

Concepts of Genetics, 10e (Klug/Cummings/Spencer/Palladino)
Chapter 1 Introduction to Genetics

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?

- A) National Institutes of Health
- B) deCODE
- C) *Gattaca*
- D) Biogen
- E) American Cancer Society

Answer: B

Section: Introduction

2) A biotechnology company, deCODE, is in the process of creating a database that contains _____.

- A) the gene sequences of all newborns in the United States beginning in 2006
- B) a compilation of all the known genes in humans throughout the free world
- C) health, genealogical, and genetic information of approximately 270,000 residents of Iceland
- D) a complete sequence of the human genome
- E) all the information available on the human genome project

Answer: C

Section: Introduction

3) Why did deCODE select Iceland for its ambitious research project?

- A) a relatively low degree of genetic diversity
- B) frequent and extensive mutational bursts
- C) high genetic diversity
- D) lack of genealogical information
- E) virtual absence of mutation

Answer: A

Section: Introduction

4) The genetic material DNA consists of basic subunits called _____.

- A) mitochondria
- B) lysosomes
- C) centrioles
- D) nucleotides
- E) None of the answers listed is correct.

Answer: D

Section: 1.3

5) The immediate product of transcription is _____.

- A) a phospholipid
- B) an amino acid
- C) a protein
- D) a carbohydrate
- E) RNA

Answer: E

Section: 1.3

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; n
- B) haploid; $2n$
- C) diploid; $2n$
- D) diploid; n
- E) None of the answers listed is correct.

Answer: C

Section: 1.2

7) Genetics is the study of _____.

- A) heredity and variation
- B) mutation and recession
- C) transcription and translation
- D) diploid and haploid
- E) replication and recombination

Answer: A

Section: 1.2

8) Early in the twentieth century, Walter Sutton and Theodore 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 _____.

Answer: Chromosome Theory of Inheritance

Section: 1.2

9) What is a mutation?

Answer: A mutation is an inherited change in a gene.

Section: 1.2

10) What is a simple definition of an allele?

Answer: An allele is a variant form of a gene.

Section: 1.2

11) Until the mid-1940s, many scientists considered proteins to be the likely candidates for the genetic material. Why?

Answer: Proteins are the most abundant, universally distributed components in cells. Because of their great structural and functional diversity, they were considered likely candidates.

Section: 1.2

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.

Answer: Gregor Mendel

Section: 1.2

13) What does the term *genetics* mean?

Answer: Genetics is a subdiscipline of biology concerned with the study of heredity and variation at the molecular, cellular, developmental, organismal, and populational levels.

Section: 1.2

14) Name the substance that serves as the hereditary material in eukaryotes and prokaryotes.

Answer: DNA or deoxyribonucleic acid

Section: 1.2

15) Name two individuals who provided the conceptual basis for our present understanding that genes are on chromosomes.

Answer: Walter Sutton and Theodore Boveri

Section: 1.2

16) What term is used to describe the fact that different genes in an organism often provide differences in observable features?

Answer: phenotype

Section: 1.2

17) A fundamental property of DNA's nitrogenous bases that is necessary for the double-stranded nature of its structure is _____.

Answer: complementarity

Section: 1.3

18) Recombinant DNA technology is dependent on a particular class of enzymes, known as _____, that cut DNA at specific nucleotide sequences.

Answer: restriction enzymes

Section: 1.4

19) Name the botanist who, in 1900, rediscovered the work of Gregor Mendel.

Answer: Carl Correns

Section: 1.2

20) Genetics is commonly seen as being grouped into several general areas: transmission, molecular, and population/evolution. Which biological processes are studied in transmission genetics?

Answer: Mendelian inheritance (segregation and independent assortment), modification of Mendelian patterns, and pedigree analysis

Section: Introduction and Summary Points

21) Who owns transgenic organisms?

Answer: Once produced, a patent can be obtained on a living organism, thereby offering exclusive use of the transgenic organism to the patent holder.

Section: 1.5

22) In 1996, a cloning experiment produced the sheep named Dolly. Contrary to the more traditional method of cloning by embryo splitting, Dolly was produced by which procedure?

