ALCOHOLS: OXIDATION

1. It is possible to get two different products from the oxidation of ethanol: ethanal, CH_3CHO, and ethanoic acid, CH_3COOH.

   To get ethanal, an excess of ethanol is heated with potassium dichromate(VI) solution acidified with dilute sulphuric acid, and the ethanal is distilled off as it is formed.

   To get ethanoic acid, ethanol is heated under reflux with an excess of potassium dichromate(VI) solution acidified with dilute sulphuric acid. When the reaction is complete, the ethanoic acid is distilled off.

   a) Write equations for the two reactions. You can simplify these by writing the oxidising agent as [O].

   b) Explain why you get a different product by changing the conditions in the way described above.

   c) Draw the structure of the product if you oxidised butan-2-ol using acidified potassium dichromate(VI) solution. (You can show hydrocarbon groups as, for example, CH_3CH_2, but should draw all the bonds in the more interesting parts of the molecule.)

   d) Why would you get the same product in the last case whatever conditions you used?

2. There are several isomers with the molecular formula $C_4H_{10}O$. Five of these were tested, and the results are shown in the table.

	Add PCl_5	**Warm with acidified potassium dichromate(VI) solution**	**Pass any product from this reaction through Schiff's reagent**
A	Violent reaction producing steamy fumes	Orange solution turns green	Schiff's reagent turns magenta at once
B	Violent reaction producing steamy fumes	No change	No change
C	Violent reaction producing steamy fumes	Orange solution turns green	No change
D	No reaction	No change	No change
E	Violent reaction producing steamy fumes	Orange solution turns green	Schiff's solution turns magenta at once

   a) What is PCl_5 testing for?

   b) What does the colour change with acidified potassium dichromate(VI) solution test for in this context?

c) What does the Schiff's reagent test for?

d) All of the compounds had a molecular formula of $C_4H_{10}O$. Write the structural formulae for A, B, C and E. You can show hydrocarbon groups as, for example, CH_3CH_2. (There are two sets of results that are identical. That means that, in those cases, you can't be sure which of the two possible isomers is which – that's OK!)

e) This isn't a part of the work on this page, but use your imagination to suggest a structural formula for D. (In fact there are 3 possibilities for this, but I am only asking you to think of one. Find all three if you like the challenge!)