Internet Resources

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http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004838 (You should be able to access the entire article. You may need to copy and paste the site address.)

http://www.ncbi.nlm.nih.gov/pubmed/20557352 (You won't be able to access the entire article, but the abstract will give you important information.)

http://www.nature.com.proxy.lib.odu.edu/ng/journal/v9/n1/pdf/ng0195-9.pdf (Please note that this is a PDF of an article.)

History

1. Nicholas II was the last czar to hold power in Russia. How long had the Romanov family been in power in Russia? **300 years**
2. Nicholas II abdicated the throne. Who took power then? **Russia was overthrown by the Bolsheviks**
3. Describe what happened to Nicholas II and his family after he abdicated the throne? **They were taken to the mountains and placed under house arrest and eventually they were all executed**
4. One of the reasons that the family of Nicholas II was executed (vs. just imprisoned) was because there was a fear that the White Russian Army would save them. Who was the White Russian Army? **They were an anti-socialist group who fought against the Bolsheviks in the Russian Civil War.**

Hemophilia

One of the pedigree charts found at the end of this assignment comes from the Module PowerPoint lecture notes.

5. How was Alix, the wife of Nicholas II, related to Queen Victoria of England? (Look at the pedigree chart very carefully.) **Queen Victoria was Alix's grandmother**
6. On what chromosome is the gene that, when mutated, causes hemophilia, and how does this contribute to its inheritance pattern? **The X chromosome**

Both Queen Victoria and Alix are designated as being carriers for hemophilia.

7. What does it mean to be a carrier for a disease? **The carrier has the potential to pass on the gene even I they don't show any symptoms for the gene**
8. Why aren't males considered *carriers* for hemophilia? **Because the disease is passed only through the X chromosome and males only have one X chromosome**
9. In a couple of sentences, describe the physiology of the disease hemophilia. (Yes, I know it is severe bleeding because the blood cannot clot. But WHY can't the blood clot? Be *very* specific.) **People who suffer from hemophilia have low levels of clotting factors in the platelets. The low clotting factors make it so the blood cannot clot in the wound.**
10. What type of hemophilia (A or B) is (probably) represented in the pedigree chart? **B**
11. Describe the mutation (at the molecular level) that apparently caused hemophilia in Alix, (and probably all the European families that had hemophilia). Be *very* specific. **The mutation is a substitution in the nitrogenous base which changed the amino acid sequence**
12. How could the mutation you described in #12 result in a faulty gene product? Be *very* specific in your description. **The substitution mutation could change the amino acid into a different gene that has a a completely different function or even a stop codon that can prevent the protein from being made in the first place**
13. The Romanov's son, Alexis, had hemophilia. Describe how Alexis genetically acquired hemophilia. (Use a Punnett square. You can either draw a table or line up the genotypes.)

	X^H	Y
X^H	X^H X^H	X^H Y
X^h	X^h X^h	X^h Y

14. Using a Punnett square (again, draw a table or line up the genotypes), explain why only males in the pedigree chart have hemophilia. (Choose at least one of the males represented in the pedigree chart, and show his parents in the Punnett square.)

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	X^H	Y
X^H	X^H X^H	X^H Y
X^h	X^h X^h	X^h Y

Only the men can have hemophilia because the disease is linked to the X chromosome. The females can have the gene but will be carriers because they have and extra X chromosome

15. Is it possible for a female to inherit hemophilia, and, if so, how? **It is possible for the female to have hemophilia but only is the mother and father have hemophilia**

16. Some historians speculate that Alexis' hemophilia condition could have led to the Russian Revolution. Explain. ***You should look up the faith healer Rasputin and read about his relationship to the Romanov family.*** **Alexis needed a faith healer and Rasputin came in and helped to heal him which made him very close to the family and allowed him to have a voice in the government**

Molecular Analysis of People in a Mass Grave

17. Two "graves" were discovered near Yekaterinburg, Russia. When were these graves discovered, and how many bodies were found in each grave? **The graves were discovered in 1991 and there were 9 bodies**

