PHENYLAMINE: INTRODUCTION

1. a) The diagrams show that the lone pair on the nitrogen in the NH_2 group can overlap with and become delocalised into the benzene ring electrons.

   b) There is a movement of electrons from the nitrogen into the benzene ring. Since the reactions of benzene largely depend on the electron density around the ring, increasing this makes phenylamine more reactive than benzene itself.

   The delocalisation of the lone pair into the ring electron system means that it is less attractive towards hydrogen ions, and so phenylamine is less basic than simpler amines.

2. a) Both molecules have a very similar shape, and the same number of electrons. The van der Waals dispersion forces in both are likely to be very similar.

   b) The table shows that the melting and boiling points of phenylamine are higher than those of methylbenzene. This is partly due to dipole-dipole attractions in the phenylamine due to the electronegativity of the nitrogen, but mainly because of hydrogen bonding in phenylamine.

3. a) It can form hydrogen bonds with the water molecules.

   b) Phenylamine is quite a big molecule, and will disrupt lots of hydrogen bonds between water molecules as it fits between them. The water molecules will also disrupt quite strong dispersion forces between the phenylamine molecules. Dissolving phenylamine in water isn't energetically profitable.