1. Which of the following scenarios best exemplifies *coevolution* driven by an evolutionary arms race?

A) Birds evolving beaks to crack hard seeds
B) Flowers evolving to attract pollinators of all types
C) Cheetahs evolving speed while gazelles evolve evasive agility
D) Whales evolving large body sizes to retain heat
ANSWER: C

2. The relationship between ants and acacia trees is an example of:

A) Parasitism
B) Predator-prey dynamics
C) Mutualism
D) Commensalism
ANSWER: C

3. What happens when DNA is hypermethylated at gene promoters?

A) Gene expression increases
B) Gene expression is silenced
C) DNA breaks down
D) Histones are removed
ANSWER: B

4. What does BLAST stand for?

A) Biological Level Analytical Sequence Tracker
B) Basic Local Alignment Search Tool
C) Biologically Linked Annotation Search Tool
D) Base-Line Algorithm for Sequence Testing
ANSWER: B

5. Which of the following is NOT a mechanism of epigenetic regulation?

A) DNA methylation
B) RNA splicing
C) Histone modification
D) Non-coding RNAs
ANSWER: B

6. Which of the following correctly matches an epigenetic mechanism with its function?

A) DNA methylation – increases transcription
B) Histone deacetylation – relaxes chromatin

C) Histone acetylation – promotes gene expression
D) RNA interference – amplifies gene translation
ANSWER: C

7. Which statement about epigenetic modifications is true?

A) They permanently alter the DNA sequence
B) They are never heritable
C) They can be reversed and are influenced by the environment
D) They only occur in cancerous cells
ANSWER: C

8. In the newt-garter snake example of coevolution, the selective pressure from newts leads to what kind of adaptation in snakes?

A) Loss of hunting behavior
B) Resistance to newt toxins
C) Enhanced digestive enzymes
D) Increased camouflage
ANSWER: B

9. Which of the following statements is true about BLAST results?

A) A higher E-value means a better match
B) Sequence identity must be above 90% to be meaningful
C) The E-value indicates the likelihood of a match occurring by chance
D) BLAST cannot align protein sequences
ANSWER: C

10. A mutation that leads to a loss of methylation at a tumor suppressor gene promoter would most likely result in:

A) Increased gene silencing
B) Reduced gene expression
C) Overexpression of the tumor suppressor gene
D) No change in expression
ANSWER: C

Multi correct

11. Which of the following are examples of coevolution?

A) Bees and flowering plants
B) Wolves and deer
C) Antibiotic-resistant bacteria and humans
D) Whales and penguins
ANSWER: A, B, C
(A: Mutualism, B: Predator-prey arms race, C: Medical coevolution)

12. *Which tools can be used to compare a nucleotide query against protein databases?*

A) BLASTn
B) BLASTp
C) BLASTx
D) tBLASTx
ANSWER: C, D
(BLASTx = DNA to protein, tBLASTx = translated nucleotide to translated nucleotide)

13. Which databases provide information about protein structure or sequence?

A) PDB
B) GenBank
C) UniProt
D) BLAST
ANSWER: A, C
(PDB = structure, UniProt = sequence/function; GenBank = nucleotide; BLAST is a tool, not a database)

14. Which conditions are typically required for transgenerational epigenetic inheritance?

A) The epigenetic mark survives gamete formation
B) The change alters the DNA sequence
C) The mark is passed to offspring and maintained
D) It occurs only in somatic cells
ANSWER: A, C

15. Which of the following statements are true about histone modification?

A) It changes the DNA sequence
B) It can activate or repress gene expression
C) It is reversible
D) It occurs only in prokaryotes
ANSWER: B, C