

THE HUMAN BODY

SCIENCE KIT



THAMES & KOSMOS



>>> IMPORTANT INFORMATION

WARNINGS. Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled. Strangulation hazard — long cords and tubes may become wrapped around the neck.

Store the experimental kit out of reach of young children.

Keep the packaging and instructions as they contain important information.

Rules for Safe Experimentation

- >>> Supervising adults should exercise discretion as to which experiments are suitable and safe for the child or children.
- >>> Supervising adults should discuss the warnings and safety information with the child or children before commencing the experiments.
- >>> Keep young children and animals away from the experimental area.
- >>> Do not eat or drink in the experimental area, unless it is expressly instructed as part of the experiment.
- >>> If your child must avoid some foods (for example, because of an allergy) or doesn't like a particular food, you can alter the experiments involving foods to avoid these foods.
- >>> After the experiments, the used pieces of equipment should be rinsed, dried with paper towel, and put back in their spots in the experiment kit. The worktable should be wiped off and hands should be washed.
- >>> After experimenting with foods, do not return them to their original containers; dispose of them in the household trash or down the drain.

>>> IMPORTANT INFORMATION

Dear Parents,

Children are curious and thirsty for knowledge, and always eager to learn about the world and understand their environment. This kit will let even five-year-olds carry out exciting experiments. Experimentation, astonishment, and play are all connected, so there will always be a good amount of fun in the learning process. As a bonus, the little researchers will develop a better understanding of their bodies, and their enjoyment of scientific research will be awakened.

The experiments are simple, but they can't be done completely without your help. Support your little explorers, because the curiosity and comprehension of children are often better developed than their manual dexterity. And if something doesn't work right away, encourage your child to give it another shot.



If an experiment is marked with this symbol, your help will be required for the experiment to be performed safely and securely.





This symbol refers you to the appropriate page on the accordion card: boy/girl, organs, skeleton, muscles, bloodstreams.

Help your child find a well-lit area that you can stand being a little messy, where he or she will be able to experiment in peace. And just as with real research, it is always a good idea to wear old clothes that you don't mind getting a little dirty. We also recommend getting all the materials ready beforehand, in order to avoid having to get up and fetch something in the middle of an experiment.

This experiment kit was designed with young researchers in mind, so the descriptions and explanations have been kept simple. You should work through them together and read them out loud to your child, so he or she can carry out the experiment on his or her own with a good understanding of its point.

We hope you have lots of fun and successful experiments!



Scissors  + Solid line  = Cut

Dotted pink area  = Gluing surface

>>> KIT CONTENTS



Checklist: Find – Inspect – Check off

✓ No.	Description	Qty.	Item No.	✓ No.	Description	Qty.	Item No.
○ 1	Die-cut cardboard	1	714 636	○ 12	Game board (cup holder)	1	708 058
○ 2	Peephole hand sheet	1	708 054	○ 13	Hourglass	1	705 254
○ 3	Fingerprint sheet	1	711 513	○ 14	Spinning top	1	703 548
○ 4	Accordion info card	1	711 514	○ 15	Feather	1	708 060
○ 5	Tactile shapes	1	708 057	○ 16	Mirror	1	702 221
○ 6	Tube	1	702 214	○ 17	Chalk	1	708 059
○ 7	Funnel	2	000 410	○ 18	String	1	706 761
○ 8	Red measuring cup	2	065 099	○ 19	Polystyrene foam ball	1	700 080
○ 9	Blue measuring cup	2	065 100	○ 20	Thick rubber band	2	708 100
○ 10	Yellow measuring cup	2	065 101	○ 21	Thin rubber band	2	161 412
○ 11	Measuring cup lid	6	061 160				

You will also need: Tape, glue, pencil, scissors, spoon, knife, cutting board, plate, scale, yardstick, photo, cloth for a blindfold, gloves, toy blocks, chair, optionally a swiveling chair, pillows, various foods (e.g. rice, noodles, oats, sugar, spices, tea, apple, bread, cheese, spinach, carrots, beets, corn, hot and cold foods)

Any materials not included in the kit are marked with this symbol **+** under the “You will need” heading.

>>> Please do a preliminary review of the parts list and check to make sure that all of the correct materials are included in the kit.

>>> If you are missing any parts, please contact Thames & Kosmos customer service.

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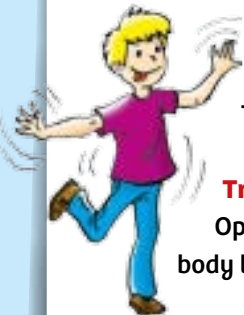
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Optical illusions and other body tricks

Dear Kids!

Do you want to explore your senses and learn about the human body in the process? Then let's get going and start in on the awesome experiments in this kit!

Your parents will be happy to help you gather the extra things you might need for each experiment, perform each step of the experiment, and read the explanations afterward. Make sure you follow the instructions closely. Don't be frustrated if something doesn't work as expected: That is an important part of science!

Let's start our experiments by sprouting some cress seeds! Have fun!





Coming to Your Senses

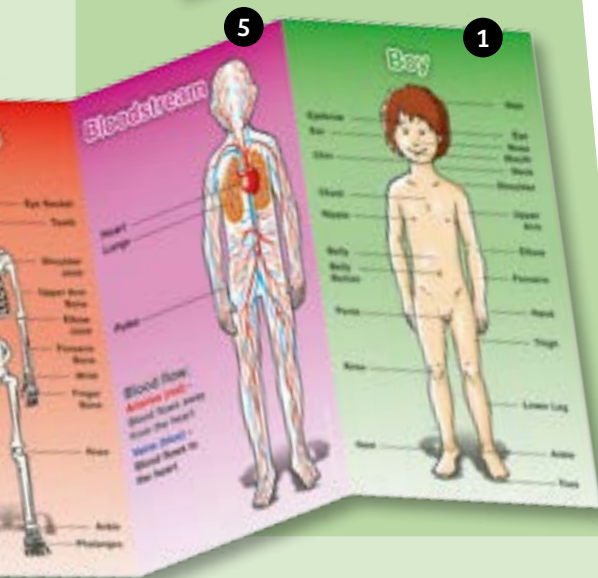
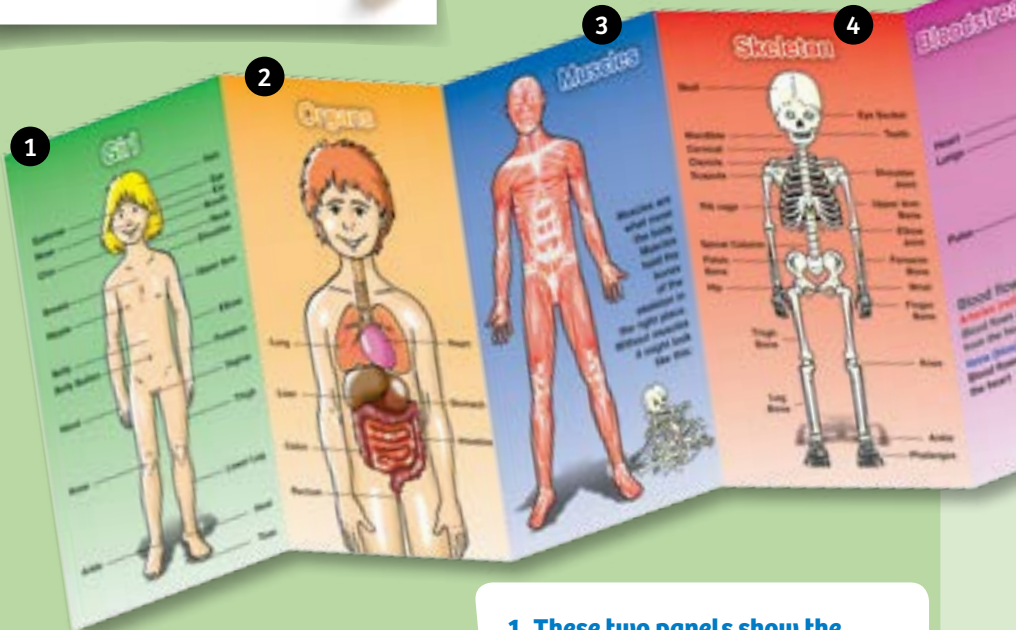


INTRODUCTION

Body systems information card



Find the accordion-folded body systems information card in your kit.



