

A note to teachers

The very last website does not work on Google Chrome, but it is an extra enrichment section. I have left this section intact for those teachers using other web browsers and I have been searching for a workaround for this. I have added an additional page to the original WebQuest, so if you have redownloaded this product, make sure to remove the original from your files.

\*\*If your students are using Chromebooks, that last link will not work.

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**DNA Fingerprinting Web Exploration**

**Go to this website to answer the following questions**  
<http://www.forensicsciencesimplified.org/dna/index.htm>

|  |  |
| --- | --- |
| **“Introduction”** | |
| 1.List 3 body fluids that may be left behind at a crime scene |  |
| 2. Why 2 attributes of DNA evidence has made it become an invaluable tool for exonerating individuals who have been wrongfully convicted? |  |
| **“Principles”** | |
| 3. Why is DNA referred to as a “genetic blueprint?” |  |
| 4. What are the patterns in DNA called that can be measured to define the DNA profile of an individual? |  |
| 5. What kind of cells don’t contain DNA? |  |
| 6. What 2 places in the cell can DNA be found? |  |
| 7. Explain how using DNA in sex chromosomes can determine that the individual is a male. |  |
| 8. From where is mitochondrial DNA inherited? |  |
| 9. Why is mtDNA more useful for identifying missing persons or unidentified remains? |  |
| **“Applications”** | |
| 10. How can DNA be found on a cigarette butt or a soda can? |  |
| 11. DNA evidence is typically conducted in what types of cases? |  |
| 12. Explain why DNA may not be used in a case of violence where a family member assaults another family member within their own home. |  |
| 13. What does CODIS stand for? |  |
| **“How It’s Done”** | |
| 14. List 5 types of biological material that can be used to determine a DNA profile |  |
| 15. Choose 2 of the DNA containing items on the long list and describe a crime scene in which those items would be used to extract DNA. (2-3 sentences each) |  |
| 16. What is low-level DNA and give one example of where it might be found |  |
| 17. What is a reference sample and why are they taken? |  |
| 18. What is an elimination sample and why are they necessary? |  |
| 19. What type of degree might someone have to get if they want to work in the FBI’s National DNA Index System lab? |  |
| 20. List and describe the 6 steps that DNA samples undergo after being submitted to a laboratory |  |
| 21. Describe how the results are interpreted |  |
| 22. What is the difference between the NDIS, SDIS, and LDIS? |  |
| 23. How many autosomal STR markers must be tested to be included in the NDIS? |  |

**Now go to this website and perform a DNA Extraction**

https://learn.genetics.utah.edu/content/labs/extraction/

|  |  |
| --- | --- |
| 24. What are 3 things that you can test from a pure sample of DNA? | **1.**  **2.**  **3.** |
| 25. How many meters of DNA is located in the nucleus of each cell? |  |
| 26. Where were the cells collected from the first test subject? |  |
| 27. What are the 4 steps used to purify DNA from a cheek swab? | **1.**  **2.**  **3.**  **4.** |
| 28. Draw a picture of the cheek cell shown. |  |
| 29. What solution do you add to “separate” the DNA? |  |
| 30. What are the two important ingredients in the lysis solution and what does each one do? |  |
| 31. What does the concentrated salt solution do? |  |
| 32. In what apparatus does the tube spin around to cause the clumps of protein to sink to the bottom? |  |
| 33. What chemical is added to the clean, new tube of DNA to make the DNA clump together? |  |
| 34. How long can DNA be stored in the freezer? |  |

**Now go to this website to do a Gel Electrophoresis Simulation**

Make sure you read the intro

<http://learn.genetics.utah.edu/content/labs/gel/>

|  |  |
| --- | --- |
| 35. If DNA were as big as your \_\_\_\_ \_\_\_\_, you could sort them by hand. |  |
| 36. There is a way to sort and measure DNA strands and it is called \_\_\_ \_\_\_\_\_. |  |
| 37. What goes in the little holes at the end of the gel? |  |
| 38. What is added to make DNA move? |  |
| 39. Do short strands or long strands move more quickly? |  |
| 40. What process makes the sorted DNA visible to the naked eye? |  |
| 41. List the 6 steps listed to run your own gel. | **1.**  **2.**  **3.**  **4.**  **5.**  **6.** |
| 42. What is agarose made from? |  |
| 43. Describe what you saw at the end of your experiment. |  |

