



INGLESE

# PERCORSI PER STUDENTI NON ITALOFONI

tratti da *Intorno a te - Capire e vedere la Scienza* di Stefano Zanoli

PERCORSI PER STUDENTI  
NON ITALOFONI

1ª



CLASSE PRIMA



# The animal kingdom: invertebrates

## Il regno degli animali: gli invertebrati

### 1 What are the main features of invertebrates?

Invertebrates are multicellular, heterotrophic organisms lacking a spine.

### 2 What are the characteristics of porifera?

Porifera, or sponges, are simple animals lacking any organs or symmetry. They live attached to the floor of salt water or fresh water.

### 3 What are the characteristics of coelenterates?

Coelenterates have a bag-shaped body, which shows radial symmetry. They live in the sea and often form colonies. They come in two shapes: polyp form, which is sessile, and medusa, which moves by means of sea currents.

### 4 What are flatworms and how do they live?

Flatworms have a flat body with bilateral symmetry, a head and a tail. They are often parasites, like the tapeworm, which can live in the human intestines.

### 5 What are the characteristics of nematodes?

Nematodes or cylindrical worms have a smooth and extended body. They can be herbivorous, carnivorous or detritivorous. Some species are parasites, such as the pinworm and the heartworm.

### 6 What is the structure of the annelid?

Annelids, or segmented worms, have a body divided into ring-like segments, called somites. Earthworms are annelids that live in the soil.

### 7 What are the characteristics and main classes of molluscs?

Molluscs are animals having a soft body, often protected by a hard shell made of calcium salts. The three main classes are: gastropods, bivalves and cephalopods.

### 8 What are arthropods and into which classes are they divided?

Arthropods have bilateral symmetry; their body is covered by a strong, external skeleton (exoskeleton). Their legs are formed by joined segments. They include: arachnids (spiders, scorpions), shellfish (shrimp, lobster), myriapoda (centipede) and insects (beetles, butterflies, flies, locusts).

### 9 What are the characteristics of insects?

Insects represent the largest and most varied group of animals. They often have six legs and two pairs of wings.

### 10 What are echinoderms?

Echinoderms are marine animals with a protective armour called dermoskeleton. Radial symmetry is present during their adulthood, while in their larva state they have bilateral symmetry. Starfish and sea urchins are two examples.





CLASSE SECONDA





# Equilibrium

## L'equilibrio

### 1 Under what conditions does a leaning body remain in equilibrium?

A leaning body remains in equilibrium if the vertical line from its centre of gravity falls within its base of support.

### 2 What parts does a lever consist of?

A lever is formed by a rigid rod supported at a fixed point called its fulcrum. The rod of the lever can rotate around it.

### 3 What are the resistance and power of a lever?

In a lever, the force to be balanced is called the resistance. The force that is to be applied is called the power.

### 4 What are the resistance arm and the power arm of a lever?

The distance between the fulcrum and the resistance is called the resistance arm. The distance between the power and the fulcrum is called the power arm.

### 5 What is the law of the lever?

The law of the lever states that:  $P \times b_p = R \times b_r$

### 6 What is the difference between the first, second and third kind of lever?

In the first kind of lever, the fulcrum is always between the resistance ( $R$ ) and the power ( $P$ ). In the second kind, the resistance ( $R$ ) is found between the fulcrum and the power ( $P$ ). In the third kind of lever, the power ( $P$ ) is found between the fulcrum and the resistance ( $R$ ).

### 7 When is a lever advantageous?

A lever is advantageous when the power arm is greater than the resistance arm.

### 8 What is pressure?

Pressure is defined as the ratio between a force and the surface on which it acts. The formula is written as:  $P = F / S$ .

### 9 What is Pascal's principle?

Pascal's principle states that if we exert a force at any point of a liquid, it is transmitted with the same intensity in all directions.

### 10 How does pressure vary between water and air?

In water, the pressure increases according to depth. In air, the pressure decreases based on height (altitude).

### 11 What is Archimedes' buoyancy (uplift)?

A body immersed in a liquid receives a buoyant force (uplift) equal to the weight of the liquid that is displaced. This force is called Archimedes' buoyancy or uplift.





# Equilibrium

## L'equilibrio

### 12 Why do some objects float on the surface of the water, while others sink?

The floating of a body depends on the specific weights of the body and the fluid. If the specific weight of the body is less than that of the fluid, it floats. If the body has a specific weight greater than that of the fluid, then it sinks.





# Blood circulation and excretion

## La circolazione e l'escrezione

### 1 What are the characteristics of human blood circulation?

It consists of two parts (double circulatory system): pulmonary circulation (between the heart and lungs) and systemic circulation (between the heart and the rest of the body).

### 2 What is blood and what is its function?

Blood is a connective tissue that is partially liquid (plasma) and partially made up of corpuscular elements (blood cells). Blood conveys nutrients and oxygen to the tissues in the body, while also receiving carbon dioxide and waste products to be eliminated.

### 3 What is the function of blood cells?

Red blood cells convey oxygen and carbon dioxide through a protein called haemoglobin; white blood cells have a defensive purpose; platelets help blood to coagulate.