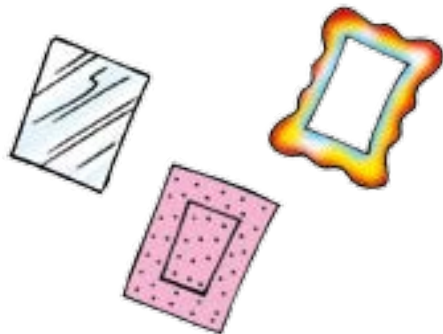
1. These two panels show the outer anatomy of males and females.
2. The body's major internal organs enable the body to breathe, digest food, pump blood around, and more.
3. The muscular system enables us to move.
4. The skeletal system is the body's structural framework.
5. The circulatory system transports oxygen and nutrients around the body.



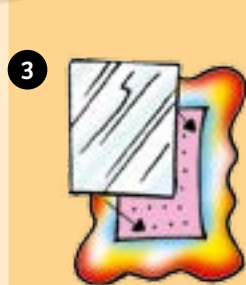
EXPERIMENT 1

Me in the mirror

YOU WILL NEED



+  Glue



Pull off protective film.



WHAT'S HAPPENING?

Hold the mirror in front of your nose and look at the image in the mirror: That's you! How do you look? Look at your hair, your eyes and eyebrows, your nose, your mouth, your teeth, your skin. Every person is unique — and everyone looks different! Only identical twins look almost exactly alike.

EXPERIMENT 2

Fingerprint

YOU WILL NEED



DID YOU KNOW?

The police use fingerprints to solve lots of crimes. If the crime scene specialists can find fingerprints, they can use them to identify the criminal.



1

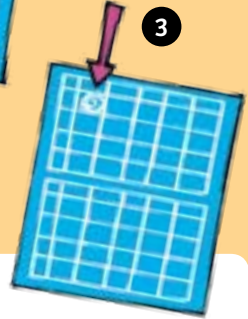


2



Keep rubbing your finger on the chalk until it turns really white from the chalk dust.

3



WHAT'S HAPPENING?

That's your fingerprint — and there's only one fingerprint like it in the whole world! Not even identical twins have the same ones. Each one of your ten fingers has a different print — see for yourself!



Arch



Loop



Whorl



Mixed

The most common type is the loop. Arch prints are somewhat less common.



EXPERIMENT 3



Your profile

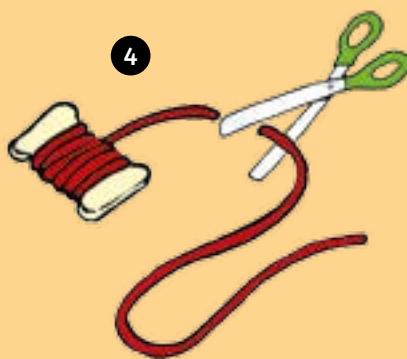
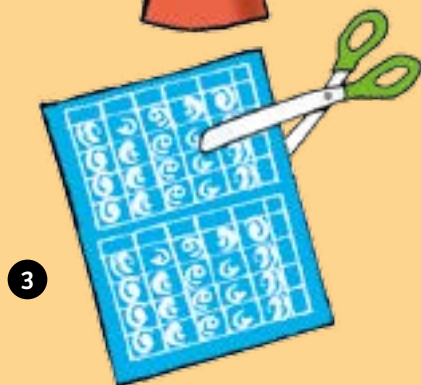
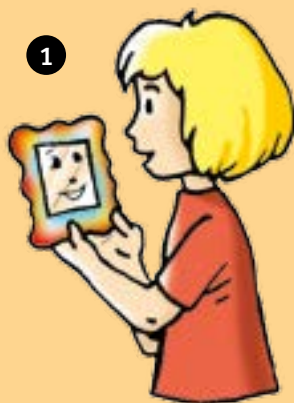
YOU WILL NEED

Mirror from Experiment 1

Fingerprint sheet from Experiment 2



- + Scissors
- + Glue
- + Tape
- + Pencil
- + Scale
- + Yardstick
- + Photo or drawing of yourself
- + Assistant



Pick the best-looking fingerprint and glue it to the profile poster!

5



You should have no problem at all finding a nice place to hang your poster!

WHAT'S HAPPENING ?

Fill out the list, asking a grown-up or older brother or sister for help if you need it. You can also glue on a photo or other picture of yourself. When everything is ready, you will have a good description of your appearance — also known as a profile.

DID YOU KNOW?

The police also use profiles to find criminals. Those are the big “wanted posters” featuring a picture and all available information about the individual they’re looking for. The police hope that someone will recognize the perpetrator and be able to provide information about where to find him.





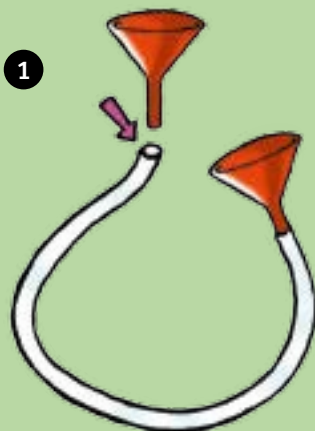
EXPERIMENT 4

Heartbeats

YOU WILL NEED



2x



Bonus Experiment:



Use the stethoscope to listen to your heart sounds. Then turn over the hourglass and jump around the room until all the sand has run out — and then listen to your heart with the stethoscope again. Is the beating faster or slower than before?

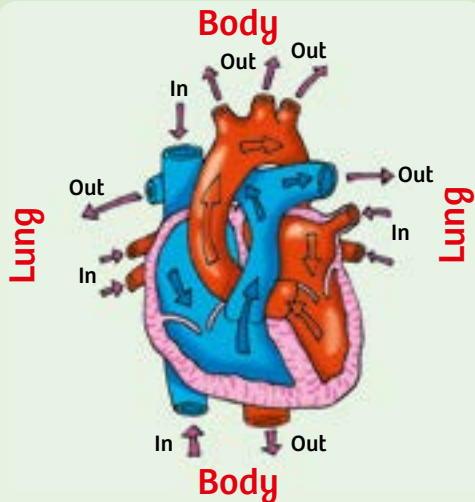
WHAT'S HAPPENING?

Your listening tube is ready! You can use it to listen to the inside of your body where you will find a lot more noises than you ever dreamed of. You probably know about listening tubes from your visits to the doctor, who calls it a stethoscope and uses it to listen in on your heart and breathing sounds during your checkups.



DID YOU KNOW?

The soft beating sound that you just heard is your heartbeat. The heart is a muscle, about as big as your fist, and it has a very important job to do: It pumps blood through your entire body — to your head, and fingertips, and all the way down to your little toes. The blood keeps your body constantly supplied with oxygen and nutrients. The oxygen is contained in the air that you breathe in through your nose, and gets from your lungs into your blood. The nutrients come from the food you eat, and pass into your blood from the digested food in your intestines.