**NOTE: This site does not work in Google Chrome.**

**Now go to this website to create a DNA fingerprint**

<https://ideastream.pbslearningmedia.org/resource/tdc02.sci.life.gen.creatednafingerprint/create-a-dna-fingerprint/#.WMKSqBIrIY0>

|  |  |
| --- | --- |
| 44. What was Jimmy’s most valued possession? |  |
| 45. Launch the “Create a DNA Fingerprint” simulation and list the steps that you took to create your fingerprint (HINT: The steps are listed on the right side) | **1.Pour restriction enzymes into DNA**  **\*What do restriction enzymes do?**  **2.**  **3.**  **4.**  **5.**  **6.**  **\*What are probes?**  **7.**  **8.**  **9.** |
| 46. Who is the culprit? |  |

**Forensic DNA Webquest**

**ANSWER KEY**

**Go to this website to answer the following questions**  
<http://www.forensicsciencesimplified.org/dna/index.htm>

|  |  |
| --- | --- |
| **“Introduction”** |  |
| 1.List 3 body fluids that may be left behind at a crime scene | **1.Blood 2.Saliva 3.Semen** |
| 2. Why 2 attributes of DNA evidence has made it become an invaluable tool for exonerating individuals who have been wrongfully convicted? | **1.Accuracy**  **2.Reliability** |
| **“Principles”** |  |
| 3. Why is DNA referred to as a “genetic blueprint?” | **It contains the instructions that govern the development of an organism** |
| 4. What are the patterns in DNA called that can be measured to define the DNA profile of an individual? | **Short Tandem Repeats (STRs)** |
| 5. What kind of cells don’t contain DNA? | **Red Blood Cells** |
| 6. What 2 places in the cell can DNA be found? | **1.Nucleus**  **2.Mitochondria** |
| 7. Explain how using DNA in sex chromosomes can determine that the individual is a male. | **A male has a Y chromosome and females only have X chromosomes** |
| 8. From where is mitochondrial DNA inherited? | **The mother** |
| 9. Why is mtDNA more useful for identifying missing persons or unidentified remains? | **It is present in much higher quantities and doesn’t degrade as quickly** |
| **“Applications”** |  |
| 10. How can DNA be found on a cigarette butt or a soda can? | **Saliva may have been left** |
| 11. DNA evidence is typically conducted in what types of cases? | **1.Sexual Assault**  **2.Homicide**  **3.Robberies**  **4.Missing persons** |
| 12. Explain why DNA may not be used in a case of violence where a family member assaults another family member within their own home. | **Their DNA is already all around the home** |
| 13. What does CODIS stand for? | **Combined DNA Index System** |
| **“How It’s Done”** |  |
| 14. List 5 types of biological material that can be used to determine a DNA profile | **Answers will vary...there is a long list** |
| 15. Choose 2 of the DNA containing items on the long list and describe a crime scene in which those items would be used to extract DNA. (2-3 sentences each) | **1.Answers will vary**  **2.Answers will vary** |
| 16. What is low-level DNA and give one example of where it might be found | **Skin cells that may have been left on objects that someone touched** |
| 17. What is a reference sample and why are they taken? | **A known DNA sample of a person that is taken to be used for comparison** |
| 18. What is an elimination sample and why are they necessary? | **They are reference samples taken from people whose DNA would probably be found at the scene and they are necessary to eliminate those people. These may be first responders, consensual partners, etc.** |
| 19. What type of degree might someone have to get if they want to work in the FBI’s National DNA Index System lab? | **A Bachelor’s degree in biology, chemistry, or forensic science** |
| 20. List and describe the 6 steps that DNA samples undergo after being submitted to a laboratory | **1.Extraction**  **2.Quantification**  **3.Amplification**  **4.Separation**  **5.Analysis/Interpretation**  **6.Quality Assurance** |
| 21. Describe how the results are interpreted | **Electropherogram is analyzed and is unique to everyone** |
| 22. What is the difference between the NDIS, SDIS, and LDIS? | **NDIS - National DNA Index System**  **SDIS - State DNA Index System**  **LDIS -Local DNA Index System** |
| 23. How many autosomal STR markers must be tested to be included in the NDIS? | **13** |

