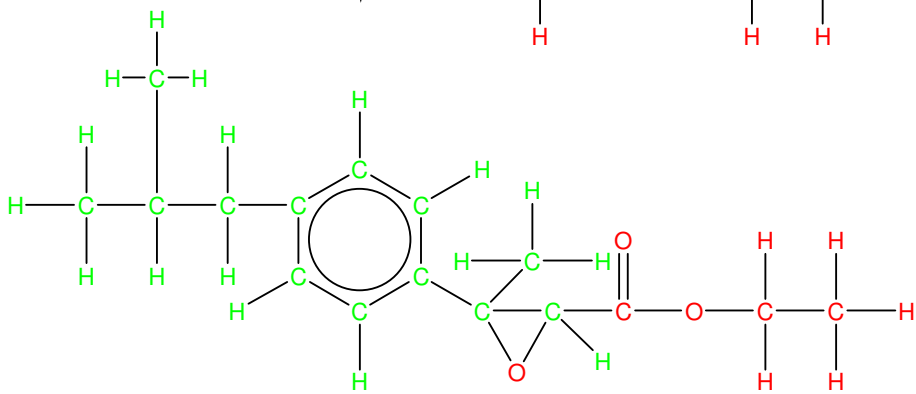
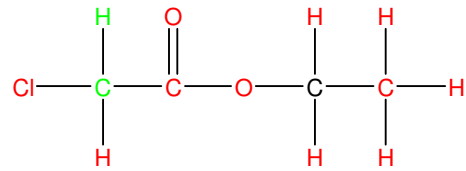
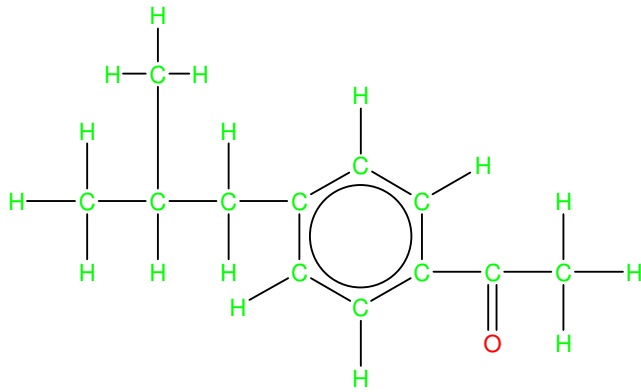
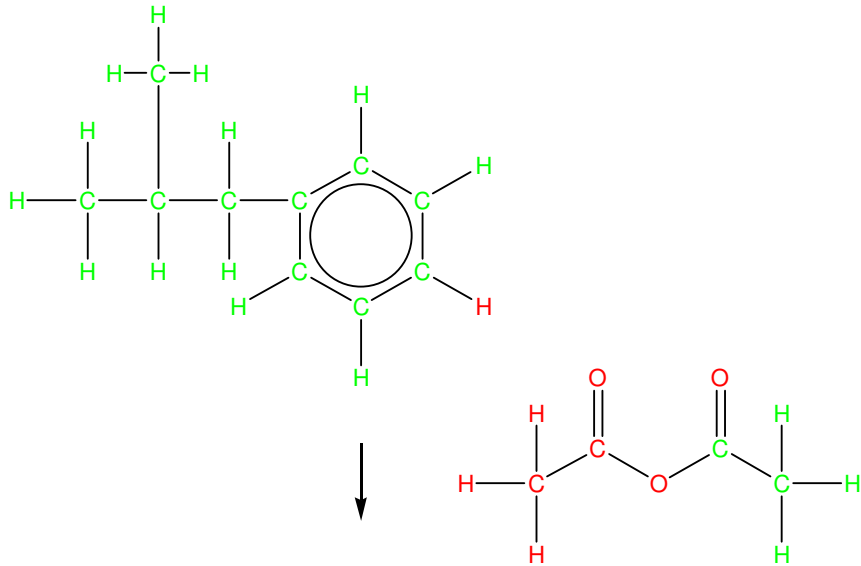