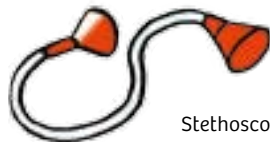




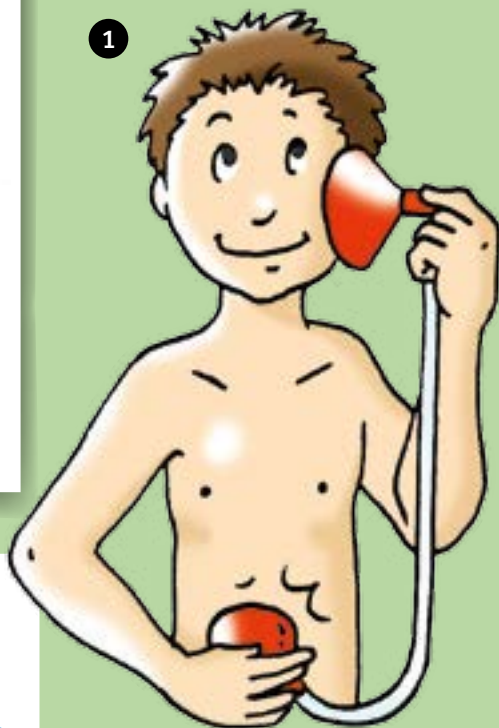
EXPERIMENT 5

Gurgling belly

YOU WILL NEED



Stethoscope from the last experiment



WHAT'S HAPPENING?

There are all sorts of things going on in your stomach, too! What you hear are noises that happen during digestion. As food moves through your body and gets broken down into smaller and smaller pieces and turned into things your body needs, gases and air bubbles are formed — so it's completely normal for you to hear gurgling and rumbling sounds in your belly! Your stomach even grumbles when it's empty. It keeps on working all the time, and when there's no more food left in it, it will work on air! That's when you'll hear it growl.

Bonus Experiment:

What other kinds of noises can your body make? Pay attention and make a list!



EXPERIMENT 6

Rattle

YOU WILL NEED



2x

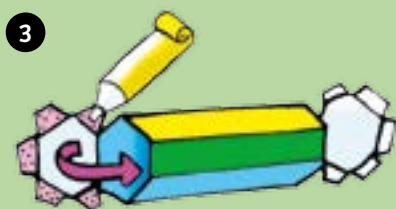
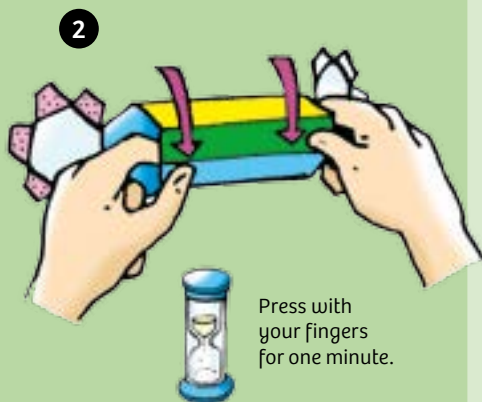


+  Glue

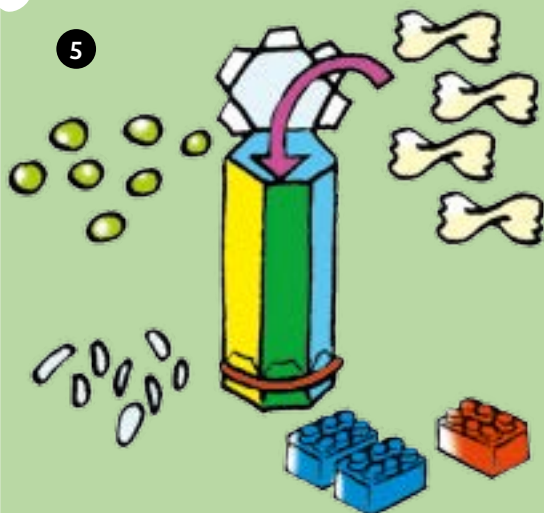
+ Filling for rattle:

 Rice,  Noodles,

 Small blocks



Do not seal this side with glue. Just hold it closed with the rubber band. That way, you can fill your rattle with different things to test the sound.



WHAT'S HAPPENING?

The rattle that you just made produces sounds — as you can hear with your ear. Loud or soft, high or low, long or short? Your ears pass the information on to your brain — and in your brain, it's all evaluated: Aha, a rattle! When your ears hear a high-pitched girl's voice, your brain can tell: Is it your friend or some other girl? If it's a deeper male voice, your brain will know if it's your father or not. Your ears can hear the sounds, but to understand them, you need your brain.




EXPERIMENT 7

Peek-a-boo

YOU WILL NEED



Rattle from the last experiment

- +  An assistant
- +  Blindfold
- +  Chair

1



2



3



WHAT'S HAPPENING?

Lucky for us, we have two ears, rather than just one! That way, we cannot only hear a sound, but we can also tell where it's coming from. If it comes from the left, then it reaches the left ear sooner than the right — just a teensy bit sooner, but that's usually enough!



EXPERIMENT 8

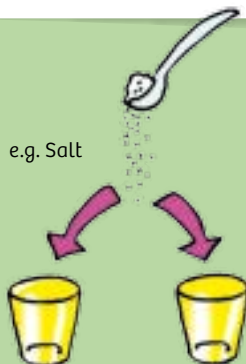
Sound memory

YOU WILL NEED



- + Noodles
- + Rice
- + Peas
- + Oats
- + Sugar
- + Spoon
- + Blindfold
- + Another player

1



2



3



Place in the tray in random order



When you shake the containers, always hold them between thumb and forefinger. That way, they'll stay tightly shut.

WHAT'S HAPPENING?

Even though you have covered your eyes, you can match them up — just count on your ears! Everything has to be nice and quiet so you can listen carefully. Which containers sound the same? Maybe your ears cannot only tell which ones sound the same — maybe they can even tell what's inside!

Sound memory gameplay tips:

- Start with 3 sound pairs that all sound quite different.
- Too easy? Then fill the containers with different things and take 3 pairs that sound pretty similar.
- Use the hourglass to run a race against time: Did you identify all 3 pairs before all the sand ran through?
- For advanced players: Instead of shaking the containers yourself, have someone else do it for you. That is harder, because you won't be able to feel the weight of the containers.



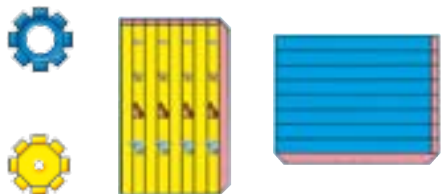


EXPERIMENT 9

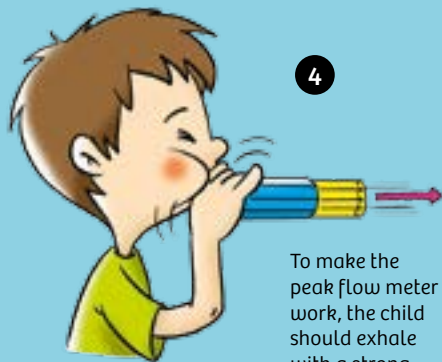
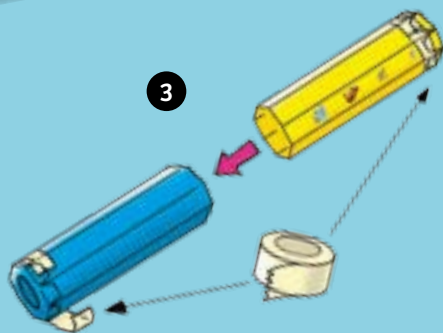
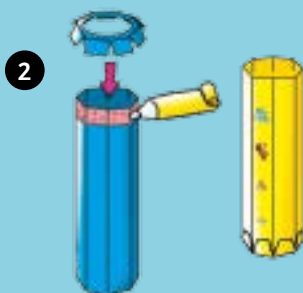
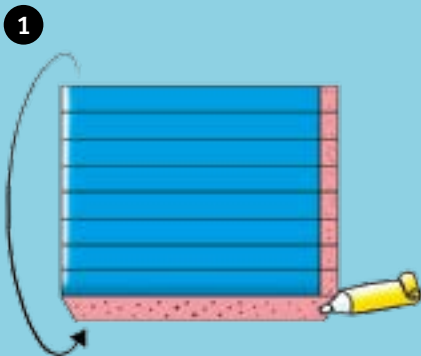


A lungful of air

YOU WILL NEED



- + Glue
- + Tape



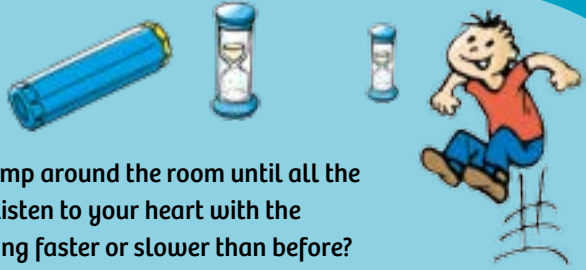
WHAT'S HAPPENING?

