Teaching guide: DNA

This resource supports the Level 3 Certificate and Extended Certificate in Applied Science. It will help you prepare students for Unit 3: Science in the modern world.

**Unit type:** Externally assessed (pre-release)

**Guided Learning hours:** 60

**What is DNA and mitochondrial DNA and how useful are they?**

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| **Focus of the Topic** | **Suggested teaching/delivery ideas** | **Links to AO** | **Resources** |
| Background to the topic of genetics, and specifically mitochondrial DNA.  Role of mitochondrial DNA in forensics. | Learners need to explore the background to this topic and understand the basic structure of the cell and DNA. This links to Unit 1: Key Concepts in Science, 1(a) Cell Structure.  Learners in small groups can research each topic and present to the class with a plenary at the end of the presentations.  How is mitochondrial DNA useful to forensics?  It can play an important role in:   * missing persons investigations * mass disasters * and other forensic investigations involving samples with limited biological material.   Learners can use the websites, books and articles from journals to discuss the use of mtDNA in forensics. (If preferred, the learners can investigate the use of mtDNA in research into evolution). | AO1: Use information about topical scientific issues obtained from a variety of media sources. | Basic Cell Structure  [bio100.class.uic.edu/lecturesf04am/lect06.htm](http://bio100.class.uic.edu/lecturesf04am/lect06.htm)  [biology4kids.com/files/cell\_main.html](http://www.biology4kids.com/files/cell_main.html)  Basic Genetics  [learn.genetics.utah.edu](http://learn.genetics.utah.edu/)  [nlm.nih.gov/exhibition/harrypottersworld/pdf/prelesson.pdf](https://www.nlm.nih.gov/exhibition/harrypottersworld/pdf/prelesson.pdf)  Mitochondrial DNA  [ghr.nlm.nih.gov/primer/basics/mtdna](https://ghr.nlm.nih.gov/primer/basics/mtdna)  [genetics.thetech.org/ask/ask165](http://genetics.thetech.org/ask/ask165)  Forensics  [nij.gov/topics/forensics/evidence/dna/research/pages/mitochondrial.aspx](http://www.nij.gov/topics/forensics/evidence/dna/research/pages/mitochondrial.aspx)  [uvm.edu/~biology/Classes/296D/10\_Mitochondria.pdf](http://www.uvm.edu/~biology/Classes/296D/10_Mitochondria.pdf)  2009  [forensicmag.com/articles/2009/04/mitochondrial-dna-examination-cold-case-crime-scene-hairs](http://www.forensicmag.com/articles/2009/04/mitochondrial-dna-examination-cold-case-crime-scene-hairs)  2014  [forensicmag.com/articles/2014/01/digging-deep-next-generation-sequencing-mitochondrial-dna-forensics](http://www.forensicmag.com/articles/2014/01/digging-deep-next-generation-sequencing-mitochondrial-dna-forensics)  *Mitochondrial DNA 2016: Methods and Protocols*  by Matthew McKenzie  ISBN-13 9781493930395  *Using Forensic DNA Evidence at Trial*  by Jane Moira Taupin  ISBN: 9781482255812  See the Resources section in the specification (pages 72-73). |

