

Chapter 2: Gene Expression and Epigenetics

Multiple Choice

1. DNA sequences that are involved in the regulation of gene expression are called
- A. cis factors.
 - B. trans factors.
 - C. attenuators.
 - D. repressors.

ANS: A

OBJ: 2-2

2. Which of the following is the binding site for the repressor protein of the lactose operon?
- A. P site
 - B. Operator
 - C. A site
 - D. Promoter

ANS: B

OBJ: 2-2

3. Which of the following would prevent transcription of the lactose operon?
- A. Loss of promoter
 - B. Presence of inducer
 - C. Loss of the repressor protein
 - D. RNA polymerase binding to the promoter

ANS: A

OBJ: 2-2

4. Which of the following is a cis factor of the lactose operon?
- A. Inducer
 - B. Operator
 - C. Repressor
 - D. Polymerase

ANS: B

OBJ: 2-2

5. In the lactose operon, which of the following configurations would result in gene expression?

- A. Promoter +, Operator +, Repressor +, no inducer present
- B. Promoter –, Operator +, Repressor +, no inducer present
- C. Promoter –, Operator –, Repressor +, inducer present
- D. Promoter +, Operator +, Repressor –, no inducer present

ANS: D

OBJ: 2-2

6. When gene expression is regulated by mechanisms other than the interaction of cis elements and trans factors, the regulation is called

- A. induction.
- B. epigenetics.
- C. attenuation.
- D. combinatorial control.

ANS: B

OBJ: 2-1

7. Genomic imprinting is accomplished primarily through

- A. methylation.
- B. acetylation.
- C. transcription.
- D. cis and trans factor interactions.

ANS: A

OBJ: 2-5

8. The most frequently methylated base in vertebrates is

- A. adenine.
- B. cytosine.
- C. guanine.
- D. thymine.

ANS: B

OBJ: 2-5

9. MicroRNAs, short endogenous RNAs, perform what function in the eukaryotic cell?

- A. Control of DNA replication
- B. Priming RNA synthesis
- C. RNA splicing
- D. Repression of gene expression

ANS: D

OBJ: 2-3

10. What mechanism may explain the difference in symptoms in Prader–Willi and Angelman syndromes?

- A. Genomic imprinting
- B. Alternative splicing
- C. Genetic recombination
- D. Capping

ANS: C

OBJ: 2-5

11. Alteration of the nucleotide sequence of RNA after transcription is called

- A. methylation.
- B. RNA silencing.
- C. RNA editing.
- D. capping.

ANS: C

OBJ: 2-5

12. Which RNA results from exogenous nucleic acids?

- A. siRNA
- B. lncRNA
- C. mRNA
- D. miRNA

ANS: A

OBJ: 2-3

13. Which DNA methyltransferase (DNMT) is responsible for maintenance of DNA methylation patterns?

- A. DNMT3A
- B. DNMT2
- C. DNMT1
- D. DNMT3B

ANS: C

OBJ: 2-5

14. Which of the following is an epigenetic mechanism?

- A. Binding of transcription factors
- B. DNA hairpin formation
- C. Cis factors
- D. DNA methylation

ANS: D

OBJ: 2-1

15. Which is a histone mark?

- A. Binding of histone H1 to euchromatin
- B. A modified nucleoside
- C. Histone H3 tail sequence
- D. Acetylation of histone H3

ANS: D

OBJ: 2-4

16. Which histone is not included in the core histones?

- A. H1
- B. H2B
- C. H3
- D. H4

ANS: A

OBJ: 2-4

17. This is a list of histone modifications that affect gene expression.

- A. Transcriptome
- B. Histone code
- C. Proteome
- D. Genetic code

ANS: B

OBJ: 2-4

18. Methylation of lysine at position 20 in histone 2B is expressed in this way.

- A. K20H2BMe
- B. H2BK20Me
- C. MeK20H2B
- D. H2K20Me

ANS: B

OBJ: 2-4

19. Acetylation of histone H3 would result in which of the following effects?

- A. Degradation of mRNA
- B. Formation of heterochromatin
- C. Exclusion of activator proteins
- D. Increased gene expression

ANS: D

OBJ: 2-4

20. These DNA sequence structures function in epigenetic gene regulation.

- A. Operators
- B. CpG islands
- C. Inverted repeats
- D. Regulator genes

ANS: B

OBJ: 2-5

21. Which proteins perform demethylation of DNA?

- A. DNA polymerases
- B. TET enzymes
- C. METTL enzymes
- D. TFIID protein

ANS: B

OBJ: 2-5

22. This complex is required for miRNA and siRNA association to mRNA targets.

- A. Replisome
- B. Retrotransposon
- C. RISC
- D. XIC

ANS: C

OBJ: 2-3

23. Enhancer regulation of gene expression is facilitated by this RNA.

- A. lncRNA
- B. miRNA
- C. siRNA
- D. Ri Xist RNA

ANS: A

OBJ: 2-3

24. DNA hypermethylation would have what effect of movement of retrotransposons through RNA intermediates?

- A. Increase movement by activating transcription
- B. Increase movement by repressing transcription
- C. No effect on movement nor transcription
- D. Inhibi movement by repressing transcription

ANS: D

OBJ: 2-5

25. Multiple products are generated from the same gene by what mechanism?

- A. Alternative splicing
- B. Polyadenylation
- C. Capping
- D. Splicing

ANS: A