Inhale deeply to completely fill your lungs with air. You will feel the way your rib cage rises. Then, in a single breath, blow the air into the peak flow meter. Now take a look at it — it shows how fast the air came out of your lungs which correlates to the amount of air flowing through the lungs.

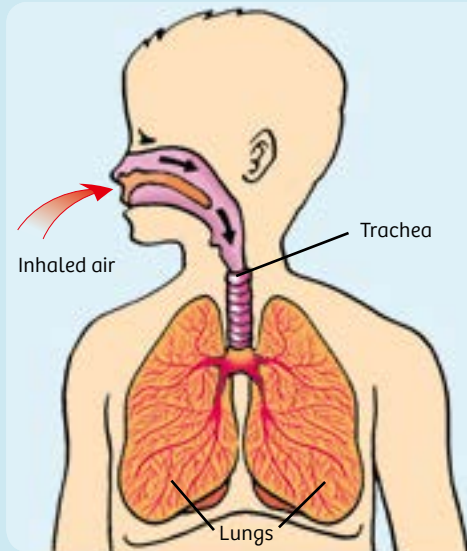
To make the peak flow meter work, the child should exhale with a strong, short burst of air. When exhaling slowly and softly, nothing will happen!

Bonus Experiment:

Use the stethoscope to listen to your heart sounds. Then turn over the hourglass and jump around the room until all the sand has run out — and then listen to your heart with the stethoscope again. Is the beating faster or slower than before?

**DID YOU KNOW?**

Your lungs look like a finely branching tree on the inside. That turns out to be very practical, since it creates a large surface area for gas to get from the air into your blood and vice versa. When you breathe in, oxygen gets from the air into your body, where your blood takes it to all your individual cells. The oxygen is needed by the cells in order to produce energy. In the process, carbon dioxide is produced, which is a waste product that has to be carried away. The blood takes this gas into the lungs, where it is breathed back out again.

**Bonus Experiment:**

Hold the mirror close to your mouth and breathe on it. What happens? In this experiment, too, you are seeing something that normally remains hidden from your eyes: your breath. Because the air you exhale contains water vapor, the mirror fogs up. In winter, when the air is cold, your breath also turns visible: When you breathe through your mouth, white clouds of vapor come out.









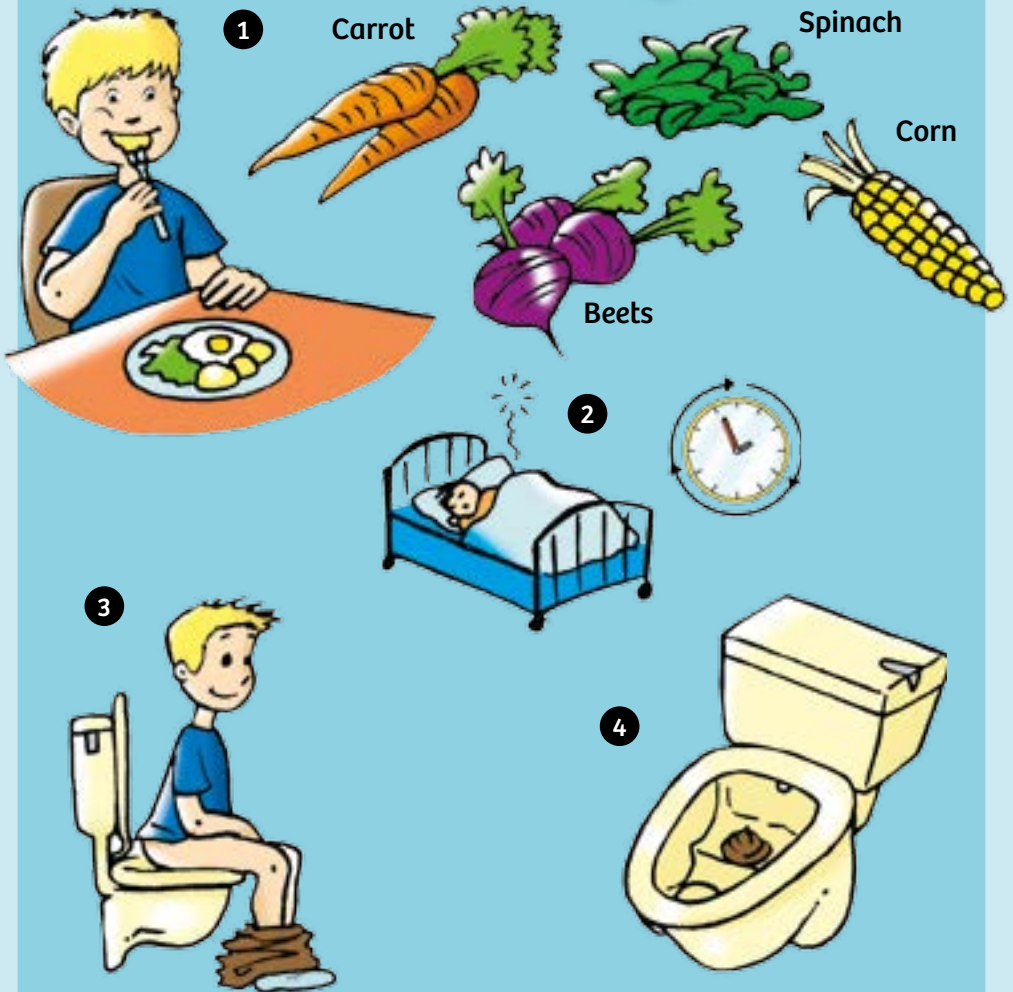


EXPERIMENT 10

Toilet detective

YOU WILL NEED

- +  Spinach
- +  Carrots
- +  Beet
- +  Corn
- +  About 1 day of time
- +  Toilet



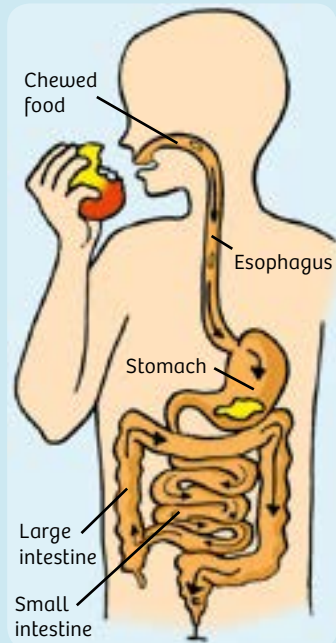
WHAT'S HAPPENING ?



Everything that you eat moves through your body and is used there. On the way, nutrients are retrieved from foods, and what is left is the stool. You have probably noticed that it doesn't always look the same. Look at what's in the toilet bowl! Sometimes the color changes a little — depending on what you ate before. A beet will turn your stool reddish, spinach will turn it grayish green, and carrots turn it light brown to orange. And sometimes — if you didn't chew for very long — you can even see entire pieces of food in there. That can happen with corn, sunflower seeds, or nuts, for example.

