Name: _____

BLAST Project: Connecting DNA to Disease Using the BLAST Database

Introduction

We've learned that DNA is the genetic material that organisms inherit from their parents, but have you ever thought about what exactly this DNA encodes for? How do our cells use DNA as a set of instructions for life? How is the information in our DNA/genes used by our bodies? And what happens when the DNA is mutated or not used properly?

You are a geneticist at a clinic and you have a patient that comes in complaining of certain aliments. After taking a sample of a gene from the patient's DNA, you must figure out which disease is associated with the gene. To do this, you will use the BLAST database to identify the **protein** associated with the gene. Next, you will perform a Google search to find out the **disease** associated with that protein.

PART 1: Review questions and lab sheet

Review Questions – _____ / 18pts

Answer the following questions:

1. Define DNA replication.
2. **When** does this happen in the life of a cell?
3. What enzymes are involved in DNA replication?

4. Define transcription.
5. What step(s) in the procedure represent transcription?
6. Where, in the cell, does transcription take place?
7. Which type of RNA is involved in transcription?

8. Define translation.
9. What step(s) in the procedure represent translation?
10. Where, in the cell, does translation take place?
11. Which types of RNA are involved in translation?
12. Which type of RNA is responsible for bringing the amino acids to the ribosome for translation?
13. Which type of RNA makes up a ribosome?

14. Define point mutation.
15. What causes a frameshift mutation and what is the effect on the amino acid sequence?

16. **Extra Credit**: If every somatic (body) cell in our body has the same DNA, then why doesn't every cell do the exact same job?
17. **Extra Credit**: If a mutation occurs in the somatic (body) cell, can it affect the offspring of that person? If a mutation occurs in a sex cell, can it affect the offspring of that person? Explain both of your answers.

Procedure – ________ / 8pts

1. Obtain your DNA sequence from your teacher. **Sequence # __________**

2. Convert your DNA sequence into a complementary mRNA sequence.

   EXAMPLE: DNA: T A C G G C T A G

   ↓

   mRNA: A U G C C G A U C

Your DNA sequence:

mRNA sequence:

3. Determine the codons.

   EXAMPLE: mRNA: A U G C C G A U C

   ↓

   Codons: AUG CCG AUC

Codons: **Write 3 letters on EACH line not 1 per line**

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

4. Translate the codon sequence into an amino sequence. Use the chart provided.

   Codons: AUG CCG AUC

   ↓

   Amino Acids: Methionine Proline Isoleucine

Amino Acid Sequence: → The first amino acid should be Methionine. DON'T write start.

1.________________ 2. ________________ 3. ________________ 4. ________________ 5. ________________

6. ________________ 7. ________________ 8. ________________ 9. ________________ 10. ________________

11________________ 12 ________________ 13 ________________ 14 ________________ 15 ________________

5. Write out the one-letter abbreviations for the amino acids in the sequence. Use the chart provided. (Write "stop" if you have a stop codon)

____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

6. Go to http://www.ncbi.nlm.nih.gov/BLAST/ and choose Protein BLAST

7. Enter the one-letter abbreviations for your amino acid sequence in the SEARCH box (The box that says "Enter accession number…") – be sure to enter them in the correct order! If you have a "stop" codon, you do not have to enter it here.

8. Scroll down and Click on the "BLAST" button. It may take a few minutes to process your sequence.

9. At the next page, scroll down to the list of proteins that matched your sequence. (You will scroll down just below "Color Key for Alignment Scores" box) Choose one of the proteins that matches a protein on **the list provided**.

10. The **protein** your DNA sequence encodes is: _____

11. Now search the name of your protein using www.google.com to find out the disease your protein causes when there is a mutation in the protein.

12. This protein is involved in the following **disease**: _____

Part 2: Research Your Disease and Create a Visual Display

Take notes on the following questions relating to DNA and your disease. Create a **visual display** of your information: powerpoint, poster, Keynote, Prezi, iMovie, ect. You will be explaining the disease caused by your protein or a mutation in this protein. **Genetics Home Reference** is a great place to start your research. **DOCUMENT YOUR REFERENCES to receive credit for this section by including a list of all websites used.**

Include:

1. Background information:
    a. What is a gene? What is a chromosome? What are autosomes? What are sex chromosomes? _____ / 8pts
    b. Explain the steps of transcription and translation _____ / 10pts
2. What are the genetic and/or non-genetic causes of your disease? _____ / 3pts
3. Which of the 23 human chromosomes would you find the gene for your protein (this should be on the Genetics Home Reference webpage)? _____ / 2pts
4. Who typically develops the disease? (anyone, young, old, male, female, certain races, ect) _____ / 4pts
5. What are the symptoms or effects of the disease? (at least 3) _____ / 6pts
6. What is the prognosis of your disease (is it treatable, curable, fatal, etc)? AND list any possible treatment options. _____ / 4pts
7. Include 3 extra, interesting facts about your disease and at least 1 picture. _____ / 4pts

Part 3: Research Your DNA Technology and Create a Visual Display:

- **Name of Your Technology**: _____

Using the DNA Technology you were given, research and answer the following questions. Create a **visual display** of your information: powerpoint, poster, Keynote, iMovie, ect. You will be discussing your technology in a small group in class if time permits. **DOCUMENT YOUR REFERENCES to receive credit for this section by including a list of all websites used.**

What to include in your research:

1. Definition of the technology. _____ / 3pts. Detailed description of how does it work. _____ / 6pts. What is the technology used for? _____ / 3pts
2. What is the history of the technology? When and who started it? _____ / 5pts
3. What are the future uses of this technology? (Impact on human race in the future. This can be your opinion based on your research) _____ / 5pts
4. What are the 6 ethical considerations about this technology? (3 Pros and 3 Cons of using it) _____ / 6pts
5. At least 3 pictures _____ / 5pts

Project Grade = _____