Figure 1 shows the family tree for red hair in my family, and includes an explanation of the conventions that are normally used in genetics.

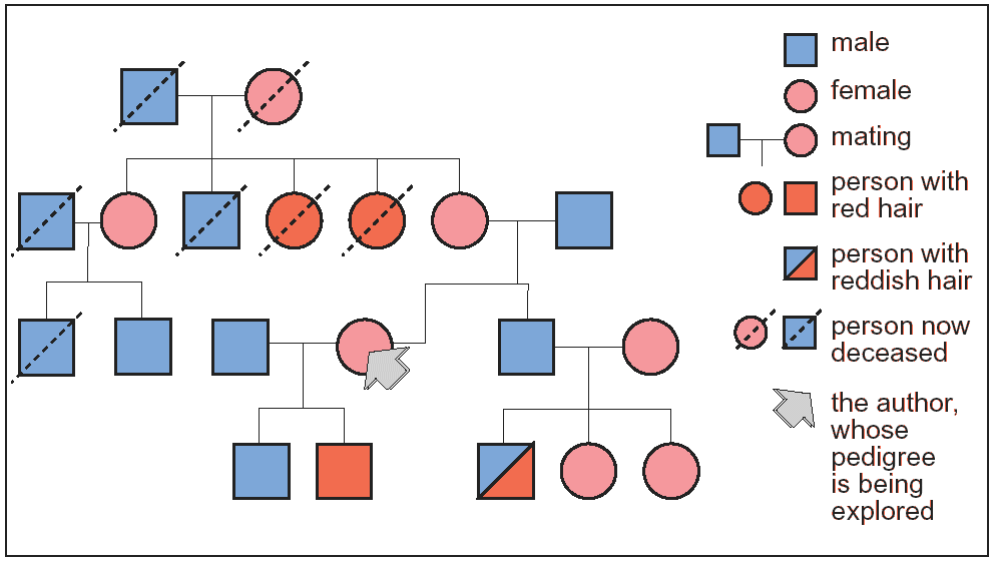

Figure 2: *A family tree – or pedigree for red hair*

It would be too confusing to show more than one characteristics on a family tree, so it is usual to draw a separate diagram for each one.

Figure 2 shows the same family again, but this time it deals with PKU rather than hair colour.

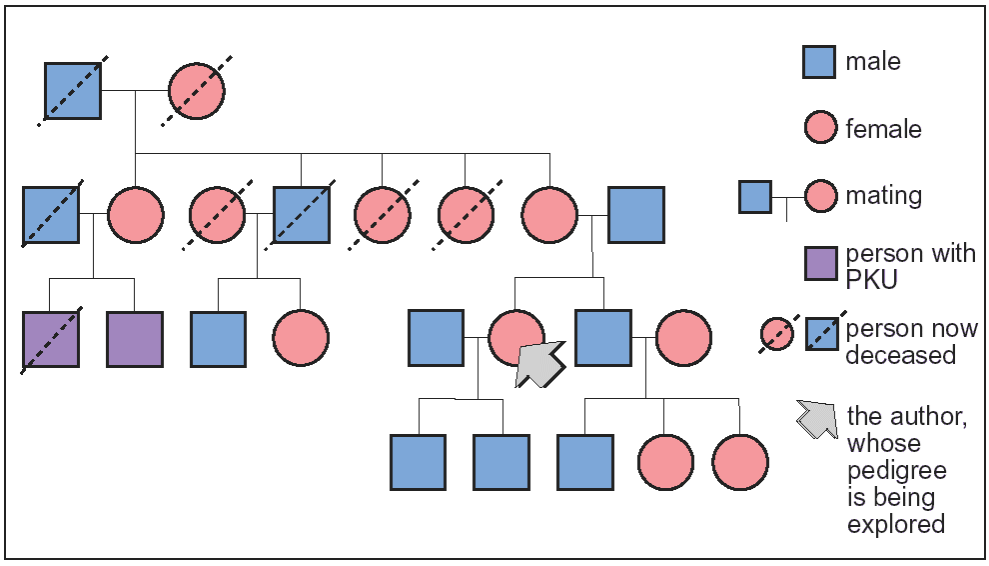

Figure 2: *A family tree for PKU*

ACTIVITY 1: QUESTION

ALLOW 20 MINUTES

Think about a family that you know well. It could be your own or someone else's – that doesn't matter, as long as you know something about at least three generations of the family. Can you identify a characteristic which has come and gone between the generations – like red hair in the family described earlier?

Write a short description of the family, and then draw a family tree to display it, using the symbols shown in *Figures 1* and *2*.

ACTIVITY 1: ANSWER

How did you get on? Were you able to detect any characteristics that came and went between the generations?

The sorts of things that people identify when they try this exercise are usually striking physical characteristics – short legs, a prominent chin, an unusual hairline, baldness, protruding ears, strong teeth, and so on. This photograph of the Kennedy family shows several such striking physical characteristics:

Figure 3 *Family characteristics in the Kennedy family*

On the other hand, the characteristics you chose might have related to abilities – physical or mental – like being musical, athletic, or good at maths. Or, they could be illnesses or disabilities.

Obviously, the larger the family, the easier it is to see patterns of inheritance in a family tree. In modern families, the numbers in each generation are usually small and the patterns don't show up too well. The family you chose may be like this, and as a consequence you may not have been able to discern any definite patterns.

Nevertheless, when you return to this family tree later on, you will have an enhanced understanding of the differences which you have initially identified.

To illustrate what we can learn from a large family tree, I have provided a very well known one for the next activity. Queen Victoria and Prince Albert were the forebears of a very large family.