DID YOU KNOW?

What happens to food in your body? When you chew it in your mouth, it gets broken into pieces and mixed with saliva (spit). Then you swallow the food down, and it passes through the esophagus (food pipe) into your stomach. The stomach is a muscle that looks like a small bag. This is where the stomach acid gets into the act, and the food is churned until only a liquid pulp remains. If you chewed well, there won't be any recognizable pieces left — which is great, because that way your body can make much better use of the nutrients. Then the food pulp (called chyme) moves into the small intestine, where it is broken down even more and the nutrients are absorbed into the blood. The rest is waste — whatever is left over goes into the large intestine. There, water is pulled from the pulp, which becomes more solid: This is where the stool is formed. The stool leaves your body and gets into the toilet through the anus, which is the exit hole in your bottom. Every human has to eat, because the body gets energy from food. We need energy to keep ourselves warm, to move, to think, and, of course, to grow.





EXPERIMENT 11

Blindfold challenge

YOU WILL NEED

+  Blindfold



1



2 Eyes and 2 Hands

2



1 Eye and 1 Hand

3



No Eyes and 2 Hands



WHAT'S HAPPENING ?

Build a tower with the six containers. First, do it with both hands and both eyes open. Simple, right?

Then try it with one hand while keeping one eye covered with your other hand. That will be harder for sure, because we need two eyes for depth perception. Since your eyes are located next to each other in different parts of your face, each eye sees the container from a slightly different perspective. In fact — even though you don't realize it — you are looking at two images, which your brain can use to determine the distance to the containers. If only one eye is open, it's harder to perceive how far away from you the containers are. Finally, try constructing a tower with your eyes blindfolded. This will give you an idea how a blind person feels: They have to rely on their other senses.

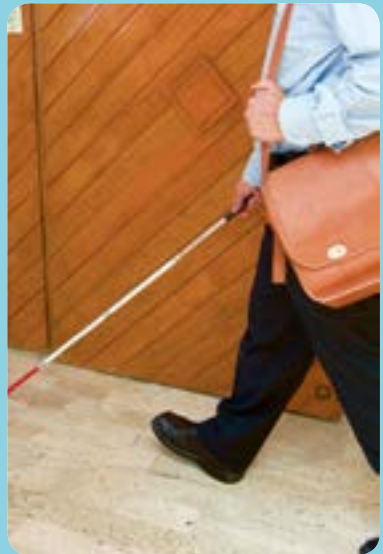


Remember the peek-a-boo game? You can also hear with a single ear, but two ears help you know the direction from which a sound is coming. Your eyes are like your ears — you have two of them as well! Just for seeing, one is enough, but to estimate distances, you need both.

Bonus Experiment:

Have an adult blindfold you and lead you around by your hand — through the apartment, through the house, outside for a walk.

Your guide will have to give you precise instructions: Is there an obstacle in your path? Are there steps? Where does the path get narrow? Where is it steep or slippery? How fast should you walk, and when should you stop?

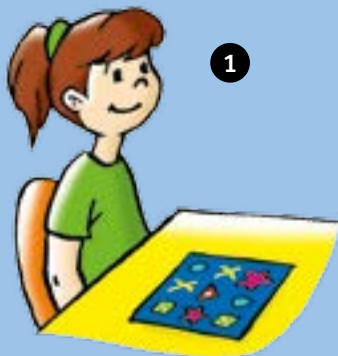




EXPERIMENT 12

Seeing with fingers

YOU WILL NEED



1

2

Close your eyes



3

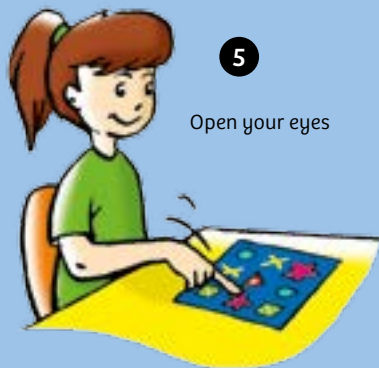


4



5

Open your eyes





WHAT'S HAPPENING?

Eyes shut! Try using nothing but your fingers to tell which shape it is. For someone who can see, the task is not so simple — because that person's sense of touch has had little practice, and isn't as well trained as it is in a blind person.

DID YOU KNOW?



Blind people can read with their fingers. They use letters for the blind invented by the Frenchman Louis Braille — which is why this type of writing is also known as



A



L



O

Braille (pronounced “brail”). The letter system consists of six dots pressed into the paper with a special machine. Each letter of the alphabet is made of a different combination of these six dots. When a blind person moves his fingers across the paper, he can feel the letters. If you pay attention, you will notice Braille writing all over the place — for example, on medicine packets and on elevator buttons.



Bonus Experiment:

Put on the gloves and try to identify the shapes. Does it work?





EXPERIMENT 13

Tickle test

YOU WILL NEED



+  An assistant



1



2



3



4



5





WHAT'S HAPPENING?

Have your assistant tickle you. Where does it tickle the most? Are there places where it doesn't tickle at all? Then switch places. The first player to make the other one laugh is the winner!

DID YOU KNOW?

Our skin is the human body's largest organ. And it's a lot more than just a simple covering for our body. There are lots of sensory cells in the skin that are responsive to different stimuli. There are touch sensors — as you know from your tickle



experiment — that are sensitive to light contact or pressure. Then there are pain sensors, which warn you about possible injury. And there are temperature sensors, which send signals about heat or cold. When you're hot, you start to sweat. The sweat evaporates on your skin and cools you off in the process. If you're cold, you get goose bumps: All the little hairs on your skin stand up straight and form an extra layer of air around your body, which helps to warm you up.

Bonus Experiment:



Try tickling yourself with the feather! Doesn't work? The reason lies in your brain: It knows what you're planning, warns you, and the feather's touch doesn't come as a surprise. You adjust to it beforehand, so you're not ticklish.



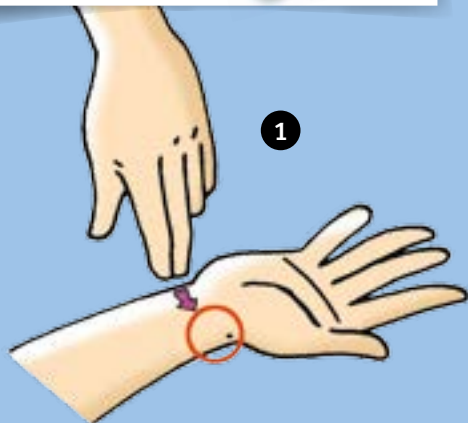


EXPERIMENT 14

Feeling your pulse

YOU WILL NEED

+ Just you!



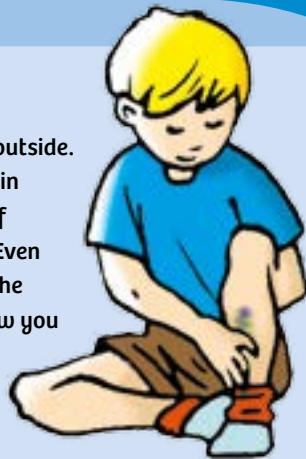
WHAT'S HAPPENING ?

You can feel the blood flowing through your body with your fingers! Use two fingers to find the location on your wrist where you can feel a light beating with your fingertips. Have a little patience, because the location is not always easy to find. Have you found it? That's your pulse. The blood in your body doesn't flow all by itself in a steady stream, like water in a creek. It can only flow when there's a pump to send it into all the parts of your body. Everybody has this sort of pump — it's called your heart. The heart pumps the blood all the way to the top and all the way to the bottom of your entire body, and then back to the heart again. When your fingertips feel one beat, it means that your heart has pumped once.

DID YOU KNOW?

