you?
3) Write an equation for the reaction taking place during the test with Tollen's reagent.
4) What is the purpose of using anti-bumping granules?
5) The propanal that was produced could be separated by distillation as it has a lower boiling point (49°C) than propan-1-ol (97°C). Explain why propanal has a lower boiling point than propan-1-ol.
6) The density of propan-1-ol is 0.80 g cm^{-3}. Calculate the percentage yield of propanal in your experiment.