

Advanced Genetic Fundamentals

Genetics · Answer Key · 20 Questions

1. Which enzyme is primarily responsible for synthesizing new DNA strands by adding nucleotides to the 3' end of the growing chain during replication?

- A) DNA Helicase
- B) DNA Polymerase III**
- C) DNA Ligase
- D) Primase

2. In the context of the lac operon in E. coli, what molecule acts as the inducer that binds to the repressor protein to prevent it from binding to the operator?

- A) Glucose
- B) Lactose**
- C) ATP
- D) RNA Polymerase

3. During meiosis I, what specific process involves the physical exchange of genetic material between non-sister chromatids of homologous chromosomes?

- A) Independent Assortment
- B) Cytokinesis
- C) Crossing Over**
- D) Nondisjunction

4. Which nitrogenous base is replaced by uracil in RNA molecules?

- A) Adenine
- B) Guanine
- C) Cytosine
- D) Thymine**

5. What is the term for a permanent alteration in the DNA sequence that makes up a gene, such that the sequence differs from what is found in most people?

- A) Phenotype
- B) Mutation**
- C) Genotype
- D) Transcription

6. Which phase of the cell cycle is characterized by the replication of the genome?

- A) G1 phase
- B) G2 phase
- C) S phase**
- D) M phase

7. In a diploid organism, what is the phenotypic ratio typically observed in the F2 generation of a classic Mendelian dihybrid cross?

- A) 3:1
- B) 9:3:3:1**
- C) 1:2:1
- D) 1:1:1:1

8. Which protein complex is responsible for the degradation of intracellular proteins that are tagged with ubiquitin?

- A) Ribosome
- B) Lysosome
- C) Proteasome**
- D) Golgi Apparatus

9. What is the primary function of the TATA box found in the promoter region of many eukaryotic genes?

- A) Termination of transcription
- B) Initiation of DNA replication
- C) Binding site for transcription factors**
- D) Encoding a stop codon

10. Which genetic condition is characterized by a 45,X karyotype, resulting in a single X chromosome?

- A) Down Syndrome
- B) Turner Syndrome**
- C) Klinefelter Syndrome
- D) Huntington Disease

11. What type of inheritance pattern is exhibited by the ABO blood group system in humans, involving both dominance and the expression of both alleles?

- A) Incomplete dominance
- B) Codominance**
- C) Polygenic inheritance
- D) Sex-linked inheritance

12. What is the role of DNA ligase in the process of DNA replication?

- A) Unwinding the DNA helix
- B) Joining Okazaki fragments**
- C) Synthesizing RNA primers
- D) Proofreading the DNA sequence

13. Which experimental discovery by Avery, MacLeod, and McCarty demonstrated that the 'transforming principle' in bacteria was DNA?

- A) The Hershey-Chase experiment
- B) The Griffith experiment
- C) Transformation of R-strain to S-strain**
- D) The Meselson-Stahl experiment

14. What is the function of the signal recognition particle (SRP) in a cell?

- A) Directing protein synthesis to the endoplasmic reticulum**
- B) Transporting mRNA to the nucleus
- C) Regulating DNA packing
- D) Initiating mitosis

15. What occurs during the process of alternative splicing?

- A) DNA is converted into mRNA
- B) mRNA is degraded by nucleases
- C) Different exons are joined to produce multiple protein isoforms**
- D) Introns are retained in the final protein product

16. Which of the following describes the 'wobble' hypothesis regarding the genetic code?

- A) The redundancy of the stop codons
- B) The non-specificity of the third base in a codon-anticodon pairing**
- C) The error rate of DNA polymerase
- D) The instability of mRNA transcripts

17. In terms of chromosome structure, what is the function of a telomere?

- A) To initiate DNA replication
- B) To protect the ends of chromosomes from degradation**
- C) To hold sister chromatids together
- D) To serve as a binding site for the spindle fibers

18. Which molecule carries amino acids to the ribosome during protein synthesis?

- A) mRNA
- B) rRNA
- C) tRNA**
- D) snRNA

19. What is the result of non-disjunction during meiosis?

- A) Normal diploid gametes
- B) Aneuploidy in the resulting zygote**
- C) Increased crossing over
- D) Formation of polyploid somatic cells

20. Which term refers to the expression of multiple phenotypic traits from a single gene?

- A) Polygenic
- B) Pleiotropy**
- C) Epistasis
- D) Codominance