

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) What is the name of the company or institution that has access to the health, genealogical, and genetic information of approximately 270,000 residents of Iceland? 1) _____
A) Biogen
B) National Institutes of Health
C) deCODE
D) American Cancer Society
E) *Gattaca*
- 2) A biotechnology company, deCODE, is in the process of creating a database that contains 2) _____
A) the gene sequences of all newborns in the United States beginning in 2006.
B) all the information available on the human genome project.
C) health, genealogical, and genetic information of approximately 270,000 residents of Iceland.
D) a compilation of all the known genes in humans throughout the free world.
E) a complete sequence of the human genome.
- 3) Why did deCODE select Iceland for its ambitious research project? 3) _____
A) frequent and extensive mutational bursts
B) high genetic diversity
C) lack of genealogical information
D) virtual absence of mutation
E) a relatively low degree of genetic diversity
- 4) The genetic material DNA consists of basic subunits called 4) _____
A) mitochondria.
B) lysosomes.
C) nucleotides.
D) centrioles.
E) none of the above
- 5) The immediate product of transcription is 5) _____
A) a protein.
B) a carbohydrate.
C) RNA.
D) an amino acid.
E) a phospholipid.
- 6) In many species, there are two representatives of each chromosome. In such species, the characteristic number of chromosomes is called the _____ number. It is usually symbolized as _____.
A) haploid; $2n$
B) diploid; n
C) haploid; n
D) diploid; $2n$
E) none of the above

- 7) Genetics is the study of which of the following? 7) _____
- A) diploid and haploid
 - B) transcription and translation
 - C) mutation and recession
 - D) heredity and variation
 - E) replication and recombination

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 8) Early in the twentieth century, Walter Sutton and Theodor Boveri noted that the behavior of chromosomes during meiosis is identical to the behavior of genes during gamete formation. They proposed that genes are carried on chromosomes, which led to the basis of the _____. 8) _____
- 9) What is a mutation? What are chromosomal mutations? 9) _____
- 10) What is a simple definition of an allele? 10) _____
- 11) Until the mid-1940s many considered proteins to be the likely candidates for the genetic material. Why? 11) _____
- 12) Name the individual who, while working with the garden pea in the mid-1850s, demonstrated quantitative patterns of heredity and developed a theory involving the behavior of hereditary factors. 12) _____
- 13) What does the term *genetics* mean? 13) _____
- 14) Name the substance that serves as the hereditary material in eukaryotes and prokaryotes. 14) _____
- 15) Name two individuals who provided the conceptual basis for our present understanding that genes are on chromosomes. 15) _____
- 16) What term is used to describe the fact that different genes in an organism often provide differences in observable features? 16) _____
- 17) A fundamental property of DNA's nitrogenous bases that is necessary for the double-stranded nature of its structure is _____. 17) _____
- 18) Recombinant DNA technology is dependent on a particular class of enzymes, known as _____ that cut DNA at specific nucleotide sequences. 18) _____
- 19) Name one of the botanists who, in 1900, rediscovered the work of Gregor Mendel. 19) _____
- 20) Genetics is commonly seen as being grouped into several general areas: transmission, molecular, and population/evolution. What biological processes are studied in transmission genetics? 20) _____
- 21) Who owns transgenic organisms? 21) _____

- 22) In 1996 a cloning experiment produced the sheep named Dolly. Instead of the more traditional method of cloning by embryo splitting, Dolly was produced by what procedure? 22) _____
- 23) What term is applied to a variety of projects whereby genome sequences are deposited in databases for research purposes? 23) _____
- 24) The first draft of the human genome sequence was reported in 2001 by two groups: the publicly funded _____ and the private company _____. 24) _____
- 25) A number of genomes have been sequenced in recent years: *Escherichia coli*, *Saccharomyces cerevisiae*, *Caenorhabditis elegans*, *Drosophila melanogaster*, and *Mus musculus*. What are the common names for the above organisms? 25) _____
- 26) What is meant by the term *genome*? What is a genomic library? 26) _____
- 27) In nonviral systems, what is the nature of the hereditary substance? 27) _____
- 28) Approximately what percentages of the following crops are genetically modified: corn, _____; soybean, _____; canola, _____; cotton, _____? 28) _____
- 29) What is meant by the term *gene*? 29) _____
- 30) Distinguish the functions of DNA and RNA in a eukaryote. 30) _____
- 31) Name the bases in DNA and their pairing specificities. 31) _____
- 32) What is meant by the term *genetic code*? 32) _____
- 33) Compare and contrast nonenzymatic and enzymatic proteins. 33) _____
- 34) List the two relatively complex processes in which genetic information is converted into functional products. 34) _____
- 35) Define two terms that are often used in the description of genetics. 35) _____
- 36) What is meant by the phrase *the central dogma of genetics*? 36) _____
- 37) What is the composition of the genetic material? 37) _____
- 38) What is meant by *complementarity* in terms of the structure of DNA? 38) _____
- 39) Reference is often made to adapter molecules when describing protein synthesis. What does this term refer to? 39) _____

