**Mitochondrial DNA**

Mitochondria are the organelles in the cell where the aerobic phase of respiration occurs to release energy for use by the cell. Most of a cell’s DNA is located in the nucleus but a small amount is in the mitochondria. This is called mitochondrial DNA or mtDNA.

1. How many genes are located on human mtDNA?
2. How many base pairs are present in the mtDNA of humans?
3. Mitochondrial DNA codes for particular proteins. What purpose do these proteins serve in the body?
4. Describe the inheritance pattern of mtDNA and, in particular, why males do not pass mtDNA on to their children.
5. If two sisters died in a house fire, could mtDNA be used to distinguish their remains from one another? Explain your answer.
6. Why is mtDNA less likely (than normal DNA) to be degraded by exposure to the elements?
7. Consider the following scenario:

*An anthropologist has found a few human bones at a site in South Africa. Investigators think the bones might belong to an adventurer who disappeared in Africa. Since the bones have been exposed to severe weather for many years, the only DNA that may be salvageable is mtDNA.*

If the adventurer’s only surviving relative is his father, would it be possible to use mtDNA for comparison? Explain your answer.

1. The pedigree (or family tree) below shows five generations of people who are related to the individual identified by the large arrow. Males are represented by squares and females by circles. The diagonal line through some symbols indicates people who have died.

Great-great grandmother

1. Connect individuals who share mtDNA from the great-great grandmother by highlighting the lines that link them to one another.
2. Of the individuals connected by dark lines, shade in the symbols for the living relatives who are eligible to have their mtDNA tested for comparison with the mtDNA from the individual identified by the large arrow.
3. Mitochondrial Eve is a name that has been given to the woman who, when traced through the female line, is the most recent common ancestor for all living humans. The mtDNA in all humans alive today is derived from her.
4. Describe how the matrilineal line is traced back to Mitochondrial Eve.
5. How long ago is Mitochondrial Eve believed to have lived?
6. In what part of the world did she live?
7. If the mtDNA of all humans is derived from Mitochondrial Eve, does that mean she was the only human female alive at the time? Explain your answer.
8. How it is possible that one woman could be the matrilineal ancestor of us all?