Ibuprofen- a case study in green chemistry: teacher's notes

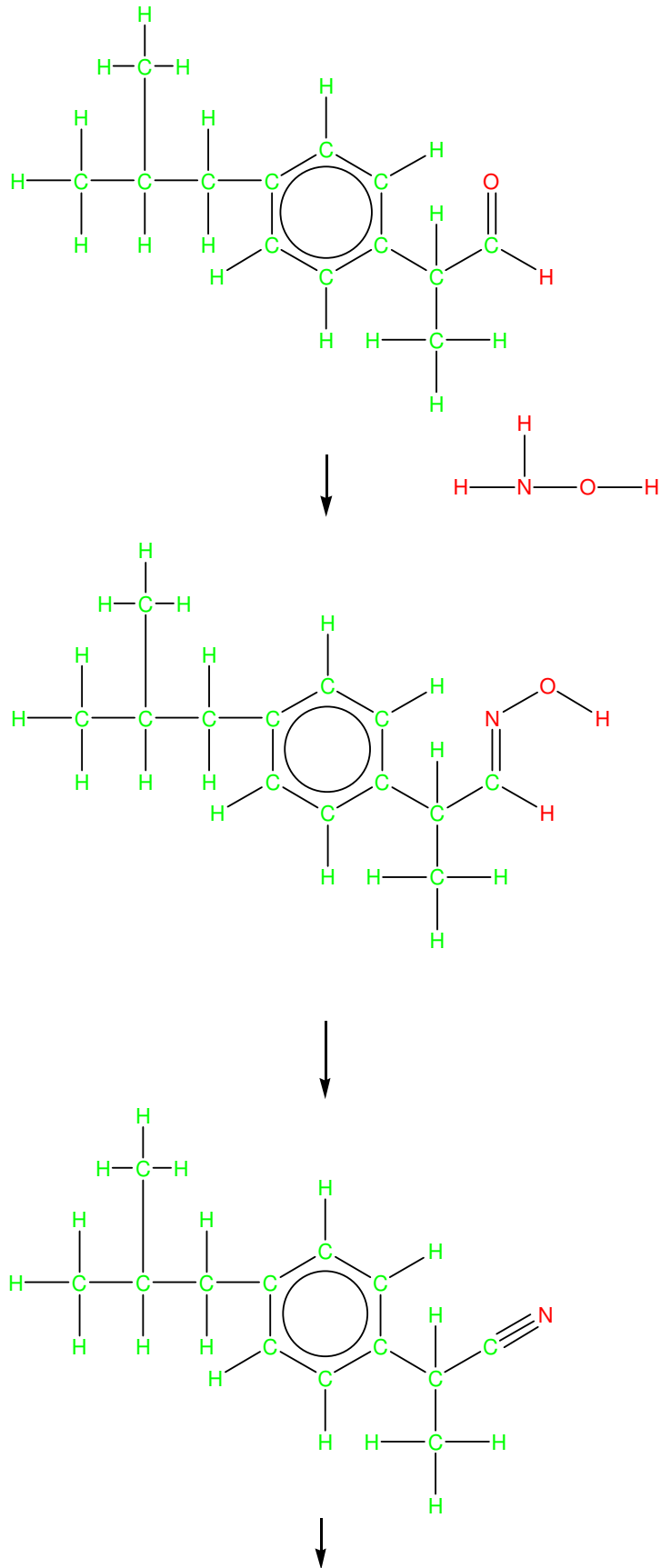
Answers to questions

- Q 1. Carbon 1 has three hydrogen atoms because it is at the end of an alkane chain. Carbon 2 has two hydrogen atoms because it is in the body of an alkane chain. Carbon 3 has one hydrogen atom because it is part of an aromatic ring.
- Q 2. (a) An aromatic ring.
(b) Electrophilic substitution reactions.
- Q 3. (a) A carboxylic acid group.
(b) A variety of reactions including oxidation of alcohols and ketones and hydrolysis of acid derivatives.
- Q 4. $0.9^6 = 53.1\%$
- Q 5. (a) 1.5×10^{10}
(b) (i) 250
(ii) This seems a high figure. The normal dose is two tablets which appears to equate to an average of about three headaches per week! However, there will be patients who regularly take several tablets a day to alleviate chronic conditions such as arthritis.
- Q 6. An electrophilic substitution reaction.
- Q 7. 74.5%
- Q 8. Elimination (of water).
- Q 9. Water, with an acid catalyst.

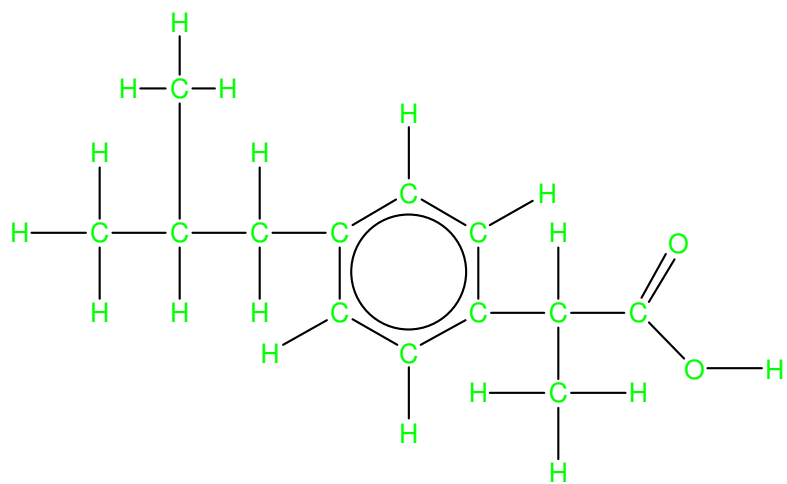
Q 10.