- 40) Given that DNA is the genetic material in prokaryotes and eukaryotes, what other general structures (macromolecules) and substances made by the cell are associated with expression of that genetic material? 40) _____
- 41) What is another term for a biological catalyst? 41) _____
- 42) Research dealing with what human blood disorder was instrumental in linking the genotype to a specific phenotype, and what conclusion was reached? 42) _____
- 43) A commercially available chip that contains thousands of fields (genetic elements) can be used to assess an individual's genome. What is the name of this chip? 43) _____
- 44) Alternative forms of a gene are called _____. 44) _____
- 45) The various characteristics of organisms that result from their genetic makeup are collectively referred to as an organism's _____. 45) _____
- 46) Organisms that are well-understood from a scientific standpoint and are often used in basic biological research are often called _____. 46) _____
- 47) *Arabidopsis* is a model organism for the study of _____. 47) _____
- 48) In the treatise *On the Seed*, Hippocrates suggested that the various hereditary traits in the body were contained in _____. 48) _____
- 49) What is the name of the theory which postulates that an organism is derived from materials originally present in the egg that eventually differentiate into adult structures during development? 49) _____

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

- 50) Genetics is the study of heredity and variation. 50) _____
- 51) Complementarity in a genetic sense refers to the polymerization of nucleotides in DNA. 51) _____
- 52) Once produced, a transgenic plant or animal can be patented. 52) _____
- 53) Archeological evidence indicates that the earliest domestication of plants and animals occurred within the last 2000 years. 53) _____
- 54) Darwin's theory of evolution is based on the phenomenon of natural selection. 54) _____
- 55) According to the *fixity of species* doctrine, animals and plants have remained unchanged since their appearance on Earth. 55) _____

Answer Key

Testname: UNTITLED1

- 1) C
- 2) C
- 3) E
- 4) C
- 5) C
- 6) D
- 7) D
- 8) chromosome theory of inheritance
- 9) A mutation is an inherited change in a gene. A chromosomal mutation affects the number or structure of chromosomes.
- 10) An allele is a variant form of a gene.
- 11) Proteins are the most abundant, universally distributed components in cells, and because of their great structural and functional diversity, they were considered likely candidates.
- 12) Gregor Mendel
- 13) Genetics is a subdiscipline of biology concerned with the study of heredity and variation at the molecular, cellular, developmental, organismal, and populational levels.
- 14) DNA, or deoxyribonucleic acid
- 15) Walter Sutton and Theodor Boveri
- 16) phenotype
- 17) complementarity
- 18) restriction enzymes
- 19) Karl Correns
- 20) Mendelian inheritance (segregation and independent assortment), modification of Mendelian patterns, pedigree analysis, and chromosome and pedigree analysis
- 21) Once produced, a patent can be obtained on a living organism, thereby offering exclusive use of the transgenic organism for the patent holder.
- 22) nuclear transfer
- 23) genomics
- 24) Human Genome Project; Celera Corporation
- 25) bacterium, yeast, roundworm, fruit fly, mouse
- 26) The genome is all the DNA carried in an organism, while a genomic library is a collection of clones that contain the entire genome.
- 27) DNA (deoxyribonucleic acid) is a double-stranded polymer organized as a double helix.
- 28) 40%; 80%; 60%; 70%
- 29) unit of inheritance
- 30) DNA is responsible for the storage and replication of genetic information, while RNA is involved in the expression of stored genetic information.
- 31) adenine:thymine, guanine:cytosine
- 32) The genetic code consists of a linear series of three adjacent nucleotides present in mRNA molecules.
- 33) Both are gene products, with their primary structure being a string of amino acids. Enzymes are required as catalysts for most biochemical reactions, while nonenzymatic proteins include structural (collagen), protective (immunoglobins), and/or transport (hemoglobin) proteins.
- 34) transcription and translation
- 35) Heredity is the similarity between parents and offspring and the similarity of members of the same species. Variation is the lack of similarity between parents and offspring and members of the same species.
- 36) functional and structural relationships among DNA, RNA, and protein
- 37) polymers of nucleotides making up DNA
- 38) base pairing of A with T and G with C
- 39) tRNA
- 40) RNA (messenger, ribosomal, transfer), ribosomes, enzymes, proteins

Answer Key

Testname: UNTITLED1

- 41) enzyme
- 42) The work on sickle-cell anemia was instrumental in showing that a mutant gene produced a mutant protein molecule.
- 43) microarray
- 44) alleles
- 45) phenotype
- 46) model organisms
- 47) plants
- 48) humors
- 49) epigenesis
- 50) TRUE
- 51) FALSE
- 52) TRUE
- 53) FALSE
- 54) TRUE
- 55) TRUE