Gene Action/Mutations

Name: _____

Note: Questions #1 - #7 refer to the DNA master strand listed below:

AAT GCC AGT GGT TCG CAC

1. Write the nitrogen base sequence of the complementary DNA strand.

2. Write the nitrogen base sequence of the strand of mRNA read from the master strand of DNA.

3. Write the protein section (amino acid chain) that results from this DNA master strand.

4. If the seventh nucleotide in the original master strand of DNA were changed from A to T, what would the resulting new M-RNA be?

5. Write the protein fragment (amino acid chain) that results from the DNA molecule described in #4.

6. Draw a circle around the amino acid in #5 that changed as a result of the mutation described in #4.

7. Name the type of mutation described in #'s 4, 5 and 6.

Note: Questions: #12 - #21 refer to the DNA master strand listed below:

AAT GCC AGT GGT TCG CAC

12. Write the nitrogen base sequence of the strand of mRNA read from the master strand of DNA.

13. Write the protein section (amino acid chain) that results from this DNA master strand.

14. If a `G' were added to the original master strand of DNA after the third nucleotide (T), what would the resulting mutated mRNA look like?

15. Write the protein fragment (amino acid chain) that results from the DNA molecule described in #14.

16. Explain how the protein fragment (amino acid chain) in #15 has changed as a result of the mutation described in #14.

17. Name the kind of mutation described in #14. (Be specific!)

18. If the `G' in the fourth nucleotide position were to be cut out of the original DNA strand, what would the resulting mRNA look like?

19. Write the protein fragment (amino acid chain) that would result from the DNA molecule described in #18.

20. Explain how the protein fragment (amino acid chain) in #19 has changed as a result of the mutation described in #18.

21. Name the kind of mutation described in #18. (Be specific!)

Note: Questions: #22 - #27 refer to the mRNA strand listed below:

22. Use the genetic code table to translate the following mRNA sequence into an amino acid sequence.

5'-GGA UGG CGA UUU CCA GGC GAA CCG GGA AAA AGC AUU GGG ACU UUU GAG ACC-3'
* # $

23. Delete the second U in this sequence (the one with the * below it) and repeat the translation. What is this type of mutation called? What effect does it have on the encoded protein?

24. Change the A nucleotide marked with a # symbol to a U. What effect does this have on the encoded protein? What is this type of mutation called?

25. Change the same A nucleotide to a G. What effect does this have on the encoded protein? What is this type of mutation called?

26. Which mutation do you think will have a greater impact on protein function, the mutation in # 24 or # 25? Why?

27. Change the G marked with a $ symbol to an A. What effect does this have on the protein sequence? Is this kind of mutation likely to be deleterious to an organism?

28. Please explain why it is critical for proper protein synthesis that aminoacyl-tRNA synthetases add the right amino acid to each tRNA.

The Persistent Problem of Cystic Fibrosis Name: _____

I love this article. It brings in a lot of information we have learned about so far this year – cell sizes, surface area to volume ratio, organelles, membrane structure, tonicity, aging and of course DNA mutations! Cystic fibrosis is a genetic disease that the IB people specifically say they want you to know about. It is a prevalent disease in our society.

1. Why can breathing be difficult for people with cystic fibrosis?

2. Why has it been difficult for scientists to study how the genetic mutation causes cystic fibrosis?

3. Describe the function of the protein defective in cystic fibrosis in terms of membrane transport.

4. What is the name for the protein that when defective causes cystic fibrosis?

5. Why is it important that the cells lining the airway in the lungs have a "combined surface area about the size of a tennis court"? *(The answer to this question is not in the article, you will have to think back over what you've learned in class).*

6. Explain why water, "pulled by osmotic pressure" follows sodium into the cell. *(The answer to this question is not in the article, you will have to think back over what you've learned in class).*

7. Describe how low glutathione concentrations may lead to cystic fibrosis.

8. How might cell membrane sugars have a role in cystic fibrosis?