**Genetics and public perception**

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| **Focus of the Topic** | **Suggested teaching/ delivery ideas** | **Links to AO** | **Resources** |
| How does the general media (ie radio, newspapers etc) perceive genetics, and does this differ from the perception of specialist media (ie New Scientist)? | Learners led research into genetics/genetic engineering/designer babies in general, newspaper articles and non-scientific journals, eg The Times, The Guardian  Learner led research into genetics/genetic engineering/designer babies in scientific journals, eg New Scientist, British Medical Journal, The Lancet.  How do they depict genetics and what is the difference between the two sources of information? eg language used, using both sides of the argument or just putting forward one point of view.  Considering that general newspapers have a much wider circulation than specialist journals, how could the general public be influenced? This could be researched as a questionnaire for science and non-science learners and statistics used on the pooled results. | AO2: Understand the public perception of science and the influence the media have  (General and specialist media). | Science and the media  [scienceandmedia.wordpress.com](https://scienceandmedia.wordpress.com/)  [sciencemediacentre.org](http://www.sciencemediacentre.org/)  [medscape.com/viewarticle/833530](http://www.medscape.com/viewarticle/833530)  Genetics and the media  [ncbi.nlm.nih.gov/pmc/articles/PMC400292/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC400292/)  [geneticsandsociety.org/section.php?id=53](http://www.geneticsandsociety.org/section.php?id=53)  Newspaper archives  [newspaperarchive.com/uk/](http://newspaperarchive.com/uk/)  New Scientist archives  [newscientist.com/issues/](https://www.newscientist.com/issues/)  Science mag  [sciencemag.org/news/2015/02/uk-parliament-approves-controversial-three-parent-mitochondrial-gene-therapy](http://www.sciencemag.org/news/2015/02/uk-parliament-approves-controversial-three-parent-mitochondrial-gene-therapy)  Daily Mirror  [mirror.co.uk/news/technology-science/science/three-parent-babies-britain-first-5225042](http://www.mirror.co.uk/news/technology-science/science/three-parent-babies-britain-first-5225042)  See resources page in specification for further guidance (pages 72-73) |

**Scientific issues**

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| **Focus of the Topic** | **Suggested teaching/ delivery ideas** | **Links to AO** | **Resources** |
| The issues involved in scientific advances:   * ethical * moral * commercial * environmental * political * and social. | Tutor led discussion on main areas of genetic research   * genetic testing * use of DNA forensics * gene therapy * reproductive genomics * genetic databanks and pharmacogenomics.   Learner led research into:   * ethical * moral * commercial * environmental * political * social aspects of these areas of research. | AO3: Understand the ethical, moral, commercial, environmental, political and social issues involved in scientific advances, and how these are represented in the media. | [who.int/genomics/research/en/](http://www.who.int/genomics/research/en/)  Issues in genetics  [genome.gov/10000006/issues-in-genetics/](https://www.genome.gov/10000006/issues-in-genetics/)  Ethical issues in human genetics and genomics  [genetics.edu.au/Publications-and-Resources/Genetics-Fact-Sheets/FactSheetELSI](http://www.genetics.edu.au/Publications-and-Resources/Genetics-Fact-Sheets/FactSheetELSI)  Moral and ethical issues in genetic engineering  [srtp.org.uk/srtp/view\_article/moral\_and\_ethical\_issues\_gene\_therapy](http://www.srtp.org.uk/srtp/view_article/moral_and_ethical_issues_gene_therapy)  See the Resources section in the specification (pages 72-73) |

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| **Focus of the Topic** | **Suggested teaching/ delivery ideas** | **Links to AO** | **Resources** |
| What jobs are available in the science industry?  What are the different responsibilities of these jobs? | Tutor led discussion into the types of jobs that scientists can do.  The main categories would include:   * earth and environmental science * physical science * life science * human biology and health science * genetics and genomics.   Learners could choose the 3 jobs that most interested them and research the different responsibilities with each of the occupations. | AO4: Understand the roles and responsibilities that science personnel carry out in the science industry. | [sciencebuddies.org/science-engineering-careers](http://www.sciencebuddies.org/science-engineering-careers)  [jobs.sciencecareers.org](http://jobs.sciencecareers.org/)  Biomedical scientist  [prospects.ac.uk/job-profiles/biomedical-scientist](https://www.prospects.ac.uk/job-profiles/biomedical-scientist)  Environmental scientist  [environmentalscience.org/careers](http://www.environmentalscience.org/careers)  Research scientist  [prospects.ac.uk/job-profiles/research-scientist-life-sciences](https://www.prospects.ac.uk/job-profiles/research-scientist-life-sciences)  Laboratory technician  [prospects.ac.uk/job-profiles/scientific-laboratory-technician](https://www.prospects.ac.uk/job-profiles/scientific-laboratory-technician)  Job description  [prospects.ac.uk/job-profiles/research-scientist-life-sciences](https://www.prospects.ac.uk/job-profiles/research-scientist-life-sciences)  See Resources section in the specification (pages 72-73). |