C6.1 Summary questions

1. a a rock or mineral that contains enough metal to make it economical to extract the metal
   b i $\text{MnO}_2 + \text{CO} \rightarrow \text{CO}_2 + \text{MnO}$
   ii It loses oxygen.
   iii It accepts / gains oxygen from manganese(IV) oxide.
   c It acts as a reducing agent.
   d It is more expensive to use electricity when carbon and carbon monoxide can be used as reducing agents.

2. a a mixture of a metal and at least one other element
   b 25%
   c i As the percentage of gold decreases / percentage of copper increases, the hardness increases.
   ii Copper and gold atoms are different sizes. The copper atoms stop layers of gold atoms sliding over each other so easily.
   iii It is mostly copper / 62% copper so its hardness is close to the hardness of copper.

3. a air / oxygen, water
   b It forms a layer that stops air / oxygen and water reaching the metal.
   c i sacrificial protection
   ii Zinc is more reactive than iron, so it corrodes in preference to the iron. Copper is less reactive than iron, so it would not protect the iron from rusting.

4. a i Aluminium alloys are strong for their weight / have a high strength to weight ratio.
   ii Ceramics are poor conductors of heat / have high melting points / higher melting points than aluminium so it protects the structure of the Shuttle.
   b Sensible suggestion based on properties, e.g. it has a higher melting point than the ceramic / is tougher / is stronger / is a better insulator (than ceramic tiles).

5. High equilibrium yield is favoured by low temperatures but the rate would be too low if a lower temperature was chosen. High equilibrium yield is favoured by high pressures but very high pressures are expensive / hazardous to maintain.

6. Answer includes:
   plants grow on low-grade ore / soil
   absorb copper / copper ions through their roots
   plants are harvested then burned
   the ash produced contains a higher concentration of copper than the material on which the plants grow.