**Now go to this website and perform a DNA Extraction**

https://learn.genetics.utah.edu/content/labs/extraction/

|  |  |
| --- | --- |
| 24. What are 3 things that you can test from a pure sample of DNA? | **1. Genetic Testing**  **2. Body Identification**  **3. Analyze forensic evidence**  **4. Study a gene involving cancer** |
| 25. How many meters of DNA is located in the nucleus of each cell? | **About two meters** |
| 26. Where were the cells collected from the first test subject? | **Inside his mouth** |
| 27. What are the 4 steps used to purify DNA from a cheek swab? | **1. Collect Cheek Cells**  **2. Burst open cells to release DNA**  **3. Separate DNA from proteins / debris**  **4. Isolate concentrated DNA** |
| 28. Draw a picture of the cheek cell shown. |  |
| 29. What solution do you add to “separate” the DNA? | **Lysis Solution** |
| 30. What are the two important ingredients in the lysis solution and what does each one do? | **Detergent – breaks down cell membrane and nuclear membrane, causing cells to burst open and release DNA.**  **Protease K – cuts the DNA free from the histones** |
| 31. What does the concentrated salt solution do? | **Causes proteins and other cellular debris to clump together.** |
| 32. In what apparatus does the tube spin around to cause the clumps of protein to sink to the bottom? | **Centrifuge** |
| 33. What chemical is added to the clean, new tube of DNA to make the DNA clump together? | **Isopropyl Alcohol** |
| 34. How long can DNA be stored in the freezer? | **Many years** |

**Now go to this website to create a DNA fingerprint**

<https://ideastream.pbslearningmedia.org/resource/tdc02.sci.life.gen.creatednafingerprint/create-a-dna-fingerprint/#.WMKSqBIrIY0>

|  |  |
| --- | --- |
| 27. What was Jimmy’s most valued possession? | **His holographic NOVA lollipop** |
| 28. Launch the “Create a DNA Fingerprint” simulation and list the steps that you took to create your fingerprint (HINT: The steps are listed on the right side) | **1.Pour restriction enzymes into DNA**  **\*What do restriction enzymes do? Cut the DNA molecules at different locations, like scissors**  **2. Pour agarose gel into tray on lab counter**  **3. Pour DNA into tray**  **4. Push “POWER” button on tray to begin electrophoresis**  **5. Place nylon membrane on top of the gel**  **6. Add probes to the nylon membrane in the tray**  **\*What are probes?**  **Probes are pieces of DNA that have been radioactively labeled. They attach themselves to the DNA fragments on the nylon membrane**  **7. Place X-ray film on top of nylon membrane in tray**  **8. Devlop film**  **9. Choose the culprit** |
| 29. Who is the culprit? | **Honey** |

**Now go to this website to do a Gel Electrophoresis Simulation**

Make sure you read the intro

<http://learn.genetics.utah.edu/content/labs/gel/>

|  |  |
| --- | --- |
| 30. If DNA were as big as your \_\_\_\_ \_\_\_\_, you could sort them by hand. | **Shoe laces** |
| 31. There is a way to sort and measure DNA strands and it is called \_\_\_ \_\_\_\_\_. | **Gel electrophoresis** |
| 32. What goes in the little holes at the end of the gel? | **The DNA** |
| 33. What is added to make DNA move? | **Electric Current** |
| 34. Do short strands or long strands move more quickly? | **Short** |
| 35. What process makes the sorted DNA visible to the naked eye? | **Staining** |
| 36. List the 6 steps listed to run your own gel. | **Make the gel**  **Set up the gel apparatus**  **Load the DNA sample**  **Hook up the electrical current & run**  **Stain the gel & analyze results** |
| 37. What is agarose made from? | **Seaweed** |
| 38. Describe what you saw at the end of your experiment. | **Answers will vary** |