SUMMING-UP

1 The structural organisation of animals

- It is possible to recognise a **structural level** in animals, which corresponds to the general shape of the body and reflects adaptation to the environment and the living habits of the organism.
- Some simple animals have bodies with **spherical symmetry** and have an infinite number of symmetry planes all passing through the centre.
- Less mobile species that live on a flat surface, such as at the bottom of the sea, generally have bodies with **radial symmetry**, characterised by a main axis of symmetry: all planes through the axis of the body divide it into two equal mirror images.
- Species that move freely and have elongated bodies have **bilateral symmetry**. Their bodies are divided into two identical mirror images with a single plane of symmetry.
- In general, an animal's body structures are directly and perfectly related to their functions.
- Structures that perform different functions in different organisms, but have the same embryonic origin, are called **homologous structures**. This is the case with the wing in birds and the fin in whales.
- Structures that perform the same function but have different embryonic origin are called **analogous structures**: the wing in birds and insects.

2 The apparatus and organs of animals

- Different apparatus are recognisable in the bodies of animals, each of which performs a specific vital function. Each apparatus is made up of several organs that coordinate their action and allow the operation of the apparatus.
- The **digestive system** is responsible for the digestion and absorption of food.
- The **respiratory system** provides gas exchange between the inside and the outside of the body.
- The **circulatory system** carries necessary substances to cells in the body. Linked with this, the **immune system** defends the body against infection.
- The **excretory system** removes waste substance.
- The **nervous system** and the **endocrine system** are responsible for receiving stimuli from the environment and processing responses.
- The **skeletal and muscular system** work together to maintain support for, and allow the movement of, the body.
- The **reproductive system** enables the body to generate offspring.

3 Animal tissues: epithelial and connective

- Four different types of tissue are present in the bodies of vertebrates: epithelial, connective, muscular and nervous.
- Epithelial tissues carry out the functions of covering and secretion.
- Epithelial tissues are made up of closely adjoining cells that form a free area, open to exchange with the environment and a surface that adheres to the **basement membrane**.
- There are two types of epithelial tissues:
  a) covering epithelium that covers the outer surface of the body, certain organs and their cavities, blood vessels, and ducts (it can be *simple* or *stratified* according to the number of cell layers);
  b) glandular epithelium, which forms part of the secreting glands.
- **Connective tissues** play a supporting and reserve role, as well as filling empty spaces. They consist of cells scattered in a *matrix*.
- The matrix contains a vital fluid substance and various protein fibres. The connectors are classified according to the type of matrix and include: loose connective tissue, fibrous, cartilage, fat, bone and blood.

4 Animal tissues: muscle and nerves

- **Muscle tissue** is the most abundant form of tissue in the bodies of vertebrates. Due to its contractile properties, muscle tissue responsible for movement and the maintenance of posture. In *homeothermic* animals it also generates heat.
- Muscle tissue is made up of elongated cells called **muscle fibres**.
- There are three types of muscle tissue.
  – **Skeletal muscle tissue** makes up the muscles attached to the skeleton and is responsible for voluntary movement. It consists of striated fibres and multinucleate cells.
  – **Smooth muscle tissue** makes up the muscles that cover the organs that have the ability to contract and expand. Its contraction is involuntary. It consists of non-striated mononucleate cells.
  – **Heart muscle tissue** makes up the walls of the heart. It is a striated type, but its contraction is involuntary.
- **Nervous tissue** carries information between the various parts of the body. It consists of **neurons**, cells that have short and branched appendages called **dendrites**, and a long extension called an **axon**. Around the neurons are **supporting cells** that function to isolate and protect them, as well as to speed the transmission of nerve impulses.

SUMMING-UP

5 The structural organisation of the plants

- Plants are multicellular autotrophic organisms. Their structural plan consists of three organs: roots, stem and leaves.
- The **root** ensures the plant an anchorage in the soil and the supply of nutrients from the soil itself.
- The **stem** is the structure that supports and carries upward the photosynthetic organs. It also serves to transport nutrients to various parts of the plant.
- The **leaves** are the organs in which photosynthesis takes place.
- In these organs there are different types of tissue and three systems are recognised:
  - the *vascular system,* which transports substances within the body
  - the *tegumentary system*, which covers the outside of the plant
  - the *ground tissue*, which performs various functions, including those of support and of reserve.