

# The Royal Disease

Pedigree Challenge ● ■ ● Newsome Biology

GROUP: \_\_\_\_\_ DATE: \_\_\_\_\_ BLOCK: \_\_\_\_\_

## Condition of Interest: *Hemophilia*

Hemophilia in humans is due to an X-chromosome mutation. You will create a pedigree chart below of Queen Victoria of England's family to illustrate inheritance of hemophilia in the royal family. Queen Victoria herself was a carrier due to a chance mutation. Her children married other royalty and passed the trait throughout the royal families of Europe. Hemophilia is a sex-linked recessive trait.



## The Royal Family: *Background Information*

Hemophilia became known as the "Royal Disease" after it suddenly popped up in some of the descendants of Great Britain's Queen Victoria and spread through the royal families of Europe. Queen Victoria and her husband Prince Albert had nine children-five girls and four boys: Victoria, Edward VII, Alice, Alfred, Helena, Louise, Arthur, Leopold, and Beatrice. Their son Leopold was a hemophiliac.

Beatrice married a man named Henry and they had four children-sons Leopold and Maurice (both hemophiliacs), daughter Eugenie and another son (not hemophiliacs). Eugenie married Alfonso XIII of Spain (non-hemophiliac) and they had six children (2 normal sons, 2 normal daughters, and 2 hemophilic sons). One of those normal sons, Infante Juan, married a non-hemophilic woman and gave birth to one son-a non-hemophilic they named Juan Carlos (who was the reigning King of Spain until his death in 2014).

Victoria's third child Alice, passed hemophilia to the German and Russian Imperial families. She was married to Louis IV Grand Duke of Hesse. Alice had six children (three girls, son Frederick, and then two more girls). Alice's third daughter Irene, married Henry and had three sons (healthy Prince Sigismund of Prussia, and then Waldemar and Henry who both had hemophilia). Waldemar married Princess Calixta. Alice's son Frederick bled for three agonizing days after a cut on the ear. He survived, but died later from internal bleeding after falling through a window. Alice's 4<sup>th</sup> daughter, Alix married Nikolai II of Russia and had four girls (Olga, Tatiana, Marie, and Anastasia) and one son (Alexis) who had hemophilia.

Queen Victoria's son Leopold married Helen and had two children (a normal son and a daughter named Alice). Alice and her husband had three children-Lady May Able, a son who died at birth, and a son Rupert who was a hemophiliac.

## Your Task: *Draw The Pedigree for This Family*

You will have **50 individuals** and **5 generations** shown in this pedigree. Determine which females are likely carriers and indicate them using the key. You must include the following in your poster.

- ✧ Roman numerals to indicate generations.
- ✧ Family member names for all individuals whose names are provided.
- ✧ A **title** for your chart.
- ✧ Key (as shown below) on your chart.
- ✧ A list of the **total** number of known female carriers and male hemophiliacs.

## Pedigree Key

 = Normal Male

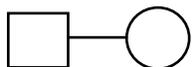
 = Hemophilic Male

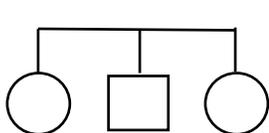
 = Normal Female

 = Carrier Female

 = Deceased Male

 = Deceased Female

 = Mating

 = Siblings

You are required to draw a **rough draft** before you start your poster-this will help you determine spacing and ensure accuracy. The rough draft will be stapled to this sheet and submitted. Count how many individuals you will have in each generation in order to space them neatly. **A ruler must be used to draw straight lines.** Neatness is a part of this grade.

### The Grade Breakdown: *The Grading Rubric*

**5- *Advanced Mastery:*** The pedigree is completed with creativity and no mistakes. Roman numerals are listed for all 5 generations, all 50 individuals are shown and named. The pedigree is complete with neatness and legibility, has good space utilization, a title and a key.

**4- *Mastery of the Standard:*** The pedigree is completed with creativity and 1-2 mistakes. Roman numerals are listed for all 5 generations, a minimum of 47 individuals are shown and named. The pedigree is complete with neatness and legibility, has good space utilization, a title and a key.

**3- *Approaching Mastery:*** The pedigree is completed with little creativity and 3-5 mistakes. Roman numerals are listed for majority of the generations, and a minimum of 45 individuals are shown and named. The pedigree is complete with neatness and legibility, has good space utilization, a title, and a key.

**2- *Developing Mastery:*** The pedigree is completed with very little creativity more than 5 mistakes. Roman numerals are not listed for the generations, and a minimum of 42 individuals are shown and named. The pedigree is complete with very little neatness and thought and is hard to follow. There is not a good use of space utilization, a title, and a key.

**0.1- *Not Yet:*** The pedigree is less than half way completed. Roman numerals are not listed for the generations, and only 30 or less individuals are shown and not all family members are named. The pedigree is complete with very little neatness and thought and can not be followed. There no use of space utilization, no title, and a key.

***Missing:*** The pedigree was not completed at all, or was completed but not submitted. This assignment will also be "missing" if the student refuses to work/join a group to complete the assignment.