Chapter 2 The Living World

Section 1 • The Hierarchical Organization of Life

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DNA and Genetic Material (*pages 51 to 53*)

1. *a)* Describe the structure of the DNA molecule. *The DNA molecule is made up of two long chains that are coiled like a telephone cord to form a double helix.*

   b) In what part of the cell is DNA found? *DNA is found in the nucleus.*

2. Which nitrogen bases make up DNA and the genetic code? *The four nitrogen bases found in DNA are: adenine (A), thymine (T), cytosine (C) and guanine (G).*

3. *a)* What is a gene? *A gene is a segment of DNA that determines a particular genetic characteristic.*

   b) What type of information does a gene contain? *A gene contains codes for hereditary traits such as eye colour, as well as instructions for the manufacturing of certain substances, especially proteins.*

   c) What term is used to refer to our entire set of genes? *Human genome*

4. What is a chromosome? *A chromosome is the structure that contains the DNA, and therefore the genes, of an organism.*

5. Somatic cells contain 23 pairs of chromosomes, for a total of 46 chromosomes.

   a) Describe a somatic cell and provide an example. *All cells of the human body are somatic cells, with the exception of reproductive cells. Example: Various answers: e.g. skin cells.*

   b) In the field of biology, how is the number of chromosomes in cells that contain chromosome pairs represented? *2n*

   c) What is a diploid cell? *A diploid cell is a cell that contains pairs of chromosomes. Somatic cells in the human body are diploid cells.*

6. Reproductive cells contain a single chromosome of each of the 23 pairs, for a total of 23 chromosomes.

   a) Name the two types of reproductive cells that humans produce. *Humans produce ova and spermatozoa.*

   b) What is a haploid cell? *A haploid cell is a cell that contains a single copy of each chromosome. Human reproductive cells are haploid cells.*

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Cell Division (*pages 54 to 57*)

1. Define cell division. *Cell division is a process that gives rise to new cells from a single mother cell.*

2. *a)* Describe cellular regeneration. *Cellular regeneration is the repair of damaged tissues.*

   b) What type of cell division helps cells to regenerate? *Mitosis*

3. For each of the following statements, indicate whether it involves mitosis or meiosis:

   a) Results in daughter cells that are genetically identical to the original cell. *Mitosis*

   b) Reproductive cells are formed through this type of cell division. *Meiosis*

   c) Four daughter cells are formed from a single mother cell. *Meiosis*

   d) The daughter cells obtained each contain 23 chromosomes. *Meiosis*

   e) Two successive divisions are required. *Meiosis*

   f) Allows the organism to grow. *Mitosis*

   g) Produces diploid cells. *Mitosis*

   h) Is the mechanism of division for somatic cells. *Mitosis*

   i) Produces haploid cells. *Meiosis*

4. *a)* What term is used to refer to the fusion of the genetic material from a spermatozoon and an ovum? *Fertilization*

   b) What is the name of the original cell resulting from this fusion? *Zygote*

   c) Is that cell haploid or diploid? *Diploid*

Genetic Diversity (*pages 58 to 60*)

5. *a)* What is genetic diversity? *Genetic diversity refers to the variety of genes among the members of a species.*

   b) Which factors contribute to genetic diversity? *Chance (during fertilization and meiosis), genetic recombination, genetic mutation and population mixing*

6. What occurs as a result of genetic recombination? *Genetic recombination allows chromosomes to exchange gene segments.*

7. *a)* What is a genetic mutation? *A genetic mutation is a sudden change in gene structure.*

   b) Name three substances that can cause genetic mutations. *Various answers: e.g. The Sun's UV rays, X-rays, cigarette smoke, polluted air and chemicals like pesticides*

8. State whether the following statements are true or false. If they are false, explain why.

   a) Only fraternal twins have identical genes. *False. Identical twins have identical genes.*

   b) Genetic diversity helps to prevent the extinction of a species. *True*

   c) Mitotic cell division results in genetic diversity. *False. Each individual is unique because of the process of meiosis.*

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Tissues, Organs and Systems (*pages 62 to 65*)

1. Arrange the following elements of the hierarchical organization of life in increasing order of complexity:

   a) Organ

   b) Cell

   c) System

   d) Tissue

   Answer: *b, d, a, c*

2. Indicate which level of the hierarchical organization of life each of the following statements corresponds to (choose your answers from the four elements listed in Question 1):

   a) A group of several different tissues that are organized in a specific way and carry out specific functions *Organ*

   b) A group of specialized cells that have the same structure and function *Tissue*

   c) The basic unit of life *Cell*

   d) A series of organs that perform a common task in a coordinated manner *System*

3. Match each statement in the left-hand column with a type of tissue from the right-hand column.

a) The most common tissue found in organisms *2*	*1)* Epithelial tissue
b) Lines the internal surfaces of organs *1*	*2)* Connective tissue
c) Type of tissue found in the brain *4*	*3)* Muscle tissue
d) Connects other tissues *2*	*4)* Nerve tissue
e) The cells of this tissue are able to contract *3*	

4. Identify the system of the human body that corresponds to each of the following functions:

   a) Makes thought and memory possible *The nervous system*

   b) Transforms food into particles that can be used by the body's cells *The digestive system*

   c) Eliminates nitrogenous waste (urea) *The excretory (urinary) system*

   d) Produces gametes *The reproductive system*

Section 2 • Nutrition

Student textbook, pages 87 and 88

Types of Nutrients (*pages 68 to 71*)

1. What is the main function of the following types of nutrients?

   a) Carbohydrates *Provide short-term energy*

   b) Fats *Provide long-term energy (energy reserves)*

   c) Proteins *Provide material for building and repairing tissues*

   d) Water *Regulates metabolism*

   e) Vitamins *Regulate metabolism*

   f) Minerals *Regulate metabolism*