PERCORSI PER STUDENTI NON ITALOFONI

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

MONDADORI EDUCATION

PERCORSI PER STUDENTI
NON ITALOFONI

1ª

CLASSE PRIMA

Light
La luce

1 What is light and where does it come from?

Light is an electromagnetic wave that conveys energy in 'packages' called photons; it even travels in the void, always in a straight line (rays). White light includes different wavelengths, each corresponding to a different colour.

2 How does light behave when it meets a body?

Transparent bodies allow light to pass through them; translucent bodies allow light to pass through them, but only partially; opaque bodies do not allow light to pass through them.

3 What is the difference between umbra and penumbra?

Umbra is the dark area (shadow cone) that is formed behind an opaque body struck by a point source of light. If the source is diffuse, then other, lighter shadow cones are formed around the umbra (penumbra).

4 What is the difference between light reflection and light diffusion?

Reflection occurs when a ray of light strikes a smooth and flat surface, and bounces off it according to specific geometrical rules. Diffusion occurs when light strikes a surface which is not smooth and the rays bounce off in all directions.

5 What are mirrors?

They are shining, polished, light-reflecting surfaces that give back clear images of the objects placed in front of them. They can be flat, concave, or convex.

6 What is refraction?

The phenomenon whereby a ray of light crossing transparent bodies with different densities does not continue along its trajectory, but is deviated (refracted).

7 What are lenses?

Lenses are transparent bodies bounded by curved surfaces that change the trajectory of light rays via double refraction.

8 What is light absorption?

The phenomenon whereby an opaque object retains the rays that strike it.

9 What is light dispersion?

The phenomenon whereby white light passing from one transparent body to another breaks down into its constituent colours via refraction.

10 When are bodies perceived as coloured?

A body appears white when it reflects all the wavelengths of the light which strikes it; black, when it absorbs all the wavelengths; coloured, when it absorbs all the wavelengths except the one corresponding to its perceived colour.

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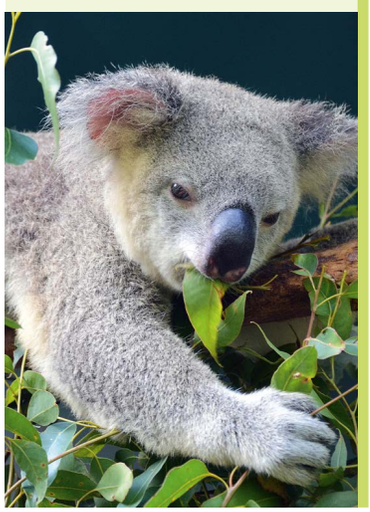
2a

CLASSE SECONDA

The animal kingdom: vertebrates

Il regno degli animali: i vertebrati



1 What are the characteristics of vertebrates?

Vertebrates have a rigid internal skeleton, called endoskeleton, consisting of a vertebral column, a skull and limbs. Their bodies have a layer of skin, which can be bare or covered with different types of coverings.

2 What are the different classes of vertebrates?

Fish, amphibia, reptiles, birds and mammals.

3 What is the difference between heterotherms and homeotherms?

In heterotherms, the body temperature varies as a function of external temperature (fish, amphibia and reptiles). Homeotherms maintain a constant body temperature (mammals and birds).

4 How do vertebrates reproduce?

Vertebrates have sexual reproduction and can have internal or external fertilisation. They can be oviparous, ovoviviparous, or viviparous.

5 What are the characteristics of fish?

Fish are aquatic, with a skin covered in scales and appendages or fins. They are heterothermic and mostly oviparous, but some species are ovoviviparous; they breathe through gills. There are cartilaginous fishes (sharks) and bony fishes.

6 What are the characteristics of amphibians and how do they live?

Amphibians live in water in their early phase, as tadpoles, and then on land as adults after metamorphosis. They are bare-skinned and mostly oviparous, but a few species are also ovoviviparous; the adults breathe through both lungs and skin.

7 What are the characteristics of reptiles?

Reptiles are heterothermic and their skin is covered in scales. Their highly resistant eggs, capable of surviving out of the water, are known as amniotic eggs.

8 What are birds and how do they live?

Birds are vertebrates adapted to flight. Their forelegs were transformed into wings. They have a light skeleton, skin covered with feathers, and beaks adapted to the type of food they eat. Birds are homeotherms and lay eggs.

9 What are the characteristics of mammals and how are they classified?

Mammals provide nutrition to their young ones with milk produced by the mother's mammary glands. The skin is covered with hairs and they are homeotherms. Mammals include monotremes (echidna and platypus), marsupials (koala, kangaroo) and placentals. They are viviparous animals, but monotremes lay eggs.

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3a

CLASSE TERZA

Illnesses and the immune system

Malattie e sistema immunitario

1 **What is illness?**

Illness is an alteration in the body's balance that limits or prevents the normal functioning of the organism.

2 **What are the causes of illnesses?**

The causes of illnesses can be physical, chemical, or biological.