RS•C



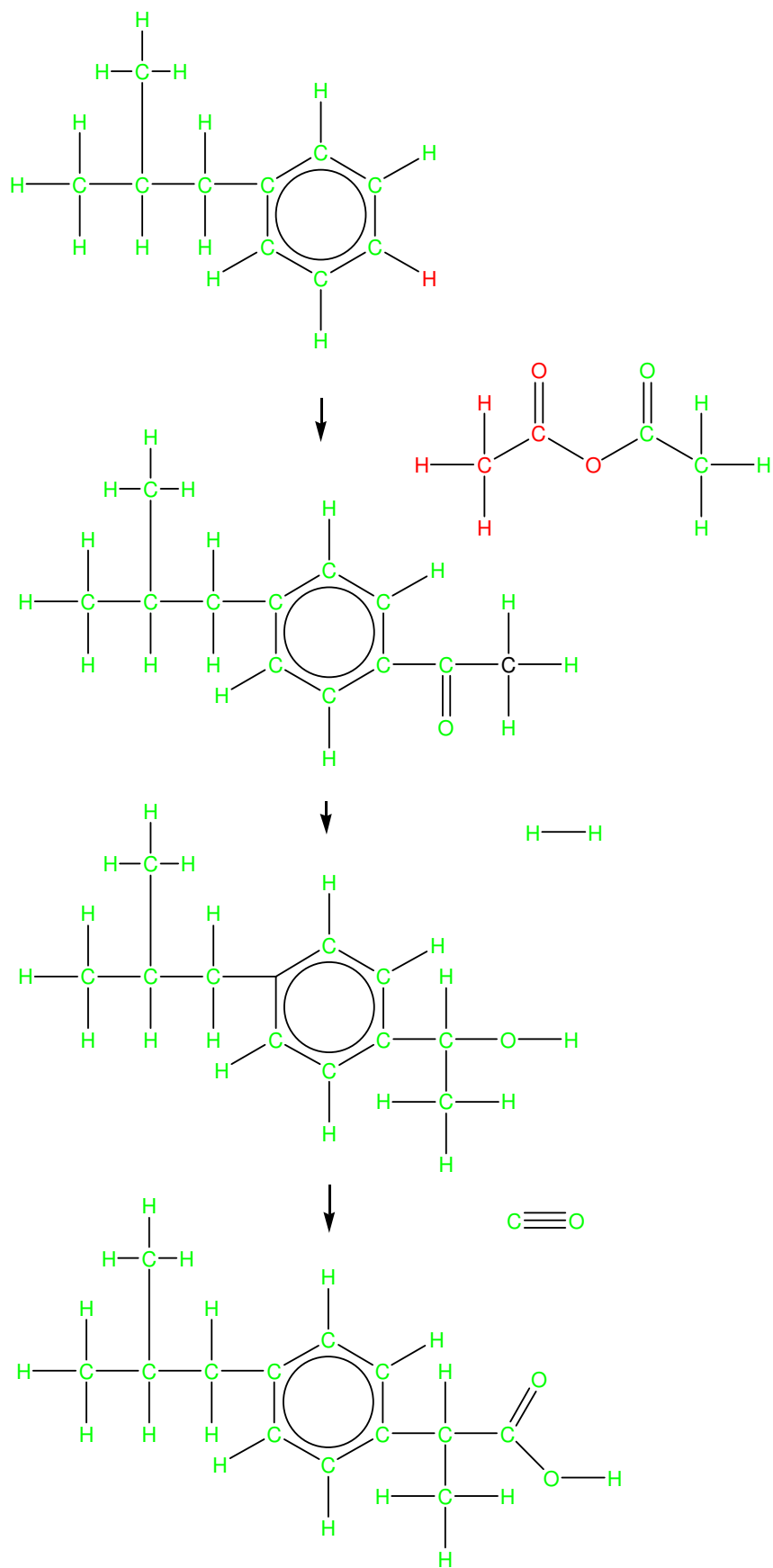
RS•C



Q 11. (a) $0.9^3 = 72.9\%$

(b) The six step synthesis would have a yield of 53.1% (see the answer to Q 4).

Q 12.



Q 13. 100%

Q 14. (a) An addition reaction.

(b) (i) It is a catalyst.

RS•C

(ii) This increases its surface area.

Q 15. (a) It could be leached out into the groundwater.

(b) Aluminium compounds leached from the soil are thought to be involved in the deaths of fish and of trees caused by acid rain. Aluminium compounds have been linked with Alzheimer's disease, although this link is far from proven.