

Chap 01

Indicate the answer choice that best completes the statement or answers the question.

- ___ 1. What commonsense observation makes the theory of acquired characteristics UNLIKELY?
- An individual may inherit traits found in both of his or her parents.
 - Anatomical changes such as loss of a limb are not seen in the offspring of an individual.
 - Evolution requires genetic change in populations.
 - Alleles that result in abnormal phenotypes may be less common in some populations than in others.
 - Offspring often look more like their parents than unrelated individuals.
- ___ 2. Which one of the following topics of research belongs to the discipline of transmission genetics?
- inheritance pattern of gene alleles
 - mechanism of DNA replication
 - gene expression patterns
 - evolution
 - chemical modification of nucleic acids
- ___ 3. The first complete DNA sequence of a nonviral, free-living organism was obtained for
- a bacterium in 1900.
 - a bacterium in 1945.
 - a bacterium in 1995.
 - humans in 1990.
 - humans in 2000.
- ___ 4. Identify a FALSE statement from the following descriptions of genetics.
- Humans first applied genetics to the domestication of plants and animals between approximately 10,000 and 12,000 years ago.
 - Some viruses use RNA to carry their genetic information.
 - Albinism results from a mutation in the genes that control the synthesis and storage of melanin.
 - All human traits that display blending inheritance are affected by a single gene.
 - The process by which genetic information is copied and decoded is similar for all forms of life.
- ___ 5. The contribution of Gilbert and Sanger to modern genetics was to
- develop the PCR technique.
 - discover DNA in the nucleus of cells.
 - describe the structure of DNA.
 - show that genes were made of DNA.
 - develop a method for sequencing DNA.

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- ___ 6. In the late 1990s, what important discovery in genetics was made?
 - a. The three-dimensional structure of DNA was described, which showed how DNA might be replicated.
 - b. The first recombinant DNA experiments were performed that started the biotechnology field.
 - c. DNA sequencing methods were first discovered.
 - d. Genes were found to be located on chromosomes.
 - e. Tiny RNAs were discovered that play important roles in the regulation of gene expression.

- ___ 7. The golden mutation in the zebrafish was useful because of which of the following results?
 - a. It led to the discovery of a similar gene in humans that is involved in skin pigmentation.
 - b. It led to the development of new varieties of wheat.
 - c. It led to the ability to identify many of the genes that result in an increase in heart attacks.
 - d. It allowed the zebrafish to be grown in captivity and become commercially profitable.
 - e. It became the first gene in a model organism to be sequenced.

- ___ 8. Which of the following scientists contributed significantly to the foundations of molecular genetics?
 - a. James Watson
 - b. Thomas Hunt Morgan
 - c. John B. S. Haldane
 - d. Charles Darwin
 - e. Sewall Wright

- ___ 9. Identify a TRUE statement.
 - a. Genetic influences are solely responsible for the traits of an organism.
 - b. Environmental influences can only responsible for the physical traits of an organism, such as height, weight, or color.
 - c. Environmental influences can only be responsible for the behavioral traits of an organism .
 - d. Environmental influences can affect gene activity.
 - e. Separating genetic and environmental influences on organismal traits is easy.

- ___ 10. Permanent, heritable changes in genetic information (DNA) are called
 - a. evolution.
 - b. defects.
 - c. SNP.
 - d. alleles.
 - e. mutations.

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- ___ 11. A measurable or observable trait or characteristic is called a
- a. phenotype.
 - b. genotype.
 - c. single-nucleotide polymorphism.
 - d. small interfering RNA.
 - e. gene bank.
- ___ 12. Which one of the following pairings between the subdiscipline of genetics and the phenomenon is INCORRECT?
- a. evolution—population genetics
 - b. gene regulation—molecular genetics
 - c. allelic frequency alteration—population genetics
 - d. arrangement of genes on chromosome—transmission genetics
 - e. chemical nature of the gene—transmission genetics
- ___ 13. A change in allele frequency within a population over time leads to
- a. a genome.
 - b. a phenotype.
 - c. a genotype.
 - d. mutations.
 - e. evolution.
- ___ 14. Which of the following scientists contributed significantly to the foundations of population genetics?
- a. James Watson
 - b. Thomas Hunt Morgan
 - c. Ronald Fisher
 - d. Charles Darwin
 - e. Frederick Sanger
- ___ 15. Which of the following statements is FALSE concerning prokaryotic cells?
- a. They lack a nuclear membrane.
 - b. They lack organelles such as chloroplasts.
 - c. They are less complex than eukaryotic cells.
 - d. They lack genetic information.
 - e. They lack a true nucleus.