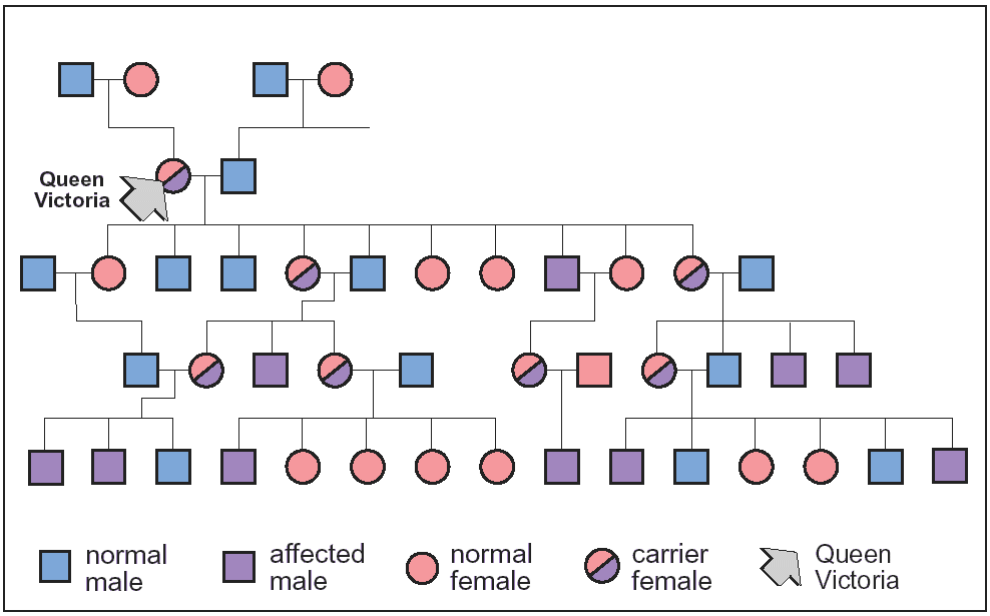

Figure 4 *Part of the family tree of Queen Victoria*

ACTIVITY 2: QUESTION

ALLOW 15 MINUTES

The characteristic shown in this Royal family tree is **haemophilia**, an inherited illness in which the blood does not clot properly and small abrasions lead to uncontrolled bleeding.

Study *Figure 4*, and note down your answers to the following questions.

1. Which is the most noticeable feature of this pattern in terms of the individuals who have been affected?

2. What do you think the link is between the affected individuals in successive generations?

3. Where do you think this inherited condition started in the Royal Family?

ACTIVITY 2: ANSWER

While studying this family tree you may have observed that:

1. All the affected individuals are male.

2. The link between generations with an affected male is always a carrier female.

3. It is difficult, with the information provided, to be certain where the condition began. You might have guessed that it started with the Queen herself and, as we will see later, this appears to be the case.

This family tree illustrates how much can be learnt about inheritance patterns when geneticists are able to study large, well-documented families. This particular case has been very extensively studied because of the effect that this disease had on Queen Victoria's descendants. Many of these descendants later became the crowned heads of European countries.

By studying family trees and patterns of inheritance, geneticists are able to answer the kinds of question we all might ask about the characteristics that we see in families. However, for health care professionals, there are other questions which may be even more important because what we try to do is to provide individualised care. We are therefore interested in people as unique individuals.

3: Note the difference

Genetics is the science of diversity. It is to do with why living things differ and why they are similar. It involves the study of ways in which the characteristics of parents are passed on to their offspring. It is one way of explaining how any living thing comes to be the way it is at a particular time.

When a health professional makes an initial assessment of someone receiving care, they try to be aware of every aspect of that person as a unique individual in an unique situation. What the practitioner observes is the result of the many forces which have acted on that person throughout their lifetime.

Genetics provides the background we need to understand how the powerful forces of inheritance and the environment have contributed to a person's individuality. So now let's begin to look at some of the differences which are to be found in the people around us.

ACTIVITY 3: QUESTION

ALLOW 10 MINUTES

You should start this observation process by observing a group of people and considering a simple question. Look at a group of people who are all dressed in the same way – maybe you could find a photograph of a school class, or a sports team, or a party of student nurses or midwives. Or perhaps you could observe a group of your current colleagues who all wear the same uniform.

The question to consider is this:

Does the uniform reduce or enhance the differences between these people?

At some time in the near future, you may like to discuss this with your colleagues, when you have a few moments to spare.

ACTIVITY 3: ANSWER

Clearly there can be no right or wrong answer to this sort of question. It is a matter of personal opinion. For example, some people consider that wearing the same clothes exaggerates the differences between the wearers. Some individuals look good in uniform – and the colour and style seems to complement their best features. Others are not so flattered by it. In this case, the difference between them is enhanced, rather than diminished and emphasises the amazing number of ways in which the various components of a human body can be put together.

However, the way people look is only one aspect of the variation between them.

The next activity gives you the opportunity to explore these variations more fully.

ACTIVITY 4: QUESTION

ALLOW 20 MINUTES

Select three people who you know well, all the same sex and about the same age. Consider the ways in which they differ from one another. In other words, select some of the characteristics that seem to vary from person to person.

The first thing which comes to mind may be their visible characteristics.

Make a list of these in Column 1 of *Table 1* (leave Column 2 until the next activity).

Next, think about how these people move, speak and generally behave.

What about their health status? Are any of the characteristics you picked up in the family tree in Activity 1 relevant? Add the characteristics to your list in Column 1.