Name_____ Class_____ Date_____

Section 12–5 Gene Regulation (pages 309–312)

This section explains how some genes in prokaryotes and eukaryotes are controlled.

Introduction (page 309)

1. Label the parts of a typical gene in the diagram below.

2. Where does RNA polymerase bind? _____

_____

3. Is the following sentence true or false? The actions of DNA-binding proteins help to determine whether a gene is turned on or turned off. _____

Gene Regulation: An Example (pages 309–310)

4. What is an operon? _____

_____

_____

5. What is the function of the genes in the *lac* operon? _____

_____

_____

6. Circle the letter of each sentence that is true about lactose.

a. Lactose is a simple sugar.

b. To use lactose for food, *E. coli* must take lactose across its cell membrane.

c. The bond between glucose and galactose must be broken in order for *E. coli* to use lactose for food.

d. Proteins encoded by the genes of the *lac* operon are needed only when *E. coli* is grown on a medium containing glucose.

7. Circle the letter of the number of genes in the *lac* operon found in *E. coli.*

a. 1 **b.** 2 **c.** 3 **d.** 4

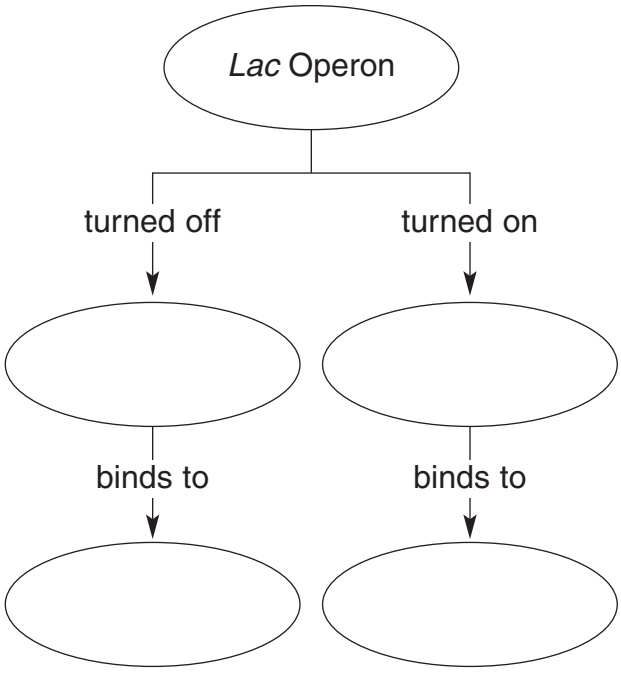
8. What turns the *lac* operon off and on? _____

_____

_____

Name _____ Class _____ Date _____

9. Complete the concept map to show how the *lac* operon is regulated.



10. How does the repressor protein prevent transcription? _____

_____

_____

11. How does lactose cause the *lac* operon to turn on? _____

_____

_____

_____

12. Circle the letter of each sentence that is true about gene regulation in prokaryotic genes.

a. The *lac* operon is the only example of genes regulated by repressor proteins.

b. Many other genes are regulated by repressor proteins.

c. Some genes are regulated by proteins that enhance the rate of transcription.

d. Cells cannot turn their genes on and off as needed.

Eukaryotic Gene Regulation (page 311)

13. Is the following sentence true or false? Operons are frequently found in eukaryotes.

_____

14. How are eukaryotic genes usually controlled? _____

_____

_____

_____

Name _____ Class _____ Date _____

15. What is the function of the TATA box? _____

_____

_____

16. Eukaryotic promoters are usually found just _____ the TATA box, and they consist of a series of short _____ sequences.

17. List three ways in which proteins that bind to enhancer sequences of a gene can work to regulate gene expression.

a. _____

b. _____

c. _____

18. Why is gene regulation in eukaryotes more complex than in prokaryotes? _____

_____

_____

_____

_____

Development and Differentiation (page 312)

19. What role do the hox genes play in the development of an organism? _____

_____

_____

_____

20. Circle the letter of each sentence that is true about hox genes.

a. A mutation in a hox gene has no effect on the organs that develop in specific parts of the body.

b. In fruit flies, a mutation affecting the hox genes can replace a fly's antennae with a pair of legs.

c. The function of the hox genes in humans seems to be almost the same as it is in fruit flies.

d. A copy of the gene that controls eye growth in mice does not function in fruit flies.

21. Why do common patterns of genetic control for development exist among animals?

_____

_____

_____