3 **What are pathogens? Can you give any examples?**

They are the organisms that cause illnesses: parasites such as lice, or microbes such as viruses and bacteria, that enter the organism and cause infections.

4 **What is the difference between viruses and bacteria?**

Viruses are only made up of DNA or RNA within a sheath of proteins. They are obligate parasites, because in order to live they must exploit the components of living cells. Bacteria are unicellular prokaryotes (their DNA is not enclosed in a nucleus with a membrane).

5 **What is a congenital illness? What is a genetic illness?**

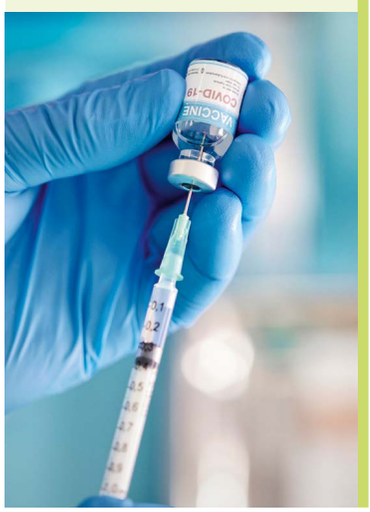
A congenital illness is present in the individual from birth. Congenital illnesses that emerge at the moment of conception are also known as genetic illnesses. They are due to DNA alterations that may be either inherited from one's parents or random.

6 **What is the immune system and what function does it serve?**

The immune system is a system of cells, molecules, tissues, and organs distributed throughout the body and capable of defending the organism against damaging agents.

7 **What are the main types of cells with an immune function?**

White blood cells (or leukocytes) of various kinds, including phagocytes, T lymphocytes, and B lymphocytes.



8 **What is the difference between antigens and antibodies?**

Antigens are molecules present in bodies entering the organism, which activate the immune system when they are detected as foreign.
Antibodies are proteins produced by B lymphocytes; each of them can only detect a single kind of antigen.

9 **What kind of immune responses does our body have?**

Nonspecific responses, which are innate and generic, include physical and chemical barriers, phagocytes, and the inflammatory response. They act immediately, but do not retain the memory of the antigens with which they have come in contact.
Specific responses are acquired when the immune system meets a particular kind of antigen; they are activated by specific lymphocites and antibodies that act slowly, but retain a memory of the antigens.

Fundamentals of genetics

Le basi della genetica

1 **What was the hypothesis at the basis of Mendel's experiments?**

Every hereditary character is determined by a "factor" transmitted from parents to their offspring.

2 **On what kind of sample did Mendel carry out his experiments and what form did these take?**

He chose sweet pea plants, which were easy to grow and capable of self-pollination. He crossed plants with traits that could be detected in their descendants.

3 **What important data-processing method did Mendel use?**

Probability calculus.

4 **What do Mendel's laws state?**

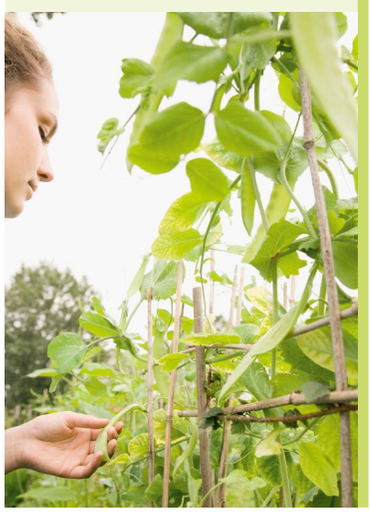
The Law of Dominance: the crossing of pure individuals, which differ only by a single trait, gives rise in the first generation to individuals that all have the dominant variant.
The Law of the Segregation of Traits: if two hybrid individuals are crossed, the individuals produced in the first generation will express the dominant variant in 75% of cases and the recessive one in 25% of cases.
The Law of Independent Assortment: if individuals differing by several traits are crossed, each trait is transmitted independently from the others according to the first two laws.

5 **What are alleles and what forms can they take?**

They are gene variants expressing slightly different traits. They can be either dominant (the trait appears) or recessive (the trait does not appear).

6 **What is the difference between an homozygote individual and a heterozygote one in relation to a specific trait?**

In a homozygote there will be two identical alleles for that trait. In a heterozygote there will be two different alleles. A dominant trait will manifest itself in both heterozygotes and homozygotes, whereas a recessive trait will only manifest itself in homozygotes.



7 **What are the genotype and the phenotype?**

The genotype is the sum of all genes inherited from one's parents. The phenotype is the sum of all traits that can be observed in an individual; it depends on the genes inherited by the individual, but is also influenced by the environment.

8 **How is the sex of offspring determined?**

Sex is determined by the pair of sexual chromosomes. In females the two chromosomes are the same (XX); in males they are different (XY). When gametes combine during fecundation, there is theoretically a 50% chance that the offspring will be male.

9 **What determines blood groups?**

Blood groups are distinguished on the basis of the presence or absence of certain antigens on the surface of the red blood cells, that are coded by multiple alleles (IA, IB, I); combinations of the three alleles in the zygote determine four different blood groups (A, B, AB, 0).