18. What type of testing was done to confirm sex and familial relationships among the remains found in the mass grave? If you use an abbreviation, write it out and define what it is. **They tested the DNA from the bones that remained in the gravesite and conducted blood samples from their living relatives**

19. HRH Prince Philip, the Duke of Edinburgh, provided mitochondrial DNA used to identify Alix and her three daughters. HRH Prince Philip, the Duke of Edinburgh, is married to Queen Elizabeth II of England. Wait, isn't Queen Elizabeth II related to Queen Victoria? So why was ***Prince Philip's*** mitochondrial DNA used? (To help you answer this question, look at the second pedigree chart.) **They used Prince Phillips mitochondrial DNA because they all have the same maternal ancestor**

20. Who was missing from the mass grave (the one with the most skeletons)? **Tsarevich Alexei**

Molecular Analysis of People in a Mass Grave, cont.

21. The Duke of Fife and Princess Xenia provided mitochondrial DNA used to identify Nicholas. One of these is a female and another is a male. Does that matter? What general statement can you make about their genetic relationship to Nicholas and Alexandra? **Yes it does matter because hemophilia affects the male population more often and that means that they come from an inbred family**

22. What was discovered in the mitochondrial DNA of Nicholas that was not identified in either the Duke of Fife or Princess Xenia? **They found a single point heteroplasmy**

23. What is the term given to the existence of two (or more) genetically different mitochondria in the cell? **Heteroplasmy**

24. What three types of DNA were used to test the remains found in a second grave? Again, if you use an abbreviation, write it out and define what it is. **Mitochondrial DNA, autosomal STR (short tandem repeat), and Y-STR (STR on the Y chromosome) testing.**

25. Of the three types of DNA you listed in the previous answer, which one would have been used specifically to identify Alexis and why? **Y-STR testing**

Princess Xenia? They found a single point heteroplasmy

23. What is the term given to the existence of two (or more) genetically different mitochondria in the cell? **Heteroplasmy**

24. What three types of DNA were used to test the remains found in a second grave? Again, if you use an abbreviation, write it out and define what it is. **Mitochondrial DNA, autosomal STR (short tandem repeat), and Y-STR (STR on the Y chromosome) testing.**

25. Of the three types of DNA you listed in the previous answer, which one would have been used specifically to identify Alexis and why? **Y-STR testing**

26. Was Anastasia in the grave in which Alexis was found? **No**

Who Wants to Be Anastasia?

Apparently, about 200 people have wanted to be Anastasia and have claimed to be her! One of the most famous imposters was a woman named Anna Anderson (Manahan).

27. Give a brief history (2-3 sentences) of Anna Anderson-both her claims and what is thought to be true. **Anna Anderson was found faking her identity, pretending to be Anastasia. She was discovered through DNA testing.**

28. Where in the US did Anna Anderson eventually settle and why? **VA for medical reasons**

29. What were the sources of Anna Andersons's nuclear DNA? **Hair and intestine**

30. What were the sources of Nicholas' and Alix's nuclear DNA? **Bone**

31. What type of analysis was done on DNA from Anna Anderson, Nicholas, and Alix? **Mitochrondrial DNA nd STR DNA**

32. Anna Anderson's mitochondrial DNA was compared to the mitochondrial DNA of what two "other" people? **Carl Maucher and Duke of Edinburgh**

33. A hypervariable region of the mitochondrial DNA was analyzed. Define a hypervariable region. **A hypervariable region has lots of different amino acids.**

34. What were the conclusions from the mitochondrial DNA comparisons? **Anna Anderson was not Anastasia**

35. The article which describes the analysis of Anna Anderson's DNA was published in 1995.

When were all of Nicholas' and Alix's children finally accounted for? **They were not accounted for until 2007**

36. What was the most surprising thing that you learned from doing this assignment? **I thought it was crazy how bones that were buried decades ago can still be used in DNA testing.**

Are you still interested in the life of the last Tsar of Russia and his relationship to British royalty? The headline for the following article showed up on my Internet browser earlier this year. While I can't vouch for it as it did not appear in a peer-reviewed journal, it might be interesting reading for you.
https://www.townandcountrymag.com/society/tradition/a31028924/windsors-romanovs-relationship-last-gathering-true-story/