

Hallmarks of Advanced Biology

Advanced Biology · Answer Key · 20 Questions

1. Which of the following organelles is primarily responsible for the synthesis of steroid hormones and detoxification of drugs and poisons?

- A) Golgi apparatus
- B) Rough endoplasmic reticulum
- C) Smooth endoplasmic reticulum**
- D) Lysosomes

2. The process of transcription, where RNA is synthesized from a DNA template, occurs in which cellular compartment in eukaryotes?

- A) Cytoplasm
- B) Ribosome
- C) Nucleus**
- D) Mitochondria

3. What is the primary function of telomeres in eukaryotic chromosomes?

- A) Initiating DNA replication
- B) Preventing chromosome fusion
- C) Protecting coding regions from degradation**
- D) Serving as binding sites for transcription factors

4. Which of the following describes the process by which a cell engulfs large particles or other cells from its external environment?

- A) Pinocytosis
- B) Exocytosis
- C) Facilitated diffusion
- D) Phagocytosis**

5. The chemiosmotic theory, explaining ATP synthesis during cellular respiration and photosynthesis, centers around the establishment of a proton gradient across which membrane?

- A) Plasma membrane
- B) Nuclear envelope
- C) Mitochondrial inner membrane**
- D) Golgi membrane

6. In the context of protein folding, what is a chaperone protein?

- A) A protein that binds to DNA and regulates gene expression
- B) An enzyme that breaks down proteins
- C) A protein that assists in the proper folding of other proteins**
- D) A protein involved in cell signaling

7. Which mechanism allows for the generation of genetic diversity in both prokaryotes and eukaryotes through the exchange of genetic material between different individuals?

- A) DNA replication
- B) Mitosis
- C) Meiosis
- D) Horizontal gene transfer (in prokaryotes) or sexual reproduction (in eukaryotes)**

8. What is the role of ubiquitin in cellular processes?

- A) Catalyzing peptide bond formation
- B) Targeting proteins for degradation by the proteasome**
- C) Directing mRNA to ribosomes
- D) Facilitating DNA repair

9. The ABO blood group system in humans is an example of which type of inheritance pattern?

- A) Autosomal recessive
- B) Autosomal dominant
- C) X-linked
- D) Codominance and multiple alleles**

10. What is the fundamental unit of heredity passed from parent to offspring?

- A) Allele
- B) Gene**
- C) Chromosome
- D) Genome

11. Which type of signaling molecule travels through the bloodstream to target cells located far from the site of release?

- A) Paracrine signal
- B) Autocrine signal
- C) Endocrine signal**
- D) Juxtacrine signal

12. The phenomenon where the expression of one gene is affected by the expression of one or more other genes is known as:

A) Pleiotropy

B) Epistasis

C) Linkage

D) Mendelian inheritance

13. What is the primary role of ribosomes in protein synthesis?

A) Transcribing DNA into mRNA

B) Carrying amino acids to the ribosome

C) Catalyzing the formation of peptide bonds between amino acids

D) Ensuring the correct sequence of nucleotides in mRNA

14. Which bacterial structure is often used as a target for antibiotics that inhibit cell wall synthesis?

A) Plasma membrane

B) Cytoplasm

C) Peptidoglycan layer

D) Ribosomes

15. The process by which a fertilized egg develops into a multicellular organism is called:

A) Gametogenesis

B) Fertilization

C) Embryogenesis

D) Histogenesis

16. What is the driving force behind the net movement of water across a selectively permeable membrane from a region of high water concentration to a region of low water concentration?

A) Active transport

B) Osmosis

C) Diffusion

D) Facilitated diffusion

17. Which class of enzymes is responsible for transferring a phosphate group from one molecule to another?

A) Hydrolases

B) Ligases

C) Kinases

D) Oxidoreductases

18. The evolution of antibiotic resistance in bacteria is a classic example of:

- A) Genetic drift
- B) Gene flow
- C) Natural selection**
- D) Artificial selection

19. What is the primary site of cellular respiration, where the majority of ATP is generated in eukaryotic cells?

- A) Endoplasmic reticulum
- B) Golgi apparatus
- C) Mitochondria**
- D) Lysosomes

20. Which of the following describes the ability of a single gene to have multiple phenotypic effects?

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