Answer: nuclear transfer

Section: 1.4

23) What term is applied to a variety of projects whereby genome sequences are deposited in databases for research purposes?

Answer: genomics

Section: 1.6

24) The first draft of the human genome sequence was reported in 2001 by two groups, the publicly funded _____ and the private company _____.

Answer: Human Genome Project; Celera Corporation

Section: 1.6

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 these organisms?

Answer: bacterium, yeast, roundworm, fruit fly, mouse

Section: 1.6, 1.7

26) What is meant by the term *genome*?

Answer: The genome is all the DNA carried in an organism.

Section: 1.4

27) In nonviral systems, what is the nature of the hereditary substance?

Answer: DNA (deoxyribonucleic acid) is a double-stranded polymer organized as a double helix.

Section: 1.3

28) What characterizes the content and function of a DNA microarray?

Answer: A DNA microarray can carry thousands of genes that can be used to test for gene expression.

Section: 1.5

29) What is meant by the term *gene*?

Answer: a unit of inheritance

Section: Summary Points

30) Distinguish the functions of DNA and RNA in a eukaryote.

Answer: DNA is responsible for the storage and replication of genetic information; RNA is involved in the expression of stored genetic information.

Section: 1.3

31) Name the bases in DNA and their pairing specificities.

Answer: adenine:thymine, guanine:cytosine

Section: 1.3

32) What is meant by the term *genetic code*?

Answer: The genetic code consists of a linear series of three adjacent nucleotides present in mRNA molecules.

Section: 1.3

33) Compare and contrast nonenzymatic and enzymatic proteins.

Answer: Both are gene products, with their primary structure being a string of amino acids. Enzymes are required as catalysts for most biochemical reactions; nonenzymatic proteins include structural (collagen), protective (immunoglobins), and/or transport (hemoglobin) proteins.

Section: 1.3

34) List the two relatively complex processes in which genetic information is converted into functional products.

Answer: transcription and translation

Section: 1.3

35) What term refers to the similarity between parents and offspring and what term refers to the lack of similarity between parents and offspring?

Answer: Heredity refers to the similarity between parents and offspring and the similarity of members of the same species. Variation refers to the lack of similarity between parents and offspring and members of the same species.

Section: 1.1, 1.2

36) What is meant by the phrase the *central dogma of genetics*?

Answer: functional and structural relationships among DNA, RNA, and protein

Section: 1.3

37) What is the composition of the genetic material?

Answer: polymers of nucleotides making up DNA

Section: 1.3

38) What is meant by *complementarity* in terms of the structure of DNA?

Answer: base pairing of A with T, and G with C

Section: 1.3

39) Reference is often made to *adapter molecules* when describing protein synthesis in that they allow amino acids to associate with nucleic acids. To what class of molecules does this term refer?

Answer: tRNA

Section: 1.3

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 the expression of that genetic material?

Answer: RNA (messenger, ribosomal, transfer), ribosomes, enzymes, proteins

Section: 1.3

41) What is another term for a biological catalyst?

Answer: enzyme

Section: 1.3

42) Research dealing with which human blood disorder was instrumental in linking the genotype to a specific phenotype, and what conclusion was reached?

Answer: The work on sickle-cell anemia was instrumental in showing that a mutant gene produced a mutant protein molecule.

Section: 1.3

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?

Answer: microarray

Section: 1.5

44) Alternative forms of a gene are called _____.

Answer: alleles

Section: 1.2

45) The various characteristics of organisms that result from their genetic makeup are collectively referred to as an organism's _____.

Answer: phenotype

Section: 1.2

46) Organisms that are well understood from a scientific standpoint and are often used in basic biological research are often called _____.

Answer: model organisms

Section: 1.7

47) *Arabidopsis* is a model organism for the study of _____.

Answer: plants

Section: 1.7

48) Genetics is the study of heredity and variation.

Answer: TRUE

Section: 1.2

49) Complementarity in a genetic sense refers to the polymerization of nucleotides in DNA.

Answer: FALSE

Section: 1.3

50) Bioinformatics is a discipline involved in the development of hardware and software for processing, storing, and retrieving nucleotide and protein data.

Answer: TRUE

Section: 1.6