### 4 What is the function of blood vessels?

Blood runs through a network of vessels. Those blood vessels which transport blood out of the heart are called arteries; those which convey blood to the heart are known as veins. Capillaries are very thin vessels where gases and nutrients are exchanged with the cells.

### 5 What is the function and the structure of the heart?

The heart is a muscle that pumps blood, allowing it to circulate through the vessels. The heart is divided into two parts (right and left). Each part contains two chambers (atrium and ventricle) and valves which prevent the blood from re-entering into the heart.

### 6 What are the phases of a cardiac cycle?

The cardiac cycle alternates two phases called diastole (dilation) and systole (compressions), whereby blood is conveyed to the heart and pushed out.

### 7 What are the interstitial fluid and the lymph?

The interstitial fluid is a liquid found in the narrow spaces between cells and capillaries. When the amount of this liquid is too great, it is transported into a series of small tubes that make up the lymphatic system. The liquid found in this system is called lymph.

### 8 What makes up the lymphatic system?

The lymphatic system consists of a network of vessels and organs, including lymph nodes that contain lymphocytes. Lymph only flows from tissues to the cardiovascular system.

### 9 What is excretion?

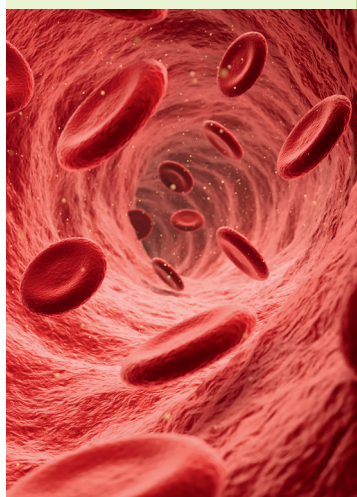
Excretion includes all processes by which the body eliminates the toxic elements produced during chemical reactions in its cells.

### 10 What makes up the waste system and what is its function?

The waste system removes metabolic waste from cells through the blood. It consists of the two kidneys and the ureter. The bladder and urethra collect and dispose of waste.

### 11 What process takes place in the kidneys?

Kidneys have millions of filtering units (nephrons). Filtration occurs in the glomerulus and the Bowman capsule; reabsorption occurs in the tubule. The end product is urine.





CLASSE TERZA





# Electricity and magnetism

## Elettricità e magnetismo

### 1 What is the origin of electricity and how can a body be electrified?

Electricity is due to charged particles in matter: electrons carry a negative charge and protons a positive one. A body can be electrified by friction, by contact, or by induction.

### 2 What is the difference between insulators and conductors of electricity?

Bodies where charges move with difficulty are electrical insulators. Bodies where charges move with ease are called good conductors of electricity.

### 3 What is an electrical current?

An electrical current is a spontaneous flow of electrons within a conductor. They move from the negative pole or anode, to the positive pole or cathode.

### 4 What is the difference between current amplitude and voltage?

Current amplitude is the quantity of charges that pass through a point of a conductor in a given time; it is measured in amperes (A). Electrical potential difference or voltage is the difference between the quantity of charges between the negative and positive poles; it is measured in volts (V).

### 5 What are the elements of an electrical circuit?

The battery is the voltage generator, the metal wire is the conductor, the bulb or electrical appliance is the user, and the flow of current is regulated by a switch. Depending on the user requirements, circuits can be either in series or parallel.

### 6 What is electrical resistance and what is its unit of measurement?

The electrical current that flows through a conductor is hampered by its particles: this phenomenon is called electrical resistance and it is measured in ohms ( $\Omega$ ).

### 7 What are Ohm's Laws?

In an electric circuit, the intensity of the current ( $i$ ) is directly proportional to the voltage ( $V$ ) and inversely proportional to the electrical resistance ( $R$ ) of the conductor ( $i = V/R$ ). The electrical resistance of a conductor depends on the material it is made of; it is directly proportional to its length and inversely proportional to its section.

### 8 What is the difference between the Joule effect and the chemical effect of a current?

The Joule effect occurs when the current passes through a conductor and emits heat. The chemical effect is the capacity of the current to trigger chemical reactions.

### 9 How do magnets work and what is the magnetic field?

Some types of bodies called magnets spontaneously attract metals like iron. The force of attraction is concentrated at two points, the magnetic poles; the space around a magnet on which this force acts is called the magnetic field.





# The Earth and the Moon

## La Terra e la Luna

### 1 What shape does the Earth have?

The Earth is a large rock sphere, a bit flattened at the Poles. Owing to its irregular shape, the Earth is described as being a geoid.

### 2 What are the Earth's movements?

The Earth's movements are a rotation on its axis and a revolution around the Sun, moving along an elliptical orbit. The plane of the terrestrial orbit is called the ecliptic.

### 3 What is the purpose of the geographical grid?

The geographical grid consists of meridians and parallels. It enables the exact localisation of every place on Earth, according to geographical coordinates: longitude indicates the meridian; latitude indicates the parallel.

### 4 What is the consequence of the Earth's rotation around its axis?

Alternating days and nights and the apparent movement of the Sun from east to west.