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- ___ 16. Which of the following examples of scientists and their contribution is matched INCORRECTLY?
- a. Watson and Crick—three-dimensional structure of DNA
 - b. Mendel—principles of heredity using pea plants
 - c. Gilbert and Sanger—DNA sequencing methods
 - d. Morgan—polymerase chain reaction
 - e. Sutton—genes on chromosomes as units of inheritance
- ___ 17. Which of the following pairs is a part of a single nucleotide?
- a. nitrogenous base and sugar
 - b. sugar and amino acid
 - c. guanine and cytosine, two nitrogenous bases
 - d. amino acid and nitrogenous base
- ___ 18. Identify a TRUE statement from the following descriptions concerning genetics.
- a. The theory of pangenesis states that all living organisms are composed of cells.
 - b. Bacteria and viruses are not useful in studying genes and inheritance because they are structurally and metabolically different from eukaryotic cells.
 - c. Charles Darwin accurately described the laws of inheritance in his landmark book, *On the Origin of Species*.
 - d. Many human traits, such as skin and hair color, are determined by more than a single gene.
 - e. Evolution can occur without genetic changes in the population.
- ___ 19. Which of the following species is considered a model genetic organism?
- a. the plant *Linaria vulgaris*
 - b. the deer mouse *Peromyscus maniculatus*
 - c. the worm *Caenorhabditis elegans*
 - d. the frog *Hyla chrysoscelis*
 - e. the chimpanzee *Pan troglodytes*
- ___ 20. Which of the following would serve the LEAST well as a model for understanding basic mechanisms of inheritance?
- a. fruit flies
 - b. humans
 - c. yeast
 - d. mice
 - e. zebrafish

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- ___ 21. Genetic information can be carried in which of the following biomolecules?
- a. proteins
 - b. DNA but not RNA
 - c. RNA but not DNA
 - d. either DNA or RNA
 - e. proteins but not RNA
- ___ 22. What commonsense observation makes the theory of blending inheritance unlikely?
- a. An individual may inherit traits found in only one of his or her parents.
 - b. Anatomical changes such as loss of a limb are not seen in the offspring of an individual.
 - c. Evolution requires genetic change in populations.
 - d. Some traits disappear in one generation and then reappear in the next generation.
 - e. Offspring often look more like their parents than unrelated individuals.
- ___ 23. Which of the following CORRECTLY describes the cell theory?
- a. Genetic information from different parts of the body travels to the reproductive organs.
 - b. The cell is the compositional and functional unit of all life.
 - c. Inside the germ cells, there exists a fully formed miniature adult that enlarges in the course of development.
 - d. The genetic material itself blends, which cannot be separated out in future generations.
 - e. Traits acquired in a person's lifetime become incorporated into the person's hereditary information, which will be passed on to his or her offspring.
- ___ 24. Assume that a geneticist is doing a study with a wild mouse species. She captures 100 of these mice, takes a DNA sample from each, and sequences the same specific gene from each mouse. This gene has two alleles within this population. She then calculates the frequency of each of the two alleles from the sequencing results. Which subdivisions of genetics would this study include?
- a. transmission and population genetics
 - b. transmission and molecular genetics
 - c. molecular genetics only
 - d. molecular and population genetics
 - e. transmission genetics only
- ___ 25. The complete genetic makeup of any organism is referred to as a
- a. phylogeny.
 - b. phenotype.
 - c. genome.
 - d. genotype.
 - e. single-nucleotide polymorphism.

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- ___ 26. Which of the following combines molecular biology and computer science?
- a. single-nucleotide polymorphism
 - b. microRNAs
 - c. polymerase chain reaction
 - d. bioinformatics
 - e. eukaryotics
- ___ 27. Which one of the following topics belongs to a different subdiscipline of genetics when compared with the rest?
- a. mechanism of gene regulation
 - b. allele frequencies of a certain gene in different environments
 - c. transcription
 - d. chemical alternation of chromosomes
 - e. mechanism of DNA replication
- ___ 28. Which of the following scientists contributed significantly to the foundations of transmission genetics?
- a. James Watson
 - b. Thomas Hunt Morgan
 - c. John B. S. Haldane
 - d. Charles Darwin
 - e. Sewall Wright
- ___ 29. Within cells, genes are located on structures called
- a. genomes.
 - b. chromosomes.
 - c. phenotypes.
 - d. genotypes.
 - e. alleles.
- ___ 30. Choose the correct match between the scientists and the field of genetics to which they contributed.
- a. Haldane and Wright—transmission genetics
 - b. Mendel—molecular genetics
 - c. Gilbert and Sanger—population genetics
 - d. Darwin—molecular genetics
 - e. Morgan—transmission genetics