You can also see the blood inside your body from the outside. Blood doesn't just slosh around in your body. It flows in narrow tubes known as veins or blood vessels. A lot of blood vessels are visible under the skin as blue lines. Even though your blood is actually red, it looks blue from the outside — because it is covered by skin and tissue. Now you can also understand why you sometimes get blue bruises: When you bump yourself, tiny little vessels burst in that spot. Luckily,

they usually quickly heal again, but a little blood collects under the skin. That's the blue bruise! Later on it can even turn yellow or green.



And what happens when you turn red? The skin is also crisscrossed with a network of tiny blood vessels. When you get excited or embarrassed, more blood flows through the skin and through the little vessels. It's particularly easy to see on your neck and face: Your skin turns really red!



Bonus Experiment:

There are also other places on your body where you can feel your pulse. Try it on your neck and foot!



EXPERIMENT 15

Smell memory

YOU WILL NEED



- + Coffee
- + Cinnamon
- + Herbes de Provence
- + Fruit tea
- + 1 Apple slice
- + 1 Piece of cheese
- + Spoon
- + Blindfold
- + Teammate

1

e.g. Cinnamon



e.g. Herbs



e.g. Apple



2



3



Place in the tray in random order



4



5



WHAT'S HAPPENING?

Open a container and sniff it. What on Earth is in it? Do you recognize the smell? Then try to find the matching container with the same contents. Can you find all three pairs of smells?

Smell memory gameplay tips:

- Start with 3 pairs of smells that are easy to tell apart.
- Too easy? Rinse out and dry the containers. Fill them with three things that smell more similar.
- Play against time with the hourglass: Can you find all three smells before the sand runs out?
- For advanced players: Instead of holding the container yourself, have someone else do it for you. That makes it harder, since you won't be able to feel the container's weight.

DID YOU KNOW?




This game wouldn't work without your brain either. True, the nose can smell, but then it transmits information about the smell through nerve cells to the brain. It is the brain that first performs an analysis: Is that a familiar smell? Okay, right, it smells like... cinnamon. Or: No, I've never smelled anything like that before — that's something new!

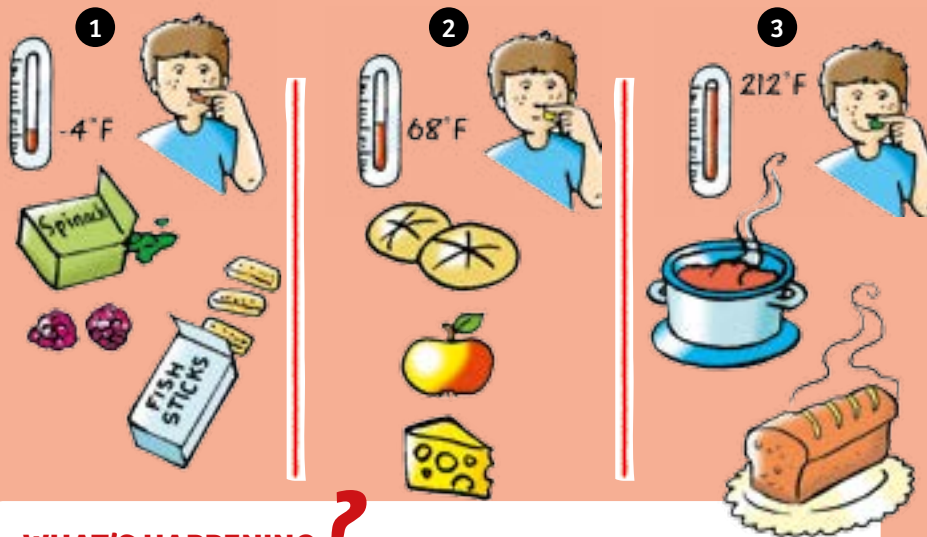
Whether it's hearing, seeing, feeling, smelling, or tasting — our five senses transmit all the information to the brain, where the analysis takes place.



Summertime smells

YOU WILL NEED

- +  Food from the freezer
- +  Cold food
- +  Warm food



WHAT'S HAPPENING ?

When you shop, cook, or eat — pay attention to the smell of foods. What is it that smells best? What smells the strongest? Really cold food from the freezer hardly smells at all. At room temperature, a lot of things start to smell pretty good — but from a hot pot or the oven, they smell delicious! Warm things give off more odors than cold things. That's why there are hardly any smells at all outside in the winter, while in the summer there are smells all over the place!



EXPERIMENT 17



Taste test

YOU WILL NEED

- + Plate
- + Various foods (cut into cubes)
- + Knife
- + Cutting board
- + Blindfold
- + Adult

1

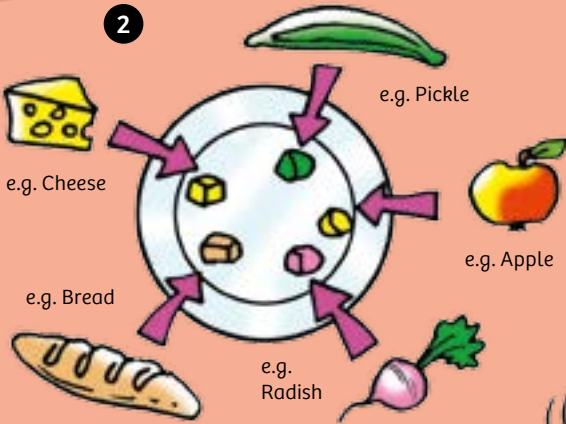


An adult cuts the foods into similarly sized cubes.

3



2

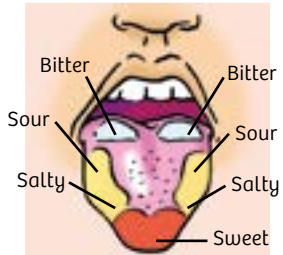


4



WHAT'S HAPPENING ?

Try a sampling of the food cubes with the blindfold on. What kind of flavor is that? It sure isn't easy when everything has the same shape! But your tongue is a real specialist. Its taste buds can recognize whether something tastes bitter, sour, salty, or sweet. There are certain areas on your tongue where the taste is particularly easy to recognize.





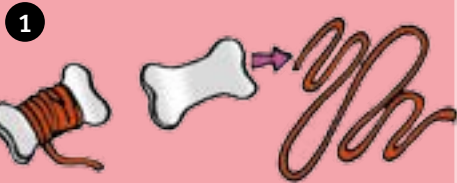
EXPERIMENT 18

Tightrope walk

YOU WILL NEED



+  Tape



WHAT'S HAPPENING?

Lay the string flat against the floor and secure it with tape so it doesn't slip. Try to walk right on the string. Can you do it without stepping to the side? Then try it on your tiptoes, on your heels, hopping on both legs, and hopping on one leg.

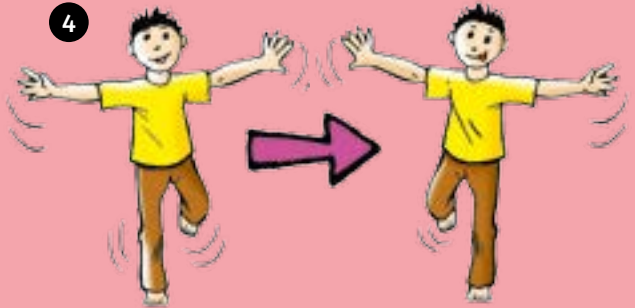
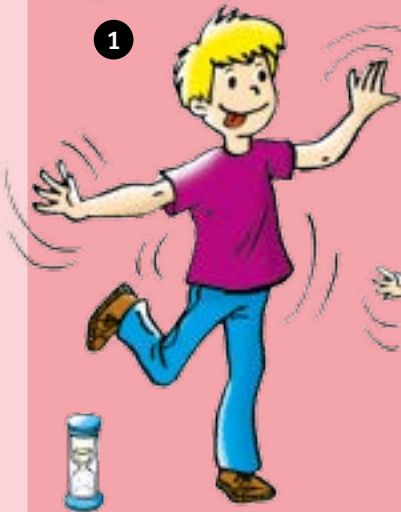


The string doesn't have to be laid out in a straight line. You can also create shapes and patterns!