### 5 What is the consequence of the Earth's revolution around the Sun?

The revolution around the Sun and the inclination of the Earth's axis result in different lengths of the day throughout the year, and thus in the change of seasons.

### 6 What are solar time and standard time?

The unit of measure for time is the hour, obtained by dividing a day into 24 sections. This is solar time and it changes as one moves from east to west. For this reason the Earth has been divided into 24 "slices" known as time zones. The time in a time zone is known as standard time.

### 7 What is the Moon made of?

The Moon is a rocky sphere with no atmosphere. On its surface we find ancient lava pools, elevated rims and several craters formed by meteorite impacts.

### 8 What are the Moon's movements?

The Moon's rotation on its axis; its revolution around the Earth; and a translational movement aligned with the Earth as both rotate around the Sun.

### 9 What are the lunar phases?

During its revolution around the Earth, different parts of the Moon appear to be more or less bright. These moon phases are: new Moon, first quarter, full moon and last quarter.

### 10 What causes tides?

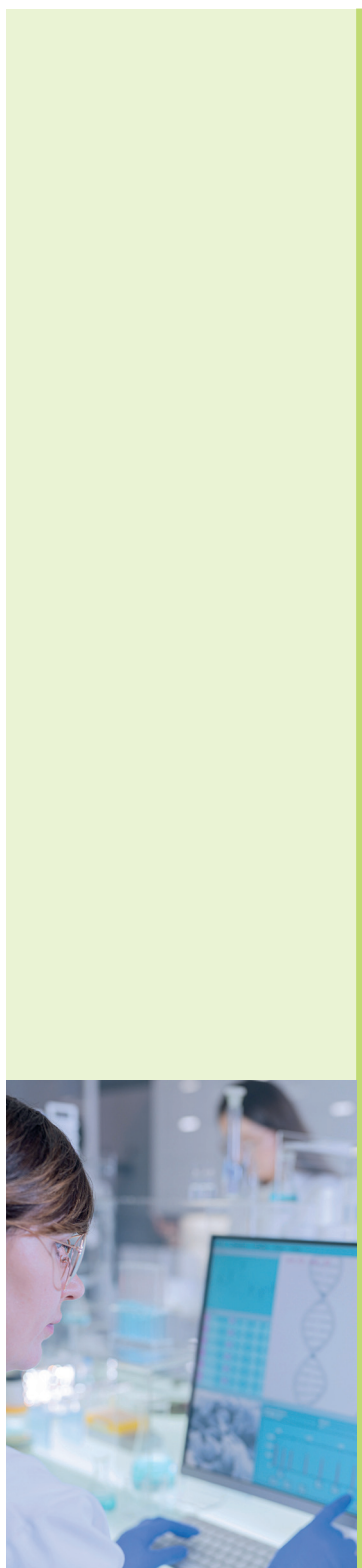
The gravitational pull by the Moon's mass that affects the bodies of water on Earth. The maximum sea level change occurs during the new moon and the full moon.





# DNA and protein synthesis

## Il DNA e la sintesi proteica



### 1 What are chromosomes?

They are corpuscles in the nucleus of eukaryotes that contain the cell's hereditary material.

### 2 What do we mean by chromosomal makeup and karyotype?

The chromosomal makeup is the sum of all chromosomes in a somatic cell. The karyotype describes the number, shape, and size of a species' chromosomes.

### 3 What are chromosomes made up of?

DNA and proteins.

### 4 What is the structure of DNA?

Each DNA molecule is made up of two strands of nucleotides twisted into the shape of a double helix.

### 5 What is the structure of DNA nucleotides?

Each DNA nucleotide is made up of a phosphoric group, a deoxyribose molecule, and a nitrogenous base which may be either adenine (A), guanine (G), thymine (T), or cytosine (C).

### 6 What are the main functions of DNA?

Duplication, which is to say the formation of identical pairs of itself, and protein synthesis.

### 7 How does protein synthesis occur?

DNA contains sequences of nucleotides called genes. Each gene contains the information required to synthesise a protein. This information is then conveyed, via an RNA molecule, from the nucleus to the cytoplasm, where the proteins are built.

### 8 What is RNA?

A nucleic acid made up of one strand of nucleotides, formed by a phosphate group, ribose, and one of the four nitrogenous bases adenine (A), guanine (G), cytosine (C), uracil (U).

### 9 How many kinds of RNA do you know? What is their function?

Messenger RNA (mRNA) copies DNA information and conveys it from the nucleus to the cytoplasm (transcription); ribosomal RNA (rRNA) is the main constituent of ribosomes; transfer RNA (tRNA) carries to the ribosomes the amino acids that will make up the protein (translation).

### 10 What does genetic code determine?

The correspondence between the series of nucleobases in messenger RNA and the series of amino acids in a protein.

### 11 What are mutations and where do they occur?

A mutation is any change in a cell's gene pool. Genetic mutations are changes of a single gene or a few genes. Chromosomal mutations affect entire DNA sections of a chromosome. Genomic mutations change the overall number of chromosomes in the nucleus of each cell, by either increasing or decreasing it.