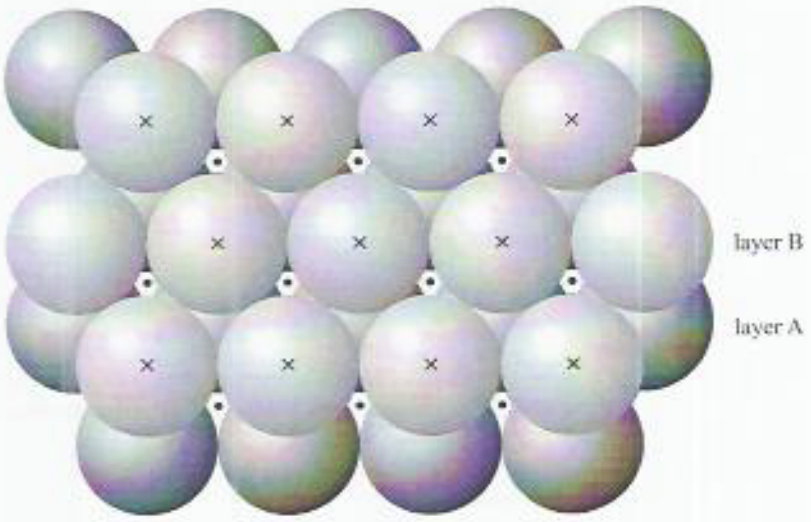
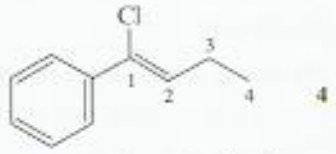


Figure 2 Two layers of close-packed spheres.

Question 4

Ignoring the ring carbon atoms, identify the longest chain in Compound **4** as C_4 and therefore derived from butane. Numbering the carbon chain from the end attached to the benzene ring gives



4

Name the chloro and phenyl groups, and put them in the correct alphabetical order.

Assign both of these substituents to C-1, and identify the double bond as 'ene'. (*Note* The double bond need not be labelled 1 (as in but-1-ene).)

The priorities on C-1 are Cl > phenyl: and on C-2 are ethyl > hydrogen. The two higher-priority groups, Cl and CH_2CH_3, are on the *same* side of the double bond, so Compound **4** is the Z-isomer.

The systematic name of Compound **4** is therefore Z-1-chloro-1-phenylbutene.

Question 5

(a) $Sn(s) + 2H^+(aq) = Sn^{2+}(aq) + H_2(g)$

(b) $\Delta S^{\ominus}_m = (-17.0 + 130.7 - 51.6)\,J\,K^{-1}\,mol^{-1} = 62.1\,J\,K^{-1}\,mol^{-1}$

$\Delta H^{\ominus}_m = -8.8\,kJ\,mol^{-1}$

So $\Delta G^{\ominus}_m = \Delta G^{\ominus}_f = \Delta H^{\ominus}_m - T\Delta S^{\ominus}_m = -8.8\,kJ\,mol^{-1} - (298.15 \times 62.1)\,J\,mol^{-1}$

$= -8.8\,kJ\,mol^{-1} - 18\,515\,J\,mol^{-1}$

$= -8.8\,kJ\,mol^{-1} - 18.5\,kJ\,mol^{-1} = -27.3\,kJ\,mol^{-1}$

Question 6

Molecularity provides a means of classifying elementary reactions in terms of the number of reactant species that take part in the reaction.

If Reaction 1 were elementary, the theoretical rate equation would be

$$J = k_{theory}[F_2][CCl_3F]$$

However, this is not the case, since the partial order with respect to F_2 in the given experimental rate equation is fractional (½).

The reaction must therefore be composite.