EXPERIMENT 19

One-legged stork

YOU WILL NEED



Bonus Experiment:

Place a pillow on the floor and stand on it — on just one leg again. If the ground is unsteady, it's harder to keep from falling. Can you stay standing until all the sand runs through the hourglass?



WHAT'S HAPPENING?

Stand on one leg and start the hourglass. Does the sand run out before you fall? First try it with your shoes on, then in socks or barefoot. Which way is easiest? Then try it on the other leg. Is that better or worse? Or are they the same?



EXPERIMENT 20

Keep your balance

YOU WILL NEED

+  Rotating desk chair



Make sure you have enough open space, so you don't bump into anything!



WHAT'S HAPPENING?

Stand up straight, close your eyes, and turn slowly in a circle. Then stop suddenly. What kind of a feeling is that?

Tip

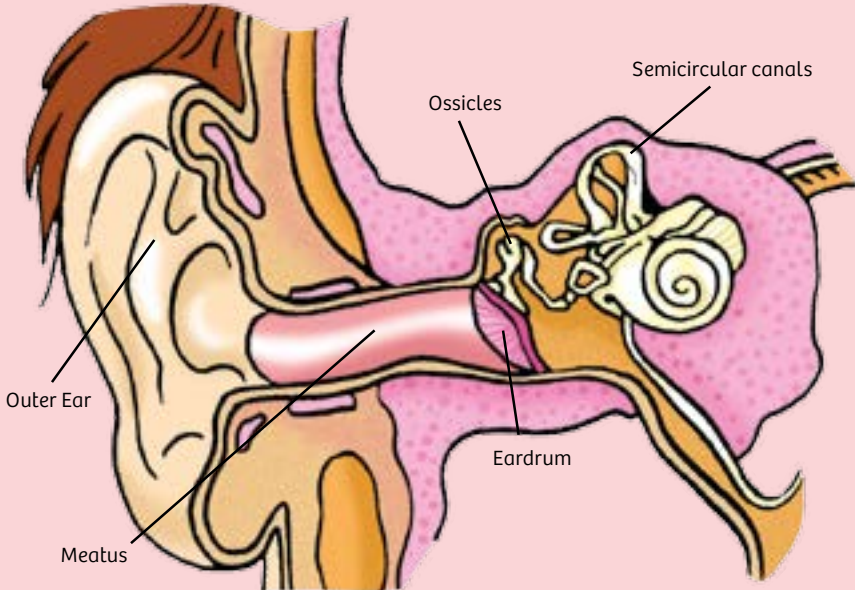


The experiment also works well if you sit on a spinning chair. Turn slowly and hold on tight!



DID YOU KNOW?

You use your ears not just for hearing, but for balance too. Behind your eardrum, there are three fluid-filled archways. When you move, the fluid in the archways moves as well, and the nerves pass on the information to the brain. For example: You're bending too far forward — careful, you might stumble!



In the spinning experiment, you scrambled up your brain a little. When you suddenly stop, the fluid in the archways keeps moving at first. Your organs of balance can't react as quickly as you can stop yourself. Even though you're standing still, your brain still gets the message: Everything's spinning! That's what the dizzy feeling comes from.





EXPERIMENT 21

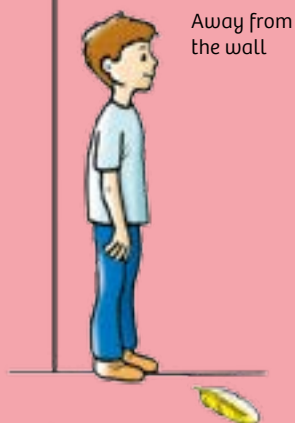
Take a bow

YOU WILL NEED

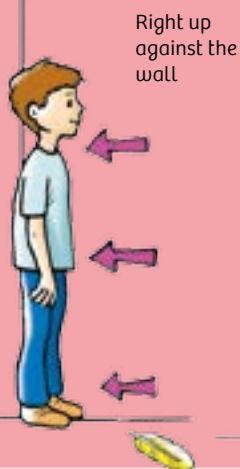
+  Wall



1



2



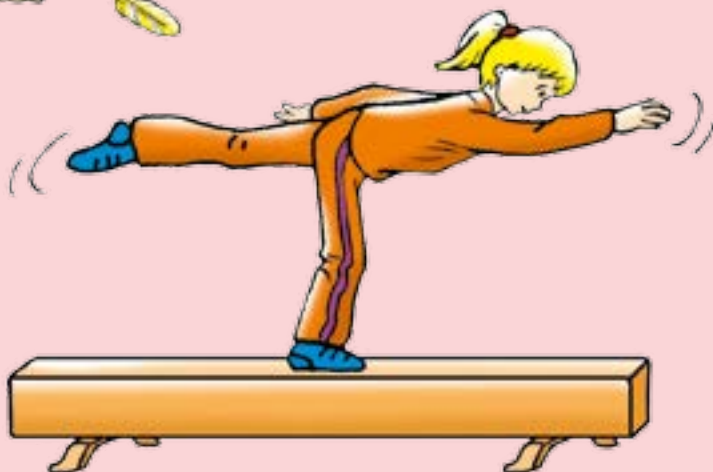
WHAT'S HAPPENING ?

Place the feather on the floor, bend over, and pick it up. It's easy, right? Then position yourself with your back against the wall and try it again — be sure to keep your heels against the wall the whole time. Now, all of a sudden, it won't work at all. To pick up the feather, you have to take a step forward. Why does that happen?

DID YOU KNOW?



You're a regular gymnast! No matter how you move, you always adjust your body so that it's balanced. That happens all by itself, without having to think about it at all. So that means that when you bend forward, your bottom has to move backward — otherwise your upper body won't be counterbalanced. In this experiment, though, the wall is in the way! Your bottom can't move to the rear. That is why you'll lose your balance, and you won't succeed in picking up the feather.





EXPERIMENT 22



Balancing ball

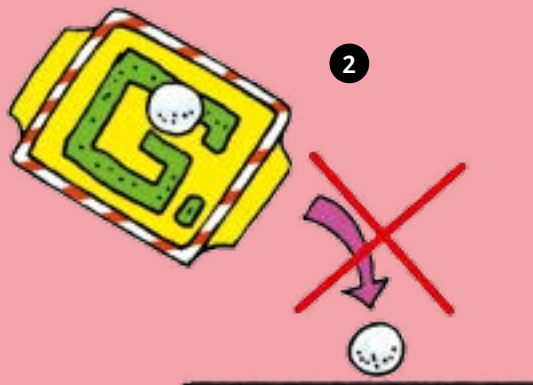
YOU WILL NEED



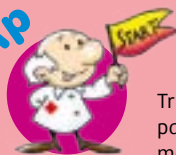
1



2



Tip



Try to follow the paths through the maze. Can you reach the goal?



WHAT'S HAPPENING?

Start the hourglass and place the ball on the labyrinth game board. Can you hold it up long enough for the sand to run through?



Bonus Experiment:



Try it with your eyes closed. It's harder! To keep the ball from falling, you don't just need a steady hand. Your eyes get into the act as well, by watching the direction that the ball is rolling. Only then can you know how your hands have to compensate in order to keep the ball from falling.





EXPERIMENT 23

Magic top

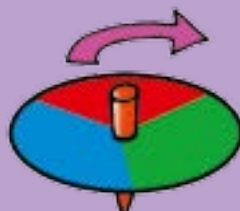
YOU WILL NEED



1



2



3





Sometimes the effect is better if the top spins fast — and sometimes it's better if the top spins slowly. Test it yourself!

