Lesson 7 How to obtain and interpret genomic information

1. Which of the following are reasons that gametes are NOT a good choice to obtain personal genetic information? Select any and all that apply.
   A. Gametes only have half the genome
   B. Females gametes could be difficult to obtain
   C. Gametes contain the only genetic information that gets passed down to children
   D. Gametes undergo recombination that mixes up the order of the genome's information

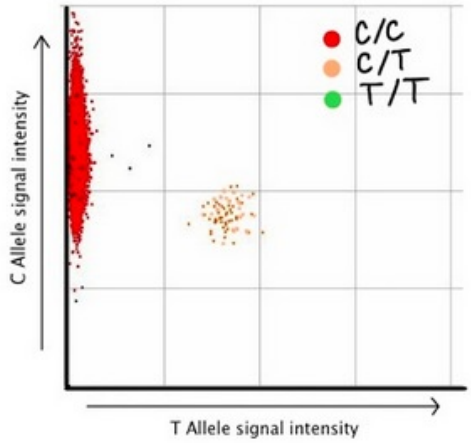
2. If you are a female and want information about your paternal lineage (Y chromosome), which of the following relatives of your father could you use to determine his Y chromosome background? Select any and all that apply.
   A. Your father's son (your brother)
   B. Your father's mother (your paternal grandmother)
   C. Your father's brother (your paternal uncle)
   D. Your father's brother's son (your cousin)
   E. Your father's sister's son (your cousin)

3. To obtain personal genetic information from a company like 23andMe, order the following general steps that must be taken. Order them from 1 to 6 where 1 is the first step and 6 is the last step.
   ___ Raw data analysis
   ___ Extract DNA from sample cells
   ___ Obtain biological sample with cells/DNA
   ___ DNA-Chip hybridization
   ___ Amplify DNA
   ___ Consent/Agree to terms

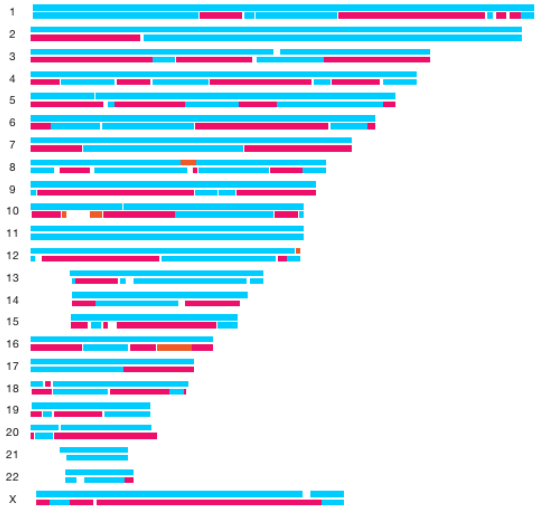
4. Of the following steps, which one is the most time expensive and time intensive?
   A. Extract DNA from sample cells
   B. Obtain biological sample with cells/DNA
   C. DNA-Chip hybridization
   D. Amplify DNA

5. In the following genotyping plot for a particular gene that causes a very rare form of cancer, which allele is most likely the cancer-associated allele? Why? (~150,000 red dots, ~50 orange dots, 0 green dots)

   A. C
   B. T



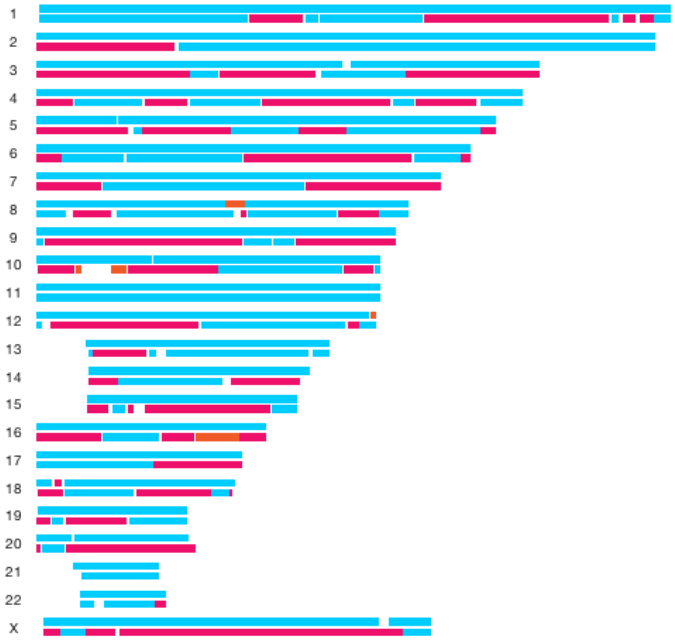
6. In the following ancestry composition graph, is this individual male or female?



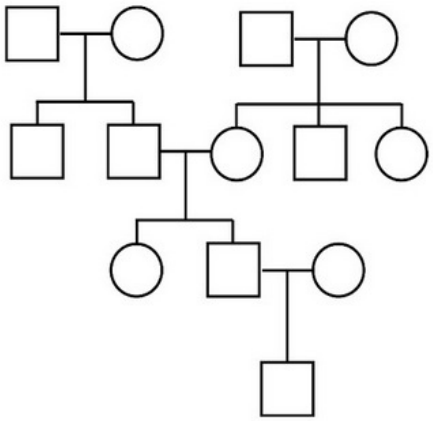
73.6%	European
24.0%	Sub-Saharan African
0.6%	East Asian & Native American
1.9%	Unassigned
100%	**Erika King**

   A. Male
   B. Female
   C. Can't be determined

7. This individual has a rich genetic history, sharing significant ancestry with individuals from both Europe and sub-Saharan Africa. Which are the only chromosomes that trace only with a European ancestry? Select any and all that apply.



8. Francisco has the following pedigree for him and his family:



Francisco is very interested in knowing about the deep past for the side of his family that is missing from the pedigree. Which of the following will give him the information that he's looking for?

A. Y chromosome analysis

B. Mitochondrial chromosome analysis

9. True or False. An individual with majority genetic ancestry from sub-Saharan Africa would be expected to share more neanderthal SNVs than an individual with majority genetic ancestry from Europe. Why?

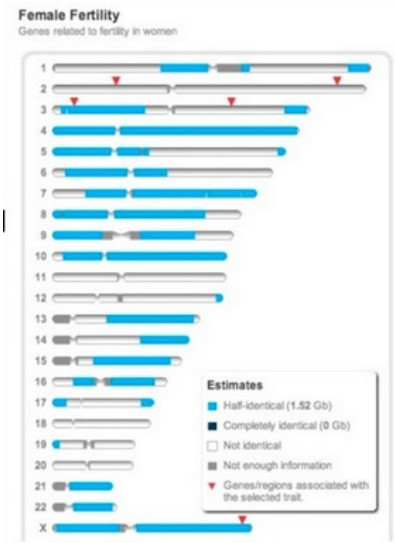
10. After getting your personal genetic information back from 23andMe you log on and discover that you likely cannot taste certain bitter flavors like those found in Brussels Sprouts because you are homozygous for an allele in the TAS2R38 gene that codes for a taste receptor with altered function. If you were heterozygous for this allele then you would be able to taste these bitter flavors. Therefore, the C-allele that prevents you from tasting bitter flavors is most likely:

Genotype	What It Means
GG	Can taste certain bitter flavors.
CG	
CC	Has about an 80% chance of not being able to taste certain bitter flavors.

A. Dominant
B. Recessive
Why?

11. Whether or not you have wet or dry earwax can be affected by what allele of the ABCC11 gene you have. The protein encoded by the ABCC11 gene transports fat-like compounds out of the cell; presumably this would be important in secreting some of the oily substances that make earwax wet. If the C allele codes for a very active ABCC11 gene and the T allele codes for a less active or inactive ABCC11 gene, based on the phenotypes associated with the phenotypes, which allele do you think is dominant? Why?
A. C-allele
B. T-allele

12. A granddaughter-grandmother duo had their DNA genotyped and compared to see what portions of chromosomes were passed from the grandmother to the granddaughter. An analysis looking at the locations of a set of fertility genes showed the results visible here. How many alleles for fertility genes did the grandmother actually pass down to her granddaughter?



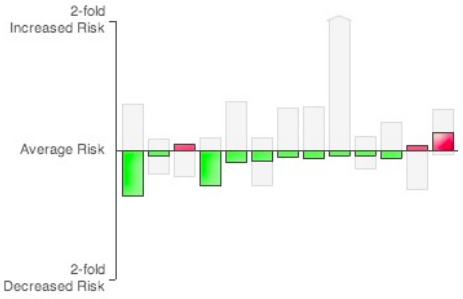
13. After submitting a DNA sample for personal genetics analysis, an individual logs in to find his/her ancestry results and is particularly interested in their paternal line. But the results say that the Paternal Haplotype (line) is "Unknown." Select any and all of the following reasons that, when taken together, explain why this information might be missing.
    A. This person is male.
    B. This person has no other paternal relatives in the 23andMe database.
    C. This person does not have mitochondria.
    D. This person does not have a Y chromosome.
    E. This person is female

14. How worried (worried about contaminated results) should 23andMe be if a saliva sample is submitted that contains a large amount of the following?
    A. Bacteria (Worried or Not Worried)
    B. White blood cells (Worried or Not worried)
    C. Food particles (Worried or Not worried)
    D. Another person's saliva (Worried or Not worried)
    E. Viral DNA from a common cold (Worried or Not Worried)

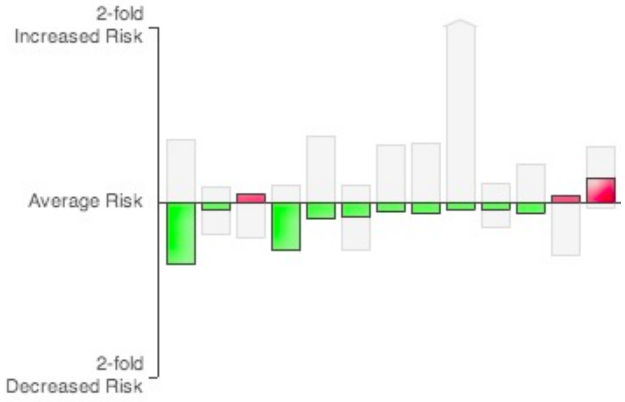
15. As knowledge about the genome grows, researchers are continually discovering new mutations/variations associated with important phenotypic traits that may not already be included on the current 23andMe genotyping platform (DNA chip). Based on what you learned about mutations in lesson 6 and the chip technology described in this lesson, which of the following are examples of variations that 23andMe could possibly include on their next chip? Select any and all that apply.
    A. A SNV that shows a T-allele associated with a specific type of colon cancer
    B. A single base deletion on chromosome 6 associated with a rare skin condition
    C. A tri-nucleotide repeat expansion associated with Huntington's Disease
    D. An extra copy of chromosome 18 associated with Edwards syndrome

16. 23andMe gives customers the option of allowing their anonymized data to be used in research projects carried out by 23andMe researchers. So far, they have gained new insights into the genetics of Parkinson's disease, motion sickness, eye color, hair curl, and more. If you were a 23andMe customer, would you give consent for your data to be used in research initiatives like these? Why or why not?

17. In a 23andMe report for a complex trait like coronary heart disease, several SNVs are used to determine overall risk compared to the average person. Here in this analysis, how many SNVs would you say went into the risk assessment? Write your answer as a number.



18. In this same risk assessment, if the overall risk is simply measured by averaging the risk of these individual SNVs, which of the following best characterizes this person's risk for coronary heart disease compared to the average person? Why?



A. 100% probability the person will get coronary heart disease
B. Higher risk than the average person
C. Exactly the same risk as the average person
D. Lower risk than the average person
E. No risk at all

19. After unlocking the results an individual finds out they're relative risk of developing chronic kidney disease is twice as much as the average person. The same is true for their risk of Alzheimer's. However, which individual risk combination should you be more concerned about for developing the trait based on risk?

	Your Risk	Avg. Risk	Relative Risk
A. Chronic Kidney Disease	6.7%	3.4%	~2x
B. Alzheimer's	14%	7.2%	~2x

20. Select the underlined word in the following paragraph that is incorrect. Then write the correct word that should replace it.
At 23andMe, with consent, DNA can be extracted, prepared, and analyzed for about 1 million SNVs. Individual SNVs are identified by their IBD, and individually or collectively they can give information about ancestry (including autosomal, mitochondrial, and Y-chromosome lineages) and traits (simple or complex).