Protein Regulation & Mutations Notesheet
C. Kohn, Waterford WI

Name: Hour Date:

Date Assignment is due: Why late? Score: + ✓ -
 Day of Week Date If your project was late, describe why**Directions**: Use the accompanying PowerPoint (*available online*) to complete this sheet. This sheet will be due upon the completion of the PowerPoint in class. These assignments are graded on a +/✓/- scale.

1. How many genes are transcribed and translated in human cells?
2. At minimum, how many proteins does any given cell produce?
3. What is the difference between a prokaryotic and eukaryotic cell?
4. Bacteria depend on their to provide them with

 to , such

as the they use for cellular respiration.
5. True or False: bacteria cannot obtain the sugars they need for respiration unless they can directly absorb them from their environment.
6. Production of these when they are not needed would waste large amounts

of .
7. How do prokaryotic cells regulate when they produce proteins? In your answer, include the term *transcription factors:*
8. How does the *lac operon* work to ensure that the proteins needed to break down lactose are only produce when lactose is available?
9. What is an operon?
10. For each of the following, match the letter of the correct description to the appropriate term.

Repressor gene: Promoter gene: Operator gene:

 lacZ: lacY: lacA:

	1. This is where the polymerase must first bind to the operon to begin transcription.
	2. This is the gene for the protein that pumps lactose into the cell if present.
	3. This is the gene for the protein that actually breaks down lactose.
	4. This is the gene for the protein that stops the productive of the other *lac operon* genes if no lactose is present.
	5. This is where the repressor protein binds to stop the production of the *lac operon* proteins if no lactose is present.
	6. This gene has a known but unimportant function for the *lac operon*.
11. If lactose is not present, what happens to the *lac operon* genes?

 . If lactose is present, what happens to the *lac operon* genes?
12. Eukaryotic cells regulate protein production in ways that are to prokaryotic cells.

However, because eukaryotic cells are more , they have a greater

dependence on even to ensure that

the right are made at the right .
13. True or False: only prokaryotic cells use transcription factors to regulate protein production.
14. True or False: only eukaryotic cells use transcription factors to regulate protein production.
15. True or False: eukaryotic cells use more kinds of transcription factors to more accurately regulate protein production.
16. These regulatory processes function less like an and

more like a .
17. Histones are that are used to DNA into tight bundles.
18. Histones are like for
19. How do histones affect the rate of protein production from any particular gene?
20. What is mRNA packaging?
21. How does mRNA packaging affect the rate of protein production from any particular gene?
22. How does degradation of mRNA affect the rate of protein production from any particular gene?
23. All of the cells in the human body (except for reproductive cells) have the same DNA, yet cells can have a wide variety of functions. How can this be possible if all of the cells have the same DNA instructions for producing proteins? Answer by explaining how methylation can be used to turn genes on or off.
24. Methylated DNA is DNA that has been ‘ ‘ or ‘

and cannot be used to .
25. Draw a section of methylated DNA
in the space to the right:
26. True or false: DNA that is not needed for a cell’s function is methylated to prevent it from being expressed.
27. True or false: as cells become specialized after conception, they become more and more methylated.
28. True or false: if DNA in cells were not methylated, a cell could not become specialized for a specific function.
29. Epigenetics refers to
30. True or false: epigenetics is when the bases that make up the genes in DNA are changed.
31. True or false: epigenetics changes which genes can be expressed but does not change the genes themselves.
32. The that you are

to today affect the and of epigenetic changes that occur in egg/sperm cells.
33. True or false: the traits that you pass on to your offspring could change based on your personal choices such as food or activity.
34. What is cancer?
35. How might DNA methylation relate to cancer?
36. A mutation occurs when DNA undergoes a

 through the , , or

of at least one
37. What is the difference between a hereditary and an acquired mutation? There are at least two key differences:
38. Briefly list and describe the three main kinds of mutations:

1

2

3
39. For each item, describe what changes will occur as the result of a mutation:

DNA:

mRNA:

tRNA:

Polypeptide:

Protein:
40. True or false: one change to one base (out of billions of bases in DNA) could prevent an entire organism from functioning.
41. How does a deletion or insertion mutation differ from a substitution mutation?
42. Because an insertion or a deletion insertion changes that

occurs the mutation, these mutations are known as

  .
43. Draw an example of a frameshift mutation below:
44. True or false: a substitution mutation will cause only one codon and amino acid to change.
45. True or false: a frameshift mutation will cause only one codon and amino acid to change.
46. What is a mutagen?
47. What are four examples of mutagens?
48. True or false: a mutation can occur simply because polymerase can make mistakes when copying DNA.
49. Explain how sickle cell anemia occurs and how it impacts an individual; describe how the DNA changes in order for sickle cell to occur.
50. True or false: mutations are always bad. Explain:
51. What is a silent mutation?
52. How did vultures benefit from a mutation to the gene for the protein that regulated the production of feathers on their head?
53. The very fact that there are millions of different kinds of living species is due to the fact that
54. Over long periods of time, this mutation many become so that the entire

species is . If enough of these

accumulate in the individuals of this species, an entirely may form as a result.
55. Summarize how mutations have enabled agriculturalists to change wild species into the more-productive domesticated species that we depend upon today for our food:
56. What is a breed?
57. The Holstein breed produces while the Jersey breed

produces .
58. While the traits occurred because of

they became in these domesticated breeds because of

Unit Wrap-up C. Kohn, Agricultural Sciences - Waterford WI

This page is designed to help raise your grade while enabling you to develop skills you will need for after high
school. You will need to complete every question and blank in order to receive full credit for your notes. Note: if you cannot come up with a strategy to remember a difficult concept on your own, see your instructor for help.

1. What is a topic or concept from this unit that you found to be more challenging? Write or describe below:

In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
2. What is a 2nd topic or concept from this unit that you found to be more challenging? Write or describe below:

In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
3. What is a 3rd topic or concept from this unit that you found to be more challenging? Write or describe below:

In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
4. Circle the most appropriate response. You will only be graded on whether or not you completed this section.

Circle one: *I used my notes outside of class to prepare for the quiz.* Definitely – Yes – Sort of - No

Circle one: *I took extra notes in the margins for very difficult concepts.* Definitely – Yes – Sort of - No

Circle one: *I created a personal strategy for at least three difficult items.* Definitely – Yes – Sort of - No

Circle one: *I was very involved and actively studying during the quiz review.* Definitely – Yes – Sort of - No

Circle one: *I think I will be satisfied with the quiz grade I received this week.* Definitely – Yes – Sort of - No

Circle one: *I might need to meet with the instructor outside of class.* Definitely – Yes – Sort of - No