ARENES: ASSORTED REACTIONS

1. a) $2C_6H_5CH_2CH_3 + 21O_2 \longrightarrow 16CO_2 + 10H_2O$
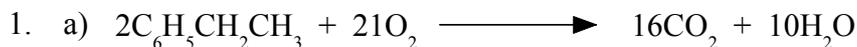
   (I have deliberately given you an equation for a reaction not given on the Chemguide page so that you couldn't get it just by using your memory. Trying to memorise things like this is frankly stupid, because they are simple to work out. If you ran into trouble with this, the secret is to allow yourself to have ½ an oxygen molecule when you first balance everything. To balance the oxygens, having already done the carbons and hydrogens, you need 21 of them – that's 10½ O_2. Then just double everything to get rid of the half.)

   b) The equation shows that you need a very large amount of oxygen for complete combustion. When you burn benzene in air, you don't have enough oxygen immediately around the benzene, and so carbon forms instead of some of the carbon dioxide. The sootiness is due to all the carbon in the flame.

2. a) React it with hydrogen in the presence of a nickel catalyst at 150°C and a high pressure.

   b) Cyclohexane doesn't have the ring of delocalised electrons which are important to the reactions of benzene. Cyclohexane just has ordinary carbon-carbon and carbon-hydrogen bonds, and so has the reactions of a simple alkane.

3. a) Either: Heat benzene with concentrated sulphuric acid under reflux for several hours.

   Or: Warm benzene at 40°C with fuming sulphuric acid under reflux for 20 – 30 minutes.

   b)
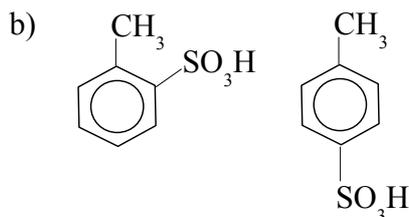
   c) It is much faster.

4. Heat it under reflux with potassium manganate(VII) solution made alkaline with sodium carbonate. This produces sodium benzoate. Add dilute sulphuric acid to give benzoic acid.