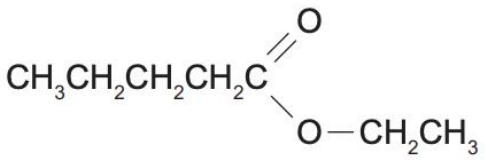
Question 33 **(9 marks)**

A chemist wanted to add a fruity fragrance to an air freshener that he was developing. A colleague suggested the compound ethyl pentanoate which has an apple-like fragrance. The structure for ethyl pentanoate is shown below.



The chemist wanted to check the fragrance of this compound to make sure that it was suitable but there was no ethyl pentanoate in the chemist's laboratory. The only organic substances that the chemist had were a:

- commercial gas cylinder containing ethene
- bottle of pentan-2-one
- bottle of pentan-1-ol
- bottle of pentanal.

Ethyl pentanoate can be synthesised from one or more of the organic substances in the above list in **three** steps.

Describe the steps that will allow the chemist to synthesise ethyl pentanoate. Include balanced equations for all reactions that occur, using molecular formulae for organic compounds. Any inorganic compounds deemed necessary can be used in the procedure. It is not necessary to specify how the products of a particular reaction will be isolated before use in another reaction.

Step One: _____

Step Two:

Step Three: