Discussion sheet

Journey into DNA

1. How DNA replicates
   1. What is the shape and what are the building blocks of the DNA molecule?
   2. Which DNA bases pair with each other? What part of the DNA molecule do they form?
   3. How does DNA replicate and why?
2. From DNA to protein
   1. Write a paragraph with illustrations, describing the steps of the protein synthesis process from DNA to polypeptide chain. Include DNA, bases, transcription, mRNA, translation,codons
   2. From DNA to Protein
      1. How is the information about making different kinds of proteins passed from parents to children?
      2. What building block molecules make up proteins?
      3. What are the steps in the process of protein synthesis from DNA to polypeptide chain? Incorporate the following terms into your discussion: DNA, bases, transcription, mRNA, translation, codons, anticodons, ribosomes, polypeptides, amino acids.
3. How Genetic disorders are inherited
   1. Why would a disease caused by a dominant gene persist in a population?
4. Tay-Sachs Disease
   1. How can a mutation in a single DNA base affect the production of normal proteins?
   2. How are mutations passed on to offspring?
   3. What does it mean to be a carrier of a disease?
   4. What is the pattern of inheritance for diseases carried by recessive genes?
   5. What is Tay Sachs?
5. A mutation story
   1. How can a mutation be harmful in one environment and helpful in another?
   2. Why should a mutation persist if it kills people?
   3. Why are there more people with sickle cell disease in one part of the world than in other parts?
6. Molecular level of genetics
   1. Why do you think DNA exists as a double helix, versus some other shape like a highly folded protein or a linear, single-stranded fatty acid?
   2. In eukaryotic cells, DNA is "trapped" inside two organelles. What are they? Do you think this is simply a biological coincidence, or might there be some benefit to cells that keep their DNA inside these structures?
   3. What is a codon? Do all codons code for amino acids?
   4. How can mutations occur during DNA replication? Can all genetic mutations be passed along from parents to offspring?
7. HIV **Discussion Questions** 
   1. A single gene mutation offers some European Caucasians immunity to human immunodeficiency virus (HIV). How does the gene mutation change cells to block HIV from entering them?
   2. Can you think of any way O'Brian's team could determine if Europeans who died during the black plague were missing the genetic mutation for HIV immunity?
   3. Do you think a genetic test should be developed so people can find out whether they are immune to HIV? What might be the pros and cons of such a test?
8. **Founder effect Discussion Questions** 
   1. What is the name of the condition this image shows?
   2. How can founder effect spread this type of deformity throughout an entire population?
9. **Chromosomes Discussion Questions**
   1. On which chromosome would you find: Tay-Sachs disease? Sickle cell anemia? Ellis-van Creveld syndrome? Huntington's disease?
   2. Which diseases are found on the X chromosome? How would their pattern of inheritance differ from diseases found on autosomal chromosomes (non-sex chromosomes)?
   3. When looking at the chromosome maps, what impressions do you get about living things?

Use this link for part 10 <http://www.genome.gov/10001204>

1. Research three other genetic diseases using the above website discuss the following.
   1. the type of mutation that causes the disease
   2. how the mutation effects the protein
   3. the effects to the individual
2. Culminating activity
   1. This activity you will do as an individual.
   2. Using the information you learned during this activity use at least one paragraph to explain how mutations occur and how they affect gene (trait) expression through protein synthesis.
   3. You need to include the following
      1. At least two types of mutations and explain how they occur
      2. A summary of the process of transcription and translation.
      3. Use one of the examples to explain how a mutation affects the expression of a trait. In other words why does the mutation give them the disease.