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- ___ 31. Assume that a mutation occurs within a gene within an individual fruit fly. What will be the most likely series of consequences of this mutation?
- It will initially change the RNA sequence; then this change in genetic information will be transferred to the DNA sequence and finally result in a change in the protein made by the gene.
 - It will initially change the DNA sequence; then this change in genetic information will be transferred to the RNA sequence and finally result in a change in the protein made by the gene.
 - It will initially change the RNA sequence; then this change in genetic information will be transferred to the protein made by the gene and finally result in a change in the DNA.
 - It will initially change the DNA sequence; then this change in genetic information will be transferred to the protein made by the gene and finally result in a change in the RNA.
 - It will initially change the protein sequence made by the gene; then this change in genetic information will be transferred to DNA and finally result in a change in the RNA.
- ___ 32. Albinism is rare in most human populations, occurring at a frequency of about 1 in 20,000 people. However, the trait occurs at a frequency of 1 in 200 in certain Hopi villages of Black Mesa in Arizona. In light of this example and others that you might be aware of, what can you conclude about particular alleles such as the allele for albinism?
- An allele that leads to an abnormal phenotype will be rare in most populations but common in Native American populations.
 - An allele that leads to an abnormal phenotype will not be beneficial in any population.
 - An allele that leads to an abnormal phenotype may be beneficial in some environments but harmful in others.
 - An allele that leads to an abnormal phenotype will rise in frequency after many generations.
 - An allele that leads to an abnormal phenotype will soon disappear from a population.
- ___ 33. What commonsense observation makes the theory of preformationism unlikely?
- An individual may inherit traits found in both of his or her parents.
 - Anatomical changes such as loss of a limb are not seen in the offspring of an individual.
 - Evolution requires genetic change in populations.
 - Alleles that result in abnormal phenotypes may be less common in some populations than in others.
 - Offspring often look more like their parents than unrelated individuals.
- ___ 34. Which of the following theories of inheritance is currently considered TRUE?
- germ-plasm theory
 - pangeneses
 - blending inheritance
 - inheritance of acquired characteristics
 - None of these theories is considered true based on new evidence.

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- ___ 35. What powerful piece of evidence suggests a genetic modification led to snakes developing without limbs?
- A few species of snakes, such as pythons, have vestigial leg bones.
 - A few rare species of snakes actually develop with small limbs.
 - Genes controlling leg development in mice can be introduced into snakes and cause them to develop limb-like structures.
 - A genetic element called an enhancer believed to be responsible for suppression of limb development in snakes was isolated from a snake and introduced into mice. The resulting mice developed with truncated limbs.
 - Sequencing of an enhancer element proved it was responsible for the suppression of limb development in snakes.
- ___ 36. _____ is a change in allele frequency of a population over time.
- Blending inheritance
 - Preformation
 - Genome
 - Evolution
 - Phenotype
- ___ 37. Among the model genetic organisms, *Escherichia coli*, a single-celled bacterium, is a prokaryote; *Saccharomyces cerevisiae*, one-celled yeast, is a eukaryote, as are *Caenorhabditis elegans*, a multicellular nematode worm, and *Arabidopsis thaliana*, a multicellular plant. Which of these organisms would NOT contain membrane-bound organelles?
- Escherichia coli*
 - Saccharomyces cerevisiae*
 - Escherichia coli* and *Saccharomyces cerevisiae*
 - Caenorhabditis elegans*
 - Caenorhabditis elegans* and *Arabidopsis thaliana*
- ___ 38. CRISPR/Cas9 is a powerful new method that allows
- DNA sequencing to be performed very quickly so that numerous individual genomes can be sequenced in a short period of time.
 - precise editing of specific DNA sequences in living cells.
 - the identification of genes involved in important medical conditions.
 - the introduction of genes from one species into another species.
 - the arrangement of genes on chromosomes.