COMPLEX IONS: ACIDITY

1. An aqueous solution containing hexaaquairon(III) ions, $[Fe(H_2O)_6]^{3+}$, has a pH of around 1.5 depending on its concentration. The hexaaqua ion reacts with water according to the equation

$$[Fe(H_2O)_6]^{3+} + H_2O \rightleftharpoons [Fe(H_2O)_5(OH)]^{2+} + H_3O^+$$
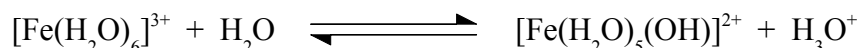
a) Describe the bonding in the hexaaquairon(III) ion between the central iron ion and the water molecules.

b) Explain very briefly why the reaction above leads to the solution having a low pH.

c) Explain carefully what is happening in the above equation, and why it leads to the formation of a hydroxonium ion.

d) A similar reaction involving hexaaquairon(II) ions, $[Fe(H_2O)_6]^{2+}$, will produce a solution with a higher pH of about 5 depending on its concentration. Write the equation for the reaction between this ion and water and explain why the solution is less acidic than the corresponding iron(III) one.

2. Explain how you might *expect* the acidity of a solution containing hexaaqua metal ions with a charge of 2+ to vary as the radius of the central metal ion increases. (Ignore the complicated reality of the situation! Just talk about how you might *expect* the acidity to change in the absence of any other complicating factors.)