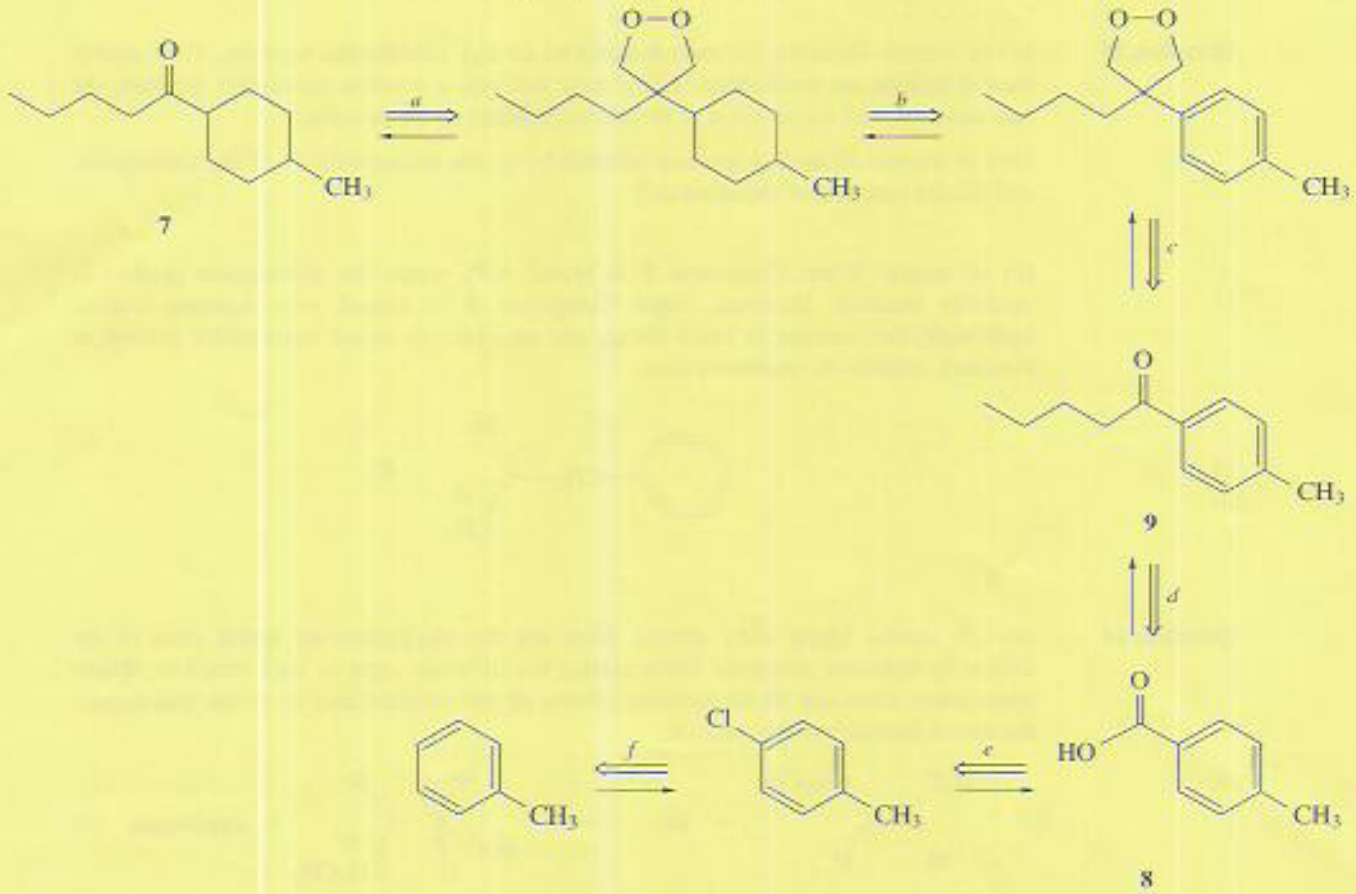
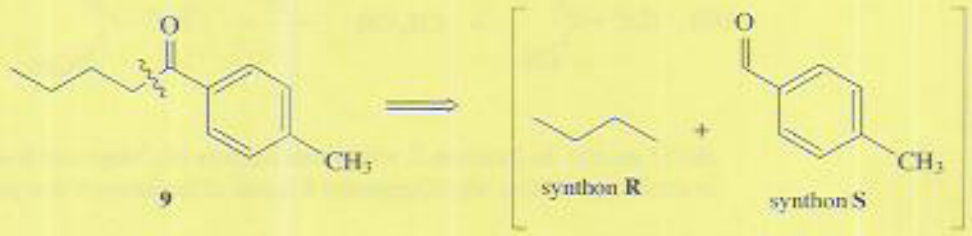
Question 15 Scheme 1 shows the *retrosynthetic analysis* for the synthesis of Compound **7**. The conventional symbols are used in Scheme 1: steps in the retrosynthetic *analysis* (starting from the target molecule, **7**) are indicated by the symbol $\Longrightarrow$, and are designated by the letters *a–f*; steps in the actual, or forward, *synthesis* of Compound **7** (starting from methylbenzene) are indicated by single arrows, $\longrightarrow$. Examine the scheme carefully, and then answer the questions that follow.



SCHEME 1

(*a*) (*3 marks*) Identify *two* carbon–carbon bond disconnections and *two* functional group interconversions (FGIs) from steps *a–f* in Scheme 1. (*Note* There may be more than two FGIs in Scheme 1.) Which groups have been interconverted in *each* of the two FGIs that you have identified?

(*b*) (*6 marks*) (i) Complete the structures of the synthons **R** and **S** produced by the disconnection shown below, by adding + and − signs, as appropriate, to indicate the electrophilic and nucleophilic sites.



(9)

(ii) The synthon **S** corresponds to the intermediate **8** in Scheme 1. To which organometallic reagent does the synthon **R** correspond? Briefly justify your choice of organometallic reagent. Using curly arrows, draw out the mechanism for its reaction with Compound **8** (assume appropriate work-up conditions).

(*c*) (*3 marks*) Discuss the strategy behind the three *synthetic* steps used to convert Compound **9** into Compound **7**.