WHAT'S HAPPENING ?

Mount a disk on the top and give it a whirl. What happens? All three disks change completely when they are in motion!



The top grows! It looks like it's getting larger and larger.



The color goes away! The different colors blend into a uniform gray.



Help, it's wobbling! The arrangement of rings suddenly looks completely regular, and some start to swing back and forth.

Bonus Experiment:

Repeat the experiment, but this time spin the top in the opposite direction. With which disk does something change? Right — with the spiral. If you spin it in the opposite direction, the top seems to shrink!





EXPERIMENT 24

Hole in your hand

YOU WILL NEED



1



2



3



4



5



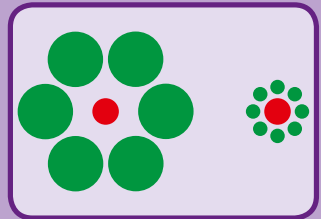
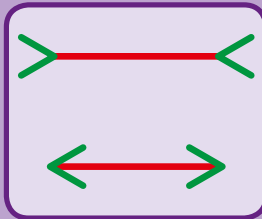
WHAT'S HAPPENING ?

Hold the magic telescope in front of one eye and hold your other hand a little way in front of your other eye. Look into the distance and slowly guide your free hand from the end of the telescope toward your face. Try it several times if it doesn't work right off the bat. Suddenly you'll see a hole in your hand! Of course, in reality your hand is in good shape.

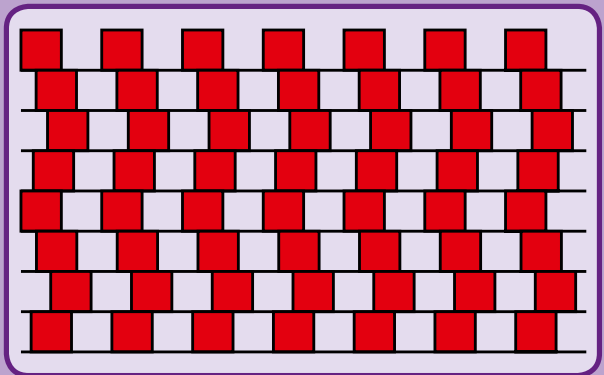
So why does it look like there's a hole in it? You have tricked your brain! Each one of your eyes sees its own image that it conveys to the brain. Normally, these two images are pretty similar, and your brain combines the two images into a single whole — without you noticing it at all. In this experiment, though, the two images look completely different! See for yourself, by shutting each eye in turn. One eye looks through the magic telescope and sees nothing but a little circle, while the other eye sees the entire surroundings. Your brain puts the two images together as usual — and, well, the result is a lot of nonsense!

Bonus Experiment:

Even if it doesn't look that way, the red lines are the same length, the red circles are the same size, and the wall is straight!



It's really unbelievable what our brain can do — but it can also be deceived. Sometimes our eyes will see something that our brain analyzes in the wrong way. That's known as an optical illusion.






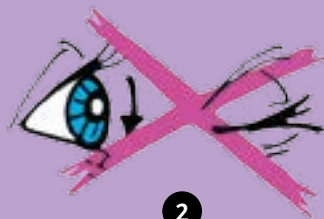
EXPERIMENT 25

Staring contest

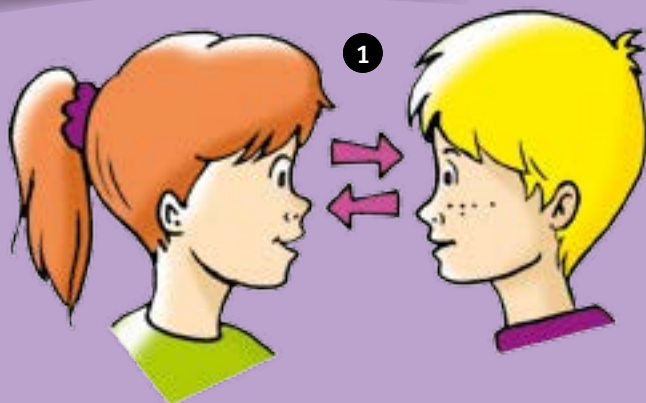
YOU WILL NEED

+  An assistant

Optional



2



If you can't find an assistant, you can compete against the hourglass! In that case, look into the mirror during the contest.



WHAT'S HAPPENING ?

Look your opponent in the eye and keep your own eyes wide open: No blinking! Whoever manages to go the longest without blinking is the winner.

No matter how hard you try to avoid it, sooner or later you will HAVE to blink. Your body has set things up to make that happen automatically — without your being able to prevent it. Blinking has the important function of ensuring clear vision. It keeps the eyes moist and free of tiny dust particles. This sort of automatic process serving to protect the body is known as a reflex.

DID YOU KNOW?

We have many reflexes. Breathing is one, along with coughing and sneezing. And if you accidentally touch a hot burner, your hand pulls away in an instant. Fortunately, nobody has to ponder it first: "Oh, I think that feels hot. Would it be better for me to pull my hand away? Ouch, that really hurts! Yeah, I'd better pull it away!" By that time, you would have burned yourself pretty badly. Reflexes are very sensible things for you to have, because they can save valuable time in preventing something worse from happening.



Bonus Experiment:

+  An assistant


Position yourself in front of the other player and clap your hands once in front of her eyes. What's her reaction? She will definitely close her eyes briefly. Blinking is also a reflex to protect the eyes when there's a sudden loud noise.

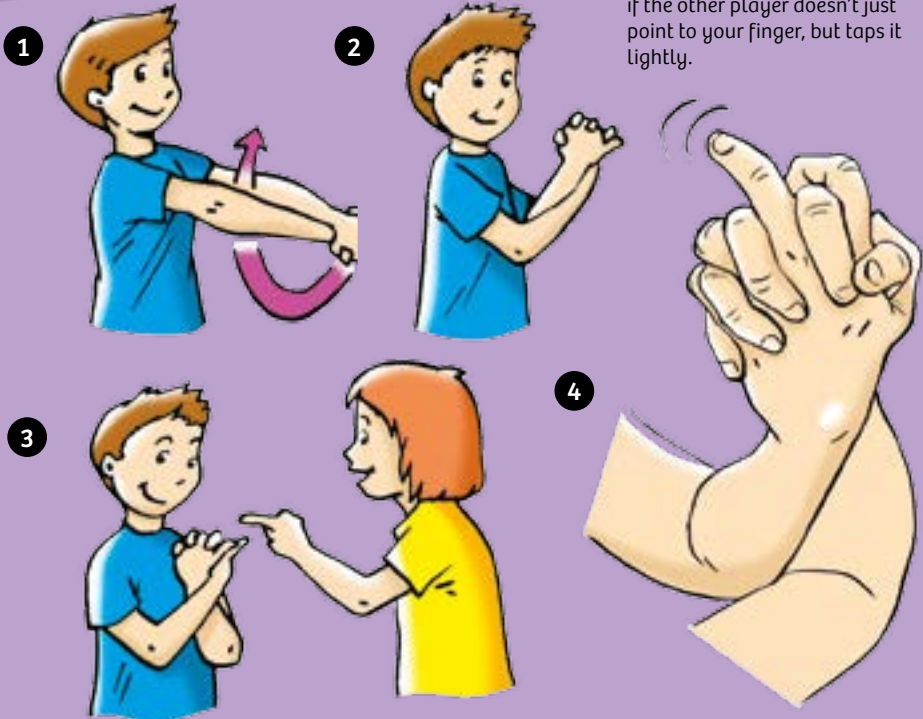


EXPERIMENT 26

The wiggling finger

YOU WILL NEED

+  An assistant



At the beginning, it will be easier if the other player doesn't just point to your finger, but taps it lightly.

WHAT'S HAPPENING?

The other player points to one of