

13.4 Gene Regulation and Expression

Prokaryotic Gene Regulation

1. How do prokaryotes conserve energy?

2. How do DNA-binding proteins in prokaryotes regulate genes?

3. What is an operon?

4. What is in the *lac* operon in *E. coli*?

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

6. What turns the *lac* operon off?

7. How does a repressor protein turn off the *lac* operon?

8. How does lactose turn on the *lac* operon?

Eukaryotic Gene Regulation

9. In what two ways is gene regulation in eukaryotes different from gene regulation in prokaryotes?

a.

b.

10. What is a TATA box? What does a TATA box do?

11. What are transcription factors and what do they do?

12. Explain how gene regulation makes cell specialization possible.

13. Explain how the process of RNA interference works.

Genetic Control of Development

For Questions 16–23, write the letter of the correct answer on the line at the left.

- _____ 14. As an embryo develops, different sets of genes are regulated by
A. mRNA and *lac* repressors. C. transcription factors and repressors.
B. operons and operators. D. promoters and operators.
- _____ 15. The process through which cells become specialized in structure and function is
A. transcription. C. differentiation.
B. gene expression. D. RNA interference.
- _____ 16. Homeotic genes are
A. regulator genes that bind to operons in prokaryotes.
B. master control genes that regulate organs that develop in specific parts of the body.
C. parts of the silencing complex that regulates gene action through RNA interference.
D. base sequences complementary to sequences in microRNA.
- _____ 17. What role do homeobox genes play in cell differentiation?
A. They code for transcription factors that activate other genes important in cell development and differentiation.
B. They block certain gene expression.
C. They cut double-stranded loops into microRNA.
D. They attach to a cluster of proteins to form a silencing complex, which binds to and destroys certain RNA.
- _____ 18. In flies, the group of homeobox genes that determines the identities of each segment of a fly's body is the group known as
A. silencing complexes. C. operators.
B. promoters. D. Hox genes.
- _____ 19. Clusters of Hox genes are found in
A. flies only. C. plants only.
B. flies and frogs only. D. nearly all animals.
- _____ 20. The “switches” that trigger particular patterns of development and differentiation in cells and tissues are
A. mRNA molecules. C. silencing complexes.
B. master control genes. D. Dicer enzymes.