NATIONAL GEOGRAPHIC™

8+

MANUAL WITH EDUCATIONAL INFORMATION AND EXCITING EXPERIMENTS

MEDIZIN-SET
MEDICAL KIT

BRESSER

NATIONAL GEOGRAPHIC™

General Warnings

- This kit contains small parts that can represent a choking risk. Seek immediate medical attention should parts be swallowed.
- Some parts of this kit may present sharp edges that should be handled with care.
- All the kit components should be kept away from the mouth, nose and eyes. In case of contact with eyes or mouth rinse immediately with plenty of running water. Seek medical assistance if irritation persists.
- Contact the emergency services immediately should any warning symptoms not mentioned in this manual appear.
- All experiments should be conducted under adult supervision.
- This kit presents no real danger. However, small irritations or injuries can result if the materials are not used correctly. Please read the instructions carefully before attempting any experiment.

Declaration of Conformity

CE Bresser GmbH has issued a ‚Declaration of Conformity' in accordance with applicable guidelines and corresponding standards. This can be viewed any time upon request.

DISPOSAL

Dispose of the packaging materials properly, according to their type, such as paper or cardboard. Please take the current legal regulations into account when disposing of your device. You can get more information on the proper disposal from your local waste-disposal service or environmental authority.

Get exclusive new Experiments – only available online!

Media about this product

You can dowload further media (experiments, manuals, etc.) from the BRESSER website* over the following QR code/weblink.

http://www.bresser.de/download/9130100

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Warranty and warranty term extension

The warranty term is two years from the date of purchase. Please keep your proof of purchase. Register at **www.bresser.de/warranty** and fill out a brief questionnaire to get your warranty term extended to **five years**. Registration must be completed within three months of purchase (date of receipt) to validate the warranty. If you register thereafter, the warranty term will not be extended.

If you have problems with your device, please contact our customer service first. Do not send any products without consulting us first by telephone. Many problems with your device can be solved over the phone. If the problem cannot be resolved by phone, we will take care of transporting your device to be repaired. If the problem occurred after the warranty ended or it is not covered by our warranty terms, you will receive a free estimate of repair costs.

Service Hotline: +49 (0) 2872 - 80 74-210

Important for any returns:
Please make sure to return the device carefully packed in the original packaging to prevent damage during transport. Also, please enclose your receipt for the device (or a copy) and a description of the defect. This warranty does not imply any restriction of your statutory rights.

Your dealer:..... Art. No.: .....

Description of problem:.....

Name:..... Telephone: .....

Street:..... Date of purchase: .....

City/Postcode:..... Signature: .....

Write the telephone number of the local poison centre or hospital in the space below. They may be able to provide information on countermeasures in case of poisoning.

In case of emergency dial
Europe 112 | UK 999
USA 911 | Australia 000

Kit contents

Description:	Quantity:
1. Disposable lab coat	1
2. Eye chart	1
3. Surgical mask	1
4. Nameplate holder	1
5. Doctor nameplate	1
6. Blood group card	1
7. Latex gloves	1
8. Red food colouring	1
9. Transparent rubber tubing	1
10. Sticking plasters	2
11. Charcoal pencil	1
12. Wooden spatulas	2
13. Syringes	2
14. Bandages	4
15. Stethoscope	1
16. Prescription book	1
17. Radiographies (hand and foot)	2

NATIONAL GEOGRAPHIC™

Index

1. Medicine

Medicine is a scientific knowledge and practice specifically related to health.

DID YOU KNOW...
That the word medicine is derived from the Latin *ars medicina*, which means "the art of healing"?

This specific area of knowledge is represented by symbols which have a connection to ancient Greece: Rod of Asclepius and Bowl of Hygeia. Asclepius represents the healing feature of medical arts and his daughter, Hygeia, represents health, cleanliness, and disinfection.

a)

b)

Medical symbols: a) Rod of Asclepius and b) Bowl of Hygeia. Both symbols are related to Greek mythology.

There are a range of different medical specialties, focusing on things like specific body parts and diseases.

Dermatology, for example, is the branch of medicine related to skin and its diseases.

DID YOU KNOW...
That there are more than 50 medical specialities?

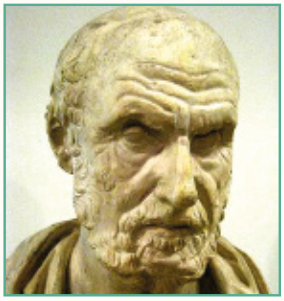
You are probably familiar with the specialty of **paediatrics**. This subject focuses on the health of children.

1.1. Doctor

A doctor or physician is a professional who practices medicine. Aspiring doctors must study for many years to receive a registration that provides them a permission to practice.

Doctor

DID YOU KNOW...
Upon graduating from medical school all medical students must swear an oath called the Hippocratic Oath to uphold the ethics of the profession. This oath is named for Hippocrates, a physician from Ancient Greece.



Hippocrates, referred to as the father of western medicine.

Doctors are essential to society. Without them, it would be difficult for people to recover from injury or illness.

1.2. Medical equipment

To help you when you are ill, in addition to their knowledge, doctors have instruments that aid them in making a proper diagnosis while protecting themselves and you.

Diagnosis is the identification of a condition, disease, disorder, or problem by systematic analysis of the background or history, examination of the signs or symptoms, evaluation of the research or test results, and investigation of the assumed or probable causes.

There are several instruments that doctors may use in diagnosis and there are ones specific to the medical branch they practice.

We are going to show you the most common ones and their functions:

Stethoscope – A medical instrument that doctors use to listen to your heart and lungs.

DID YOU KNOW...
That the stethoscope was invented by a French physician, Rene Laënnec, in 1816?

Stethoscope

Otoscope – Is a medical device which is used to look into the ears. It can be monocular or binocular and at one end the handle has a bright light and a magnifying glass.

Otoscopes

Thermometer – An instrument that can measure a human's body temperature.

Thermometer

Syringe – This device is used to push liquid into or take liquid out of someone's body. It consists of a plunger that fits tightly in a tube.

There are several types of syringes.

Spatula – This small instrument with a flat surface is used by doctors to hold your tongue down so they can examine your throat.

Wooden spatulas

Surgical mask – These are disposable devices that cover the mouth and nose during medical procedures. They prevent the spread of microorganisms between the patient and the doctor.

Mask

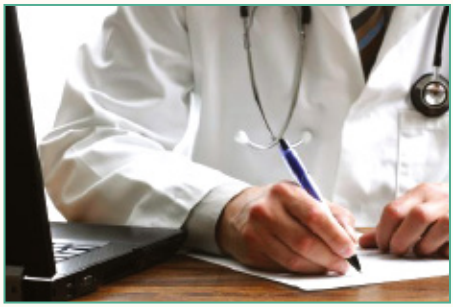
Gloves – Gloves used by doctors are normally disposable, which means doctors use them only once. They protect both doctor and patient. Different types of gloves have been designed for different occasions. For example, gloves used during surgery differ greatly from those used during routine consultations.

Protective gloves used in routine consultations.

Sticking plasters – A piece of material that you can put over a small cut on the skin in order to protect it from impurities and microorganisms.

Sticking plasters

At the end of the consultation, the doctor may if necessary use a prescription book to recommend medicines that the patient should take. The patient receives a sheet of paper where the medical information is provided. He must then deliver it to the pharmacy, where he can obtain the medicines.



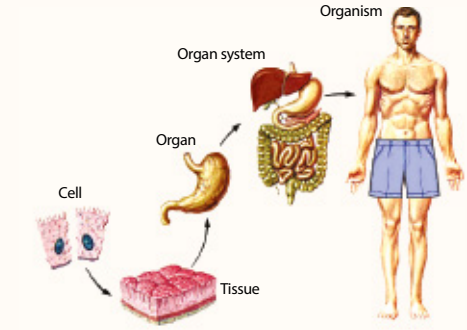
The doctor fills in a sheet from the prescription book when medicines are needed.

2. A journey through the human body

Our body is like a very complex machine. It consists of many parts that work together towards a common goal.

It's essential to get to know our bodies in order to treat them well and live healthy lives.

There are millions of **cells** inside our bodies. Cells are the basic building blocks of all living beings, can be found in a variety of forms, and serve many different specialized functions. Groups of cells compose **tissues**. **Organs** are made up of a group tissues, and **systems** are made from a group of organs. **Systems** work together to keep an organism alive.



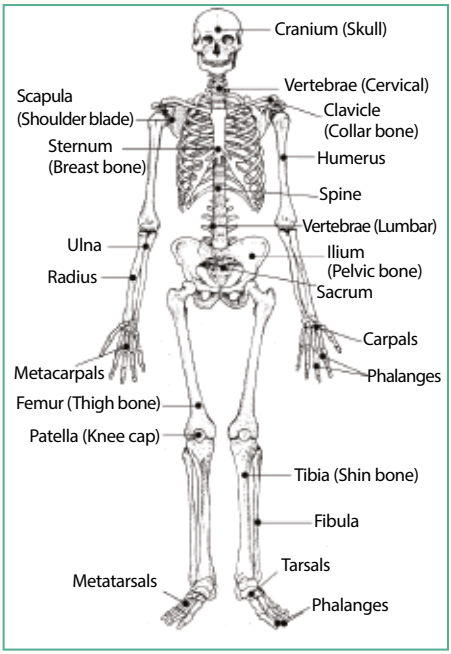
Organisational levels of a human being.

You already know that the human body is a complex machine consisting of organ systems that work together toward a common purpose.

Now, let's learn about these organ systems and their main functions.

• **Skeletal System** – Packed with over 200 bones, skeletons protect, shape, support and move our bodies, as well as produce red blood cells in bone marrow. A skeleton can be divided into three parts: head, torso and limbs. Joints connect bones, giving you the freedom to flex or rotate parts of your body. However, this gets harder with age, as your bones lose their strength and density.

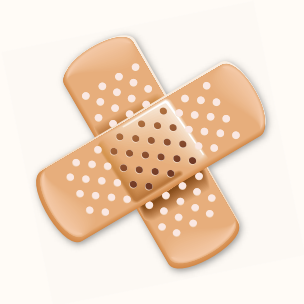
Bone specialists are called **orthopaedists** and the science of the study of bones is **osteology**.

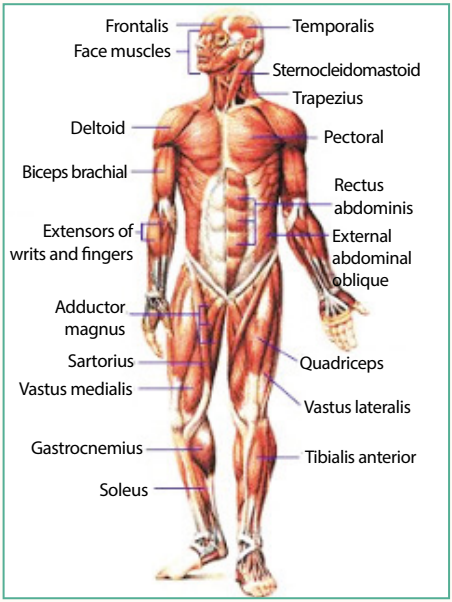


Skeletal System

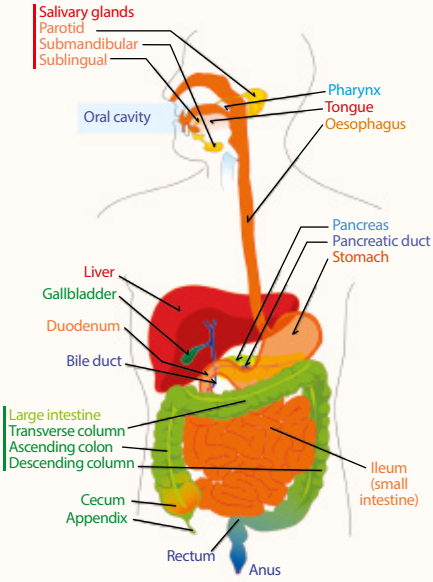
• **Muscular System** – Allows the movement of the body. Muscles transform chemical energy into mechanical energy. This represents 40-50% of the total body weight.

Muscles can also be evaluated by an orthopaedist, since muscles, bones and joints are all interconnected. Muscular problems are treated by physiotherapists. The field of **traumatology** deals with wounds and injuries in the musculoskeletal system.





Muscular System

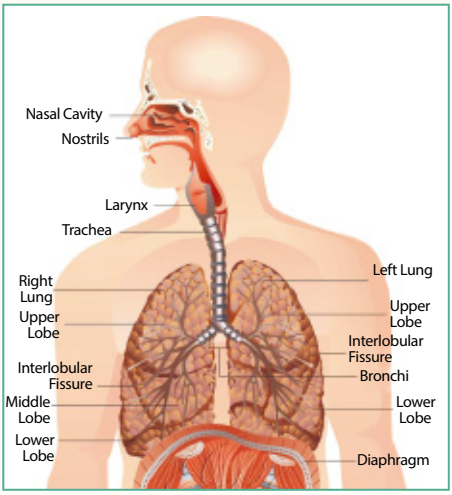


Digestive System

• **Digestive System –** When we eat we are ingesting fundamental nutrients for the proper functioning of our organism. These nutrients reach the cells of our body and are used in different ways depending on a cell's function. A number of organs belong to the digestive system and aid in the breaking down of food and absorbing of nutrients, including the mouth, tongue, pharynx, oesophagus, stomach and intestines.

A **gastroenterologist** is a doctor whose focus is the digestive system. A **nutritionist** can help you get on a healthy diet in order to minimise possible problems with this system.

• **Respiratory System –** The parts of the human respiratory system work together to get air into and out of the body. This system includes the nostrils, pharynx, larynx, trachea, bronchi and lungs.

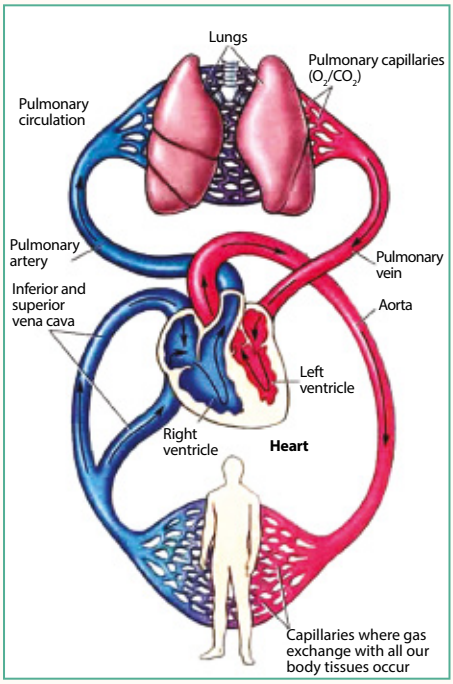


Respiratory System

In order to treat health problems related to the respiratory system, you should look for a **pulmonologist** (lung specialist).

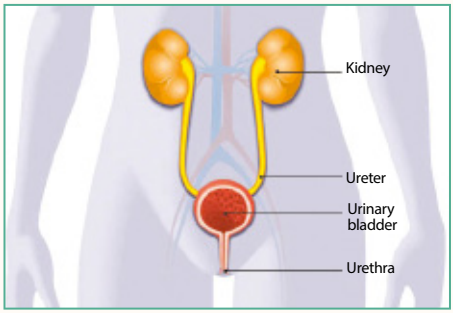
• **Circulatory System –** This system is primarily responsible for transport. It is sometimes considered to be composed of two smaller systems: the **cardiovascular system**, which distributes blood, and the **lymphatic system**, which circulates lymph. Blood transports oxygen and nutrients throughout the body and lymph helps protect against diseases, regulate body temperature, and maintain pH balance.

Angiology is the study of the circulatory and lymphatic systems. The study of the heart itself is **cardiology**. A doctor who specializes in cardiology is a **cardiologist**.



Circulatory System

• **Urinary System –** There are always excess, unnecessary materials that have to be expelled from the body. They are called excretory or urinary products. The system that expels them is composed of a number of organs, including the kidneys, ureter, urinary bladder, and urethra.



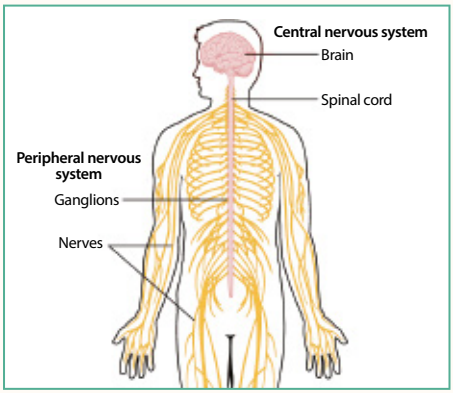
Urinary System

DID YOU KNOW…
That skin and lungs also eliminate excretory products?
Sweat is eliminated by skin and carbon dioxide is eliminated while breathing.

Urology is the medical specialty dedicated to the urinary system. A doctor specialized in this field is a **urologist**.

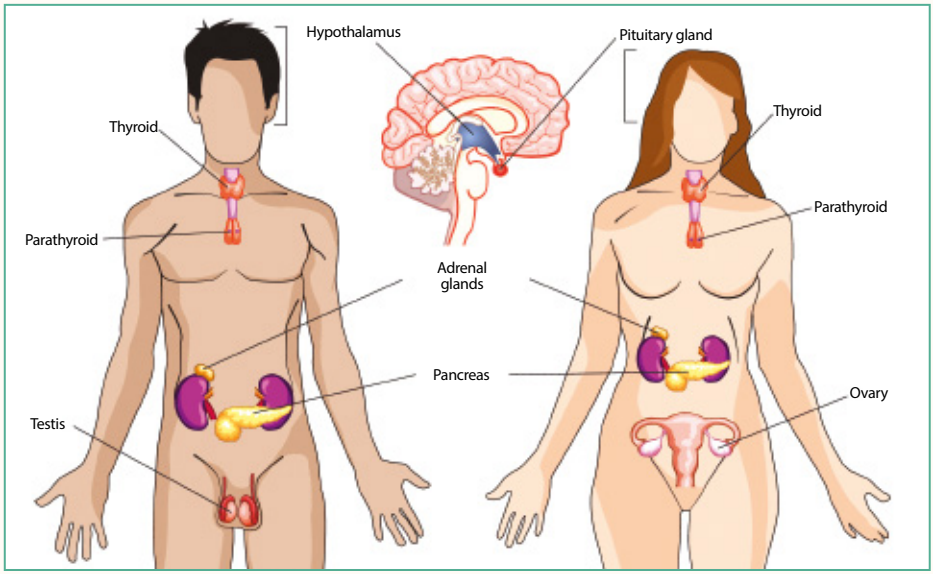
• **Neuro-Hormonal System –** Is responsible for the maintenance and good functioning of our organism. It consists of the **nervous system** – which is divided into the central nervous system and peripheral nervous system - and the **endocrine system**. The nervous system allows the body to respond to changes in the environment in a process usually coordinated by the brain. Reflex actions are extra-rapid responses to stimuli preformed by the nervous system and bypass the brain. In addition to the brain, the nervous system also includes the spinal cord, nerves, and other important body parts. It controls voluntary and

involuntary movements (like the heartbeat). The endocrine system includes all the glands of the body as well as the hormones produced by those glands. Hormones can be considered chemical messengers, as they are chemical substances that are capable of influencing organ and tissue activity.



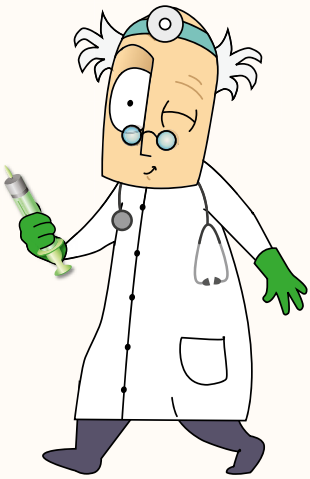
Nervous System. The central nervous system is represented in pink and the peripheral nervous system is in yellow.

The doctor responsible for the study of the nervous system is called a **neurologist**. **Endocrinology** is the subject that studies the endocrine system. A doctor who specializes in the endocrine system is called an **endocrinologist**.



Endocrine System

• **Reproductive System** – This system is a collection of organs that work together for the purpose of producing a new human life. Both female and male reproductive systems work towards the same goal, but their organs and mechanisms differ significantly. The female reproductive system contains: ovaries, Fallopian tubes, uterus, vagina, and vulva. The male reproductive system contains: testes (or testicles), epididymis, ductus deferens, prostate, seminal vesicle, urethra and penis.



Gynaecology is the medical speciality responsible for the study of the female reproductive system. **Obstetricians** work to care for the development of the foetus from the beginning of pregnancy through birth.

DID YOU KNOW...
That gynaecology means "the science of women"?

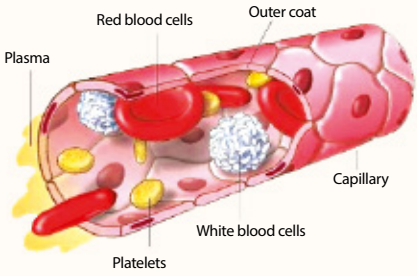
The male reproductive system is analysed by a urologist. This medical specialist takes its name from the urethra, which belongs to both the reproductive and urinary systems.

2.1. Blood

Blood is a liquid conjunctive tissue, produced in bone marrow. Blood is formed by several types of cells, which consist of a solid part of the blood immersed in a liquid called **plasma**. This fluid aims to deliver nutrients to all of our body's cells and carries off carbon dioxide and other waste products.

Tube with blood.

Blood cells are classified into three groups: **white blood cells** or leukocytes, which belong to the body's immune system; **red blood cells** or ethrythrocytes, which are involved in the transport of oxygen; and **platelets**, which function in the stopping of bleeding through clotting.



Blood and its components.

The ABO System

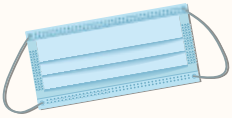
The ABO blood group system is widely credited to have been discovered by the Austrian scientist **Karl Landsteiner**, in 1900, who identified the type of blood of each person. It therefore helps us know who can give and who can receive blood during a **blood transfusion** (blood exchange).

In order to use blood in transfusions it's necessary to know which type of blood has the donor and the receiver.

There are different types of red blood cells accordingly to the antigens they have.

> Antigens are substances that are capable of stimulating the production of antibodies in the body.

Blood groups are determined by a protein (antigen), on the surface of the red cell. As so, we have two types of antigens (A and B) and two types of antibodies (Anti-A and Anti-B). This allows having 4 different blood types accordingly to the antigens present in the red cells. Check the following table:



	Group A	Group B	Group AB	Group O
Red cell				
Antibodies	 Anti-B	 Anti-A	none	 Anti-A and Anti-B
Antigen	A	B	A e B	Without antigens

Blood types from the ABO System.

It allows us to know whether different blood samples can be "mixed." The blood type AB contains A and B antigens and therefore can receive A and B blood types because it doesn't create antibodies against these types. On the other hand, blood type A only consists of A antigens. If it receives blood type B it will develop antibodies that work against B antigens, causing an adverse reaction. Therefore Blood type A cannot receive blood type B and vice versa.

Group O has neither A nor B antigens so samples from this blood group can be given to those of any other group. This is why group O donors are known as "universal donors." Group O has both anti-A and anti-B antibodies and a person with blood group O can only receive blood from other people with blood group O.

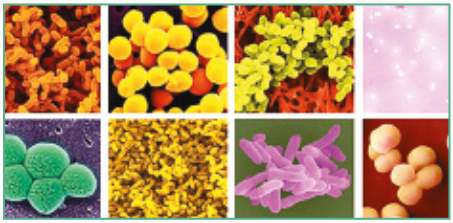
On table 1 you may find a summary of the relations between blood types.

		DONOR			
		A	B	AB	O
RECEPTOR	A	✓			✓
	B		✓		✓
	AB	✓	✓	✓	✓
	O				✓

Table 1. Relation between blood types.

3. What causes diseases?

Microorganisms like bacteria, protozoa, viruses, and fungi cause most diseases. They are tiny organisms visible only with a microscope. Relax, they aren't all harmful. Some of them actually help our organism work.

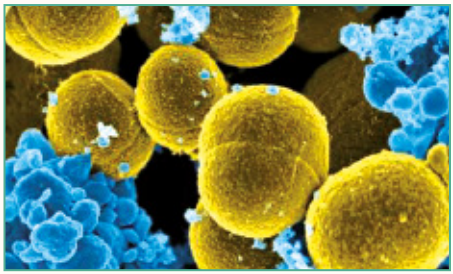


There are diverse types of microorganisms.

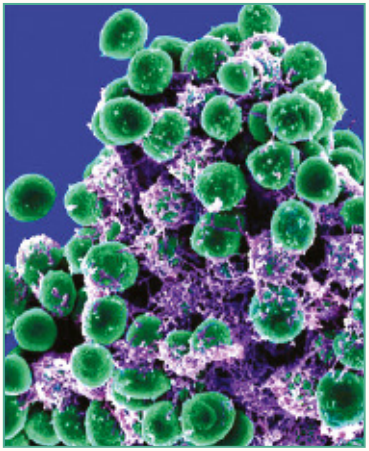
DID YOU KNOW…
That the science that studies microorganisms is called **microbiology**?

Healthy human beings live symbiotically with a number of microorganisms that together form what is called the **microbial flora**. This flora forms in our organism right after we are born and consists primarily of bacteria. These helpful microorganisms help the human body in a variety of ways, including assisting in the protection against harmful microorganisms. Without the microbial flora we would therefore be more vulnerable to disease.

The most common and perhaps most useful microorganisms belonging to the microbial flora include *Staphylococcus aureus*, which is present in our skin and nose, and *Staphyloccus epidermidis*, which is present in our skin. *Escherichia coli* and *Lactobacillus casei* are both present in our small intestine and colon.



Staphylococcus aureus



Staphylococcus epidermidis

Escherichia coli

Microorganisms responsible for diseases are commonly referred to as pathogens.

A pathogen is any small organism, such as a virus or bacteria, that can cause disease.

3.1. Bacteria

The word "bacteria" is plural. Bacterium is the singular version. Bacteria are unicellular organisms and may appear in a variety of different shapes. Some have tails (called flagella) that let them move. Bacteria do not have a distinctive nucleus. Many cause diseases, but others are essential for important natural processes.

Bacteria are responsible for diseases like dental cavity, cholera, tetanus, meningitis, diptheria, tuberculosis and legionella.

Dental cavities are caused by bacteria such as *Streptococcus mutans* and *Streptococcus sobrinus*.

The bacterium *Mycobacterium tuberculosis*, such as the name indicates, is responsible for tuberculosis development.

3.2. Protozoa

Protozoa are single-celled organisms. Some protozoa are parasites. These organisms live on, or inside, another organism and cause it harm. Food contaminated with protozoa can cause infections such as amoebic dysentery, of which severe diarrhoea is a symptom.

Malaria is a disease caused by protozoa that live in the blood. It is passed to a person by an insect vector, the mosquito.

Paramecium is a protozoa.

3.3. Viruses

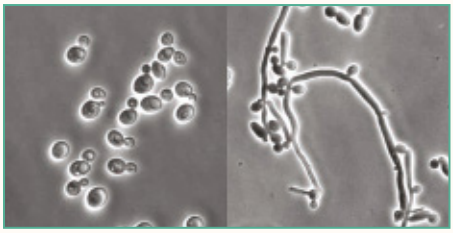
Viruses are smaller than bacteria. They can only reproduce in living cells, and that's the reason why they infect us and cause diseases. They consist of a fragment of genetic material inside a protective protein coat called capsid.

Some examples of diseases caused by viruses include influenza--flu, measles, poliomyelitis, aids, mumps, herpes, meningitis, hepatitis, foot-and-mouth disease.

Graphic representation of a virus.

3.4. Fungi

Fungi are living beings that grow from filaments. Mushrooms and toadstools are fungi, but they are made of lots of cells, so they are not microorganisms. Yeasts are single-celled fungi, so they are considered microorganisms.

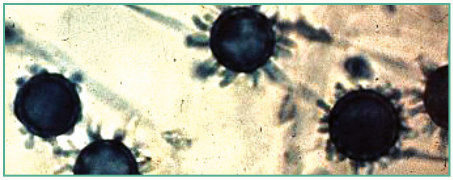


Candida albicans fungus.

Many fungi are unicellular and generally reproduce by great amounts of spores that float in the air. Some live in the human organism or in other animals like parasites.

On top, toes with onychomycosis, below healthy toes. It's also known as **dermatophytic** onychomycosis. These fungi grow and colonise the skin, releasing substances that cause swelling and itch. They cause several diseases in humans, including mycosis and histoplasmosis.

They cause several diseases in humans such as mycosis and histoplasmosis.



The fungus *Histoplasma* is the cause of *histoplasmosis*, a lung disease.

Scientist, remember that there are also diseases not caused by microorganisms.

An unbalanced diet may cause diseases. Listening to loud music can damage your ears. Your behaviours also influence your health.

4. Transmission of microorganisms

Even though we can't see them with a naked eye due to their size, microorganisms are all around us.

Their transmission may occur through direct contact (saliva, sexual relations, mosquitoes and flies) or **indirect transmission** (contaminated objects, food or water).

5. Body defence mechanisms

The body has several defenses against pathogens, preventing us from falling ill. They are considered dangerous when they enter our skin or when passing through it and reaching the bloodstream.

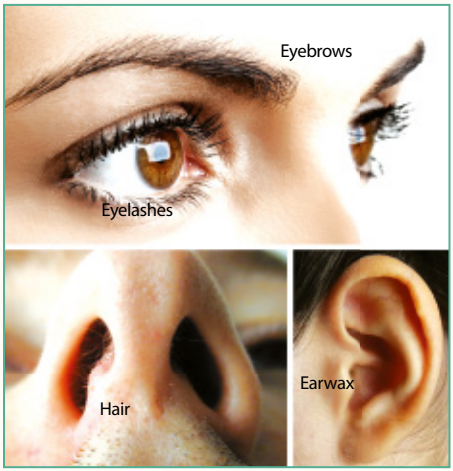
DID YOU KNOW...
That the entry into and development of pathogens in a living being called infection?

Once in contact with our bodies, microorganisms may initiate activity and remain in the same place where they first entered the organism or spread throughout it.

Our body has set up a variety of natural defenses to protect us from disease. Collectively these are referred to as the **immune system**. Parts of the immune system can be divided into several parts including **natural barriers** and **innate and specific immunity**.

Our skin is one of the first obstacles that microorganisms face.

Natural barriers prevent harmful microorganisms from even entering the body. Some examples of natural barriers include a human's skin, eyelashes, eyebrows, hair, earwax, tears, and stomach acid. Some of them also have active immune functions.



Eyelashes, **eyebrows** and **hair** (nasal cavity) and even **earwax** make it difficult for microorganisms to get in our organism.

If microorganisms get past any of these natural barriers, innate immunity will act nonspecifically. Specific immunity recognises the exact antigens, and, using white blood cells and antibodies, eliminates them.

6. Preventing diseases

In order to prevent diseases from pathogens we can follow some preventive processes such as:

- Eliminate microorganisms by practicing good **hygiene**.
- Microorganism removal through **sterilization** and **disinfection**.
- Obtain defences through **vaccination**, **allowing** the organism to create antibodies.

6.1. Personal hygiene

Hygiene can be understood as following procedures that keep us healthy.

The most common procedure is to bathe regularly. In addition to bathing, we should also wash our hands, hair, and cut our nails, keeping them clean. In fact, this is one of the most important routines used in defending ourselves form infections.

Bathing frequently is a way to preserve your personal hygiene.

However, there are other ways to guarantee that you are kept healthy:

- Be aware of the distances you read and see in order to not damage your vision.
- Avoid inadequate postures in order to not harm your back.
- Sleep a necessary number of hours (depending on your age) - sleeping is fundamental to keeping your brain healthy.

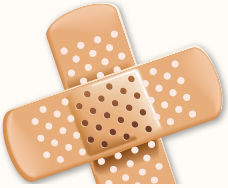
Sleeping the necessary hours is very important for the well-functioning of your organism.

Meeting hygiene requirements is necessary for leading a healthy life.

6.2. Sterilization and Disinfection

In medical care, the processes of **sterilization** and **disinfection** are both very important. They diminish the risk of contamination by pathogens.

Sterilization is the process of making something completely clean and free from bacteria and other microorganisms. Heat and ultraviolet radiation are often used in sterilization processes.



In surgeries all the equipment used is sterilized to avoid the transmission of microorganisms.

Disinfection is the partial or complete removal of microorganisms. The agents used in disinfection are disinfectants and antiseptics.

6.3. Vaccines

Vaccines are some of the most effective and safe ways to prevent some diseases.

When it comes to certain diseases, vaccinated people have a greater capacity of resistance in the case of infection.

In general, it's necessary to take several doses of a vaccine for it to be effective. Other times, it's necessary to take additional doses, booster doses, to strengthen the one already taken.

DID YOU KNOW...
That the concept of vaccinations was first developed by English physician, Edward Jenner? He invented the smallpox vaccine.

A vaccine contains a disease-causing pathogenic organism or part of one. The microorganism has been weakened so that it doesn't cause disease anymore. But it can nevertheless still produce a reaction in our organism.

When vaccinated, a microorganism or part of one enters our body and stimulates our immune system to react. Because the microorganism is innoffensive, the human body is capable of fighting against it and eliminating it, while at the same time developing mechanisms to control and avoid new threats.

As the weakened pathogenic organism in the vaccine travels through the blood stream, the body develops antibodies to identify them and neutralize any harmful potential they carry. After they are produced, these antibodies remain in your organism and are ready to defend you if the real microorganism enters your body.

By simulating an actual attack of a microorganism, a vaccine is one of the most effective methods of protecting your body against disease.

DID YOU KNOW…

The higher the number of people in a given community who are vaccinated, the harder it is for a disease to pass among the people in the community who haven't been vaccinated. This concept is called "herd immunity.

When the majority of a population is vaccinated, it is very difficult for a disease to spread among and infect people who weren't vaccinated. This concept of 'herd immunity' is very helpful when it comes to protecting people who cannot be vaccinated due to a weakened immune system.

Vaccines are normally applied with a syringe.

The Personal Child Health Record (commonly referred to as the Red Book).

When an entire population is vaccinated, the disease can actually disappear and the disease is removed from the vaccination schedule. An example is smallpox.

The chart below shows the National Health System vaccination schedule for the United Kingdom.

- **Infant vaccine:** Also known as the DTaP/IPV/Hib vaccine, this vaccine protects against diptheria, tetanus, whooping cough, polio, and Hib (Haemophilus influenzae type b).
- **Pneumococcal vaccine:** Protects against the bacterium *Streptococcus pneumoniae*, which can lead to pneumonia, septicameia and meningitis.
- **Rotavirus vaccine:** Protects against rotavirus infection that causes diarrhoea.
- **Men C vaccine:** The meningitis C vaccine protects against infection by meningococcal group C bacteria, which causes meningitis and septicaemia.
- **MMR vaccine:** Protects against measles, mumps and rubella.
- **Hib/Men C:** Protects against Haemophilus influenzae type b (Hib) and meningitis C.
- **Pre-school vaccine:** Also known as the DTaP/IPV, this virus protects against diphtheria, tetanus, whooping cough and polio.
- **HPV vaccine:** Only for girls, this virus protects against the human papilloma virus that causes cervical cancer.
- **Teenage vaccine:** Also known as the Td/IPV vaccine, this vaccine protects against tetanus, diptheria and polio.
- **BCG (TB) vaccine:** Protects against Tuberculosis.
- **Chickenpox vaccine:** Protects against the varicella zoster virus that causes chickenpox.

2 months • 5-in-1 infant vaccine • Pneumococcal vaccine • Rotavirus vaccine **3 months** • Men C vaccine • 5-in-1 infant vaccine (2nd dose) • Rotavirus vaccine (2nd dose) **4 months** • 5-in-1 infant vaccine (3rd dose) • Pneumococcal vaccine (2nd dose) **12 - 13 months** • MMR vaccine • Hib/Men C booster vaccine • Pneumococcal vaccine (3rd dose)	**2, 3 and 4 years** • Children´s anual flu vaccine **3 years and 4 months** • 4-in-1 pre-school booster • MMR vaccine (2nd dose) **12 - 13 years** • HPV vaccine **13 - 15 years** • Men C teenage booster **13 - 18 years** • 3-in-1 teenage booster vaccine	**65 and over** • Pneumococcal vaccine • Annual flu vaccine **70 years** • Shingles vaccine	**Vaccines only for "at risk" groups** • BCG (TB) vaccine (birth to age 35) • Chickenpox vaccine (any age) • Flu vaccine (adults) • Flu vaccine (children) • Pneumococcal vaccine (2 years to 65 years) • Hepatitis B vaccine (birth onwards)

Table 2. NHS vaccination schedule.

7. Experiments

Before conducting the following experiments, set up your medical office.

You need a large space, a table and two chairs. On one side of the table sits the doctor — you — and on the other, the patient. Place on the table the prescription book and all the medical instruments you'll need. Now, you are able to give consultations.

Experiment 1
Medical record

The first time you visit a doctor you will be asked to complete a health history form, in order to create a **medical record**.

The medical history is a compilation of all your medical information, important for your treatment. It includes your age, diseases that you may have and medicines that you take, among other important characteristics.

DID YOU KNOW...
The case history that a doctor gets from his patient is called **anamnesis**.

Knowledge of a patient's health history is critical to a doctor's completion of a medical analysis. People of certain ages and working in certain professions are more likely to develop certain diseases. This way, the doctor may easily define which disease the patient about and how to treat it.

What you will need:
- Pen
- White sheet of paper

Steps:

1. Ask your patient to have a seat.

2. Now you may introduce yourself and then start making your patient's medical record. Here are some examples of questions you may ask:
- How old are you?
- Do you have children?
- What's your job?
- Do you suffer from any disease?
- Do you take any medicine regularly? If yes, which ones?
- How often do you do exercise?
- Do you get tired after climbing stairs?
- Do you often feel like sleeping?

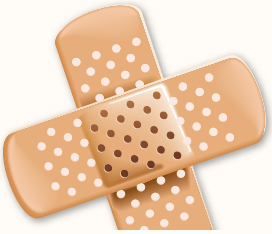
Experiment 2
Reflex actions: knee jerk

Steps:

1. Ask an adult to sit on a big chair with the lower part of the leg hang relaxed (with both feet suspended).

2. Extend your hand horizontally towards your patient's knee.

3. Carefully, tap his/her knee and see what happens.



The knee jerk is an example of the simplest type of reflex.

Explanation: When tapping, you cause a contraction on the knee which makes the leg involuntarily stretch out forward. The tap on the knee's tendon makes it stretch which stimulates a receptor on the extensor muscle. This causes a nerve signal which is intercepted before reaching the brain, being processed automatically. The presence of this reflex shows the efficiency of certain nervous cells of our spinal cord. The absence or reduction of this reflex is known as **Westphal's sign**.

Experiment 3
Heartbeat

What you will need:
- Stethoscope

Steps:

1. Put on your lab coat.

2. Ask the patient to sit down and free his/her chest for you to hear the heartbeats.

3. Put on the stethoscope earphones and the extremity on the patient's chest, next to the heart.

4. For 1 minute, count the heartbeats.

5. Compare the result with the table below.

Suggestion: The age of the patient is important so pay attention to the numbers on the table as they may vary in more or less 10 bpm.

Age	Beats per minute (bpm)
Newborn	130
1 year old	120
2 years old	115
3-6 years old	100
8 years old	90
12 years old	85
Adult	60-100

Table 3. Heartbeats per minute accordingly to ages.

Experiment 4
Irregular heartbeat

What you will need:
- Stethoscope
- Lab coat

Steps:

1. Repeat experiment 3 but before doing so, ask the patient to go for a short run and then measure his/her heartbeat.

2. Write down the BPM. Was it the same after both experiments or did it change.

Explanation: When are completing normal activities our heartbeats tend to stabilize over time. When we are sleeping it lowers because our metabolism is reduced. When we make physical efforts we spend more energy and oxygen and our bodies therefore need more oxygen. The heart will pump more times per minute in order to compensate the energy expended. The same thing happens when we get nervous or experience an unusual or intense emotion. The heart is connected to the brain, which, via nervous stimuli, tells the heart how much it needs to work.

Experiment 5
Temperature measurement

What you will need:
- Thermometer

Steps:

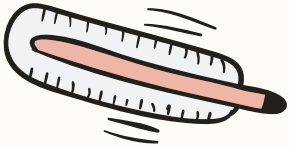
1. Ask an adult for a thermometer.

2. Now place it under your arm, on your armpit.

3. Wait 15 minutes.

4. What's your body temperature? Is it normal?

The commonly accepted average core body temperature (taken internally) is 37.0°C (98.6°F). Above this value it's considered that a person has fever.



Experiment 6
Prescriptions

What you will need:
- Prescription Book
- Pencil

Steps:

1. Ask a friend or a relative to describe some of the symptoms he/she feels when ill and then think of something to prescribe.

2. Write on the prescription book what your patient should do. For example, drink a cup of tea for a throat irritation, eat fish and boiled rice for a stomach ache or take a nap for head aches.

Suggestion: Create the patient's medical record (experiment 1) for you to know what happened in the past and make a better analysis and conclusion of what he/she has now. When writing the prescription, pay attention to the symptoms, age and gender.

Experiment 7
Patient information leaflet

When are sick, we shouldn't self-medicate. We should visit a doctor in order to obtain the correct medicine prescription. After buying the medicine we should carefully read the information leaflet.

What you will need:
- Information leaflet

Procedure:

1. Ask an adult for an empty medicine package and information leaflet.

2. Begin by checking to see whether it is valid.

3. Now look for the following parameters in the leaflet:
- What is it indicated for?
- Who can take it and in which doses? How is it administrated?
- Does it have side effects? Which and why?
- How should it be stored?

Explain to your friends and family everything you know about the medicine.

Experiment 8
Eagle vision

When you "get your eyes checked" the doctor who sees you is called an **ophthalmologist**. In this experiment you'll find out how an ophthalmologist analyses our vision.

What you will need:
- Eye chart
- Scissors

Steps:

1. Begin by cutting the eye charts.

2. Now ask your patient to sit at a three metres (9.8 ft) distance from you.

3. Place the eye chart on a high place so that your patient can see it.

4. Ask your patient to start reading it from the top to the bottom (from the bigger letters to the smaller ones).

5. Pay attention to what your patient answers and register it.

Does your patient have a good vision? And what about you, do you have an eagle vision?

Suggestion: Increase or reduce the distance your patient is from the chart. What's the effect?

Experiment 9
Left eye or right eye?

What you will need:
- Eye charts

Steps:

1. Follow the same steps from the previous experiment however, this time, ask your patient to cover the left eye with his/her hand and then to read the letters.

2. Register what you observe.

3. Now ask your patient to uncover the left eye and cover the right one.

Is the vision the same in both eyes? If not, which one sees better, right or left?

Experiment 10
Colour blindness

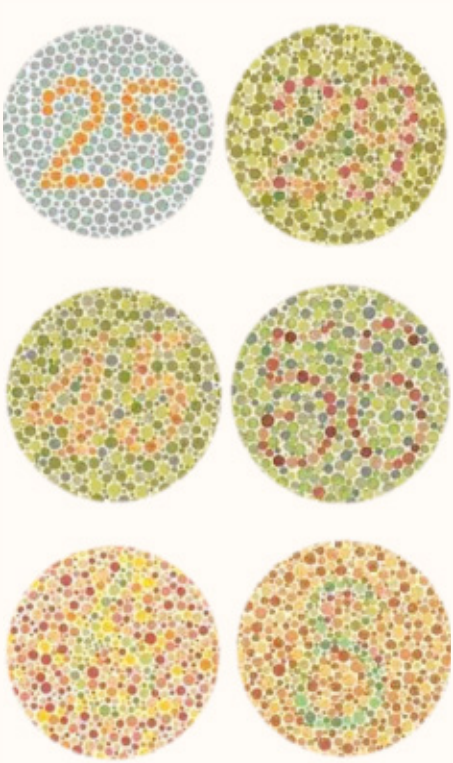
Colour blindness is a visual perception disorder characterised by an inability to distinguish among all or some colours, most commonly red and green. This disorder is normally genetic, but it can also be caused by an injury to the organs responsible for our vision or by a neurological injury.

What you will need:
- Colour blindness images below

Steps:

1. Observe the following images and try to find the hidden number.

• Can you distinguish the colours and identify the number?



Experiment 11
Throat anatomy

What you will need:

- Surgical mask
- Wooden spatula
- Lab coat
- Gloves
- Lantern

Steps:

1. Put on the lab coat, then the surgical mask over the mouth and then the gloves.

2. Ask the patient to sit down in a place with a lot of light and then to open the mouth.

3. With the wooden spatula push the tongue down to observe the throat.

4. Pick up the lantern and turn on the light to see even better inside.

5. Ask your patient to say "aaaaaaa".

6. What can you see?

Experiment 12
ABO System

What you will need:

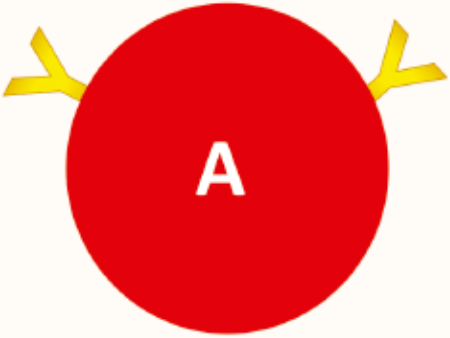
- Blood group cards
- Glue
- Scissors

Steps:

1. Cut the blood group cards and make the red cells for each blood type.

2. Ask for your blood type (and your family and friends type also) and analyse your case.

3. Now you can explain to your friends and/or family how blood types are defined.



Suggestion of a red cell from blood group A.

Experiment 13
Who gives blood to who?

Steps:

1. Ask your family and friends which blood groups they belong to.

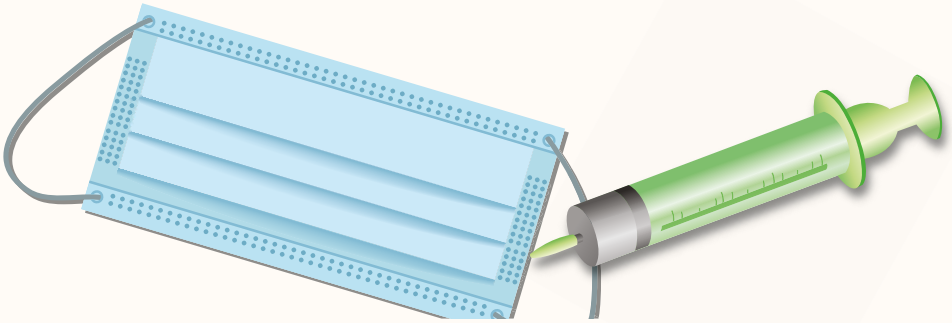
2. Analyse who can receive and give blood to who.

3. Ask an adult to help you make a table that relates the people and the possibilties to give/receive blood.

4. Save the table. In case of emergency, you already know who you may count on. (There's an example of a table below).

		DONOR					
		Joanna (A)	Peter (B)	Anna (AB)	Charles (O)	Mary (O)	John (A)
RECEIVER	Joanna (A)				✓	✓	✓
	Peter (B)				✓	✓	
	Anna (AB)	✓	✓		✓	✓	✓
	Charles (O)					✓	
	Mary (O)				✓		
	John (A)	✓			✓	✓	

Table 4. Example of a table that you can make. Write your family/friends names and blood groups and check who can give and receive blood and from who.



Experiment 14
Blood

What you will need:
- Lab coat
- Gloves
- Catheter
- 2 Syringes
- Red food colouring
- 50 ml (1.8 fl. oz.) flask
- Water

Steps:

1. Put on the lab coat and gloves.

2. Fill in the flask with tap water and mix the red food colouring until the water turns red. The blood is done.

3. Pick up one syringe, with the plunger inside, and fit one of the ends of the catheter in the syringe's tip.

4. Now with another syringe place the tip inside the blood and pull the plunger back, in order to suck in the liquid.

5. You may remove the syringe from the flask and fit its tip in the free end of the catheter.

6. Push the plunger down to inject blood into the catheter. Be careful not to fill it too much.

7. Remove blood to the flask by pulling the plunger back to suck in the blood.

Explanation: This is what happens when you have to take a sample of your blood. Blood circulates in your veins, as is shown by the catheter. The person who collects your blood pricks your arm slightly with a syringe, then pulls a small amount of blood, which is then analyzed to check to see if your organism has the right quanitities of all substances it needs to survive.

Experiment 15
Radiography analysis

What you will need:
- Radiographies

Steps:

1. Analyze the radiographies included in your kit. Which body parts are they? Which bones can you identify?

Experiment 16
Foot sprain or broken hand?

What you will need:
- Radiographies

Steps:

1. Invite your patient to sit down (agree with him/her the complaints – pain on the feet).

2. Ask him/her how he/her got hurt (in a football match, for example).

3. Take the patient to the radiography area.

4. Show the patient the radiography and analyse it.

5. Is it broken or is it just a sprain?

6. What's the recommended treatment? Write it down on the prescription book.

Experiment 17
Treat a cut

What you will need:
- Sticking plasters
- Bandages
- Water

Steps:

1. Let's pretend you have a cut on your arm.

2. Wet the bandage with water and clean the cut with it.

3. Now, cover the cut with a plaster to protect it and let it heal.

4. You are now ready to continue playing!

Experiment 18
Stomach ache

What you will need:
- Lab coat
- Gloves

Steps:

1. Ask your patient what are his/her complaints.

2. Put your gloves on.

3. Ask him/her to locate the pain on the stomach.

4. Ask the patient to lie down.

5. Stretch your forefinger and middle finger and keep the others bent.

6. Carefully, put your stretched fingers over your patient's stomach and apply some pressure.

7. Repeat this on several stomach parts.

8. Pay attention to areas that are harder.

9. Register your observations and make your diagnosis.

10. Don't forget to prescribe medicines, if needed.

Experiment 19
Inspiration and expiration

What you will need:
- Balloon

Steps:

1. Ask your patient to put the balloon in his/her mouth.

2. Put your hands on your patient's chest and ask to take a deep and slow breath.

- Can you feel the respiratory movements?
- Can he/her fill in the balloon completely or just a little bit?

Experiment 20
Breath sounds

What you will need:
- Stethoscope
- Lab coat

Steps:

1. Put on your lab coat.

2. Ask the patient to sit down and free his/her chest for you to hear the respiratory movements.

3. Put on the stethoscope earphones on your ears.

4. Place the stethoscope on the area right below the chest on the left side and ask the patient to breathe in and out deeply. Repeat the same for the right side.

5. Then, place the stethoscope on the upper part of both sides.

6. Now, do the same on the back.
• Can you hear soft or strong sounds?

Experiment 21
Vaccination book

What you will need:
• Your own vaccination book

Steps:

1. Ask an adult to help you analyse your vaccination book.
• Which vaccines have you already taken? To which disease are you immune?

Experiment 22
Nutritional consultation

Nutritional consultations define a proper diet plan for each individual. This plan considers factors such as age, gender, frequency of physical exercise and individual goals.

Steps:

1. Begin by posing some questions to the patient, just as you did in experiment 1, about medical records.

2. Now ask what are his/her food habits:
• Do you eat a lot of fats?
• How often do you eat vegetables? Every day? How many times a week?
• Do you normally add fish to your meals? How many times a week?

3. Write down everything the patient tells you.

4. Now, ask your patient why he booked a nutritional consultation:
• Do you have any disease that requires a specific diet?
• Do you want to lose weight?
• Do you play sports and you want to adequate your diet to a specific sport?

5. Given your patient's answers, make his/her diet plan.

Experiment 23
Mole analysis

Moles are growths on the skin that are usually brown or black. Moles can appear anywhere on the skin, alone or in groups. Most moles appear in early childhood and during the first 30 years of a person's life. It is normal to have from 10 to 40 moles by adulthood. Some can be dangerous and you should visit a doctor called a dermatologist in case you have any concern about one developing on your skin.

What you will need:
• Gloves
• Magnifying glass

Steps:

1. Ask the patient to show you his/her moles.

2. Put your gloves on.

3. Analyse one by one.

4. Pay attention to its colour, is it light or dark? Does it have the same colour or is it darker on one specific side? Is it brown or red?

5. Is it plain or uneven?

6. And its shape is round or irregular?

7. Does it have hair?

8. Register your observations.

Explanation: Red moles on skin, also known as 'cherry angiomas', are benign skin lesions which some people develop over the years, and that are the consequence of the proliferation of very superficial blood vessels. In general, we must pay attention to moles that do not have well defined margins, that are not symmetric and that do not present an even colour, if their size is larger than 6 mm or if we notice that the mole grew.

Experiment 24
Toothache

Taking good care of our teeth is fundamental! When we don't treat them well they get weak, develop tooth decay and so much pain that sometimes doesn't allow us to eat. This way, remember to brush your teeth at least twice a day, do not abuse on sweets and visit a dentist at least two times a year.

What you will need:
- Lab coat
- Mask
- Magnifying glass
- Gloves

Steps:

1. Put on the lab coat, gloves and mask.

2. Ask the patient to tilt his/her head back.

3. Observe the teeth.

4. Is there tooth decay? Are they dirty?

5. Prepare a plan with treatment procedures.

6. Talk with the patient and begin the treatment.

Experiment 25
The ideal height and weight

What you will need:
- Scales
- Measuring tape

Steps:

1. Place the whole measuring tape vertically next to a wall and write down your height, with no shoes on (ask an adult for help).

2. Now ask for a scales and check your weight.

3. Take a look at the growth chart specifically for your age, included in the red book (Personal Child Health Record).

4. You may calculate the body mass index (BMI) by using the BMI healthy weight calculator, provided by NHS (National Health Service) web site or with the help of an adult.

Experiment 26
Medical emergency – 999

When you come across with an emergency situation you should always ask professionals for help. When you call the emergency line (999) it is important that you can provide the most important information to the person you are calling.

The Healthcare in the United Kingdom is provided by the National Health Service (NHS), to all permanent residents of the United Kingdom.

Attention: The emergency line must be exclusively used for real emergency situations and never for other purposes. If you interrupt the line with jokes you are preventing people who really need help from receiving it. In this experience, we are only simulating situations so do not dial the emergency number.

Steps:

1. Ask a relative or a friend to simulate an emergency situation in which you need to call for help.

2. What to say when calling an emergency line? Follow our tips.

Attention: Remember, we are only simulating a call and you must not dial the emergency number.

3. Know what you will be asked. Make sure that you are aware of each of the following: where the emergency is; nature of the emergency; a detailed, yet concise, description: what happened, how many details do you know; know the phone number of your phone.

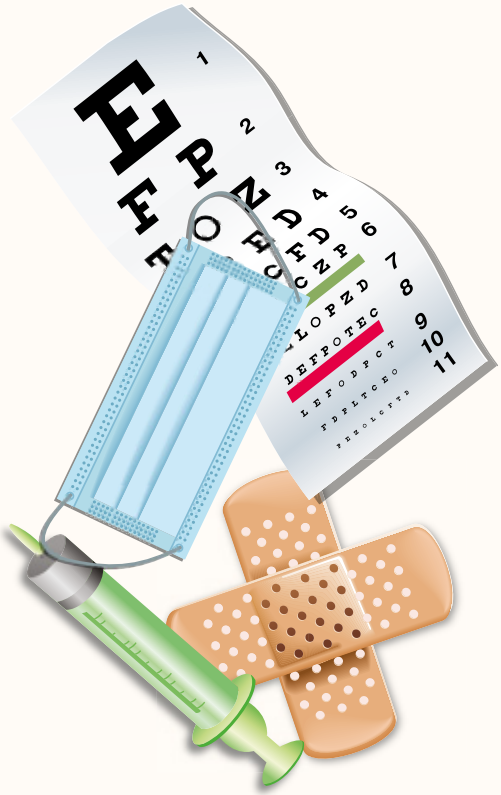
4. Listen to the dispatcher and follow orders. The better and faster you follow orders, the higher everyone's rate of survival will be. Even in a non-lethal situation (broken bones, for example) this is of vital importance.

5. Explain where you are. If possible, give information of what you see around you, in detail, so that the emergency team can find you more easily. How many people are in danger? What are the genders and ages? Which are the victim's symptoms? Is the person awake and able to speak? Is there any blood near the victim?

6. Do not hang up until instructed to. Anything can happen, and the emergency services need to know your situation at all times. If the building is on fire, for example, the dispatcher will need to know if there are other people in the building and where any safe exits are.

Now you know what to do during an emergency situation.

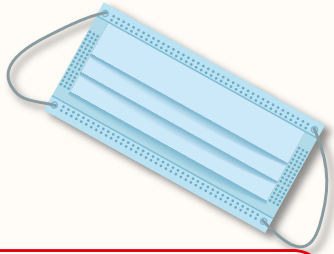
Suggestion: Together with your friends define who belongs to the emergency team, who is the person in danger and who'll call the emergency line and provide the necessary information. Repeat the experiment playing different roles.



8. Quiz

1. Which oath do graduating doctors swear on?

a) The Aristotle oath
b) The Hippocratic oath
c) The Socratic oath



2. Which of the following isn't an instrument used by a doctor in a consultation?

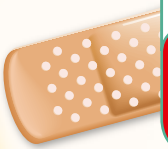
a) Stethoscope
b) Wooden spatula
c) Scalpel

6. What's the name given to a doctor that treats respiratory system problems?

a) Cardiologist
b) Pulmonologist
c) Urologist

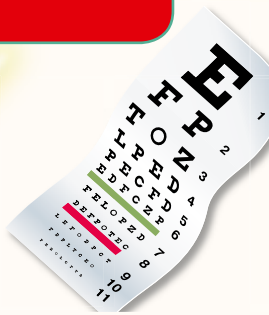
8. Which one isn't a natural barrier to our body?

a) Skin
b) Antibody
c) Tear



7. Which of the following options isn't a way to transmit diseases?

a) Washed hands
b) Particles of saliva
c) Contaminated water



3. What is the medical instrument that helps the doctor listening to heart-beats and breath sounds of a patient?

a) Stethoscope
b) Otoscope
c) Thermometer

4. What is the basic unit of all known living organisms?

a) Cell
b) Organ
c) Tissue

5. The skeleton system consists of:

a) Veins
b) Lungs
c) Bones

10. According to ABO System, how many blood groups exist?

a) 3
b) 4
c) 5

9. To prevent diseases what can people do?

a) Have surgery
b) Take medicines
c) Get vaccinated

Answers:

1–b)	2–c)	3–a)	4–a)	5–c)
6–b)	7–a)	8–b)	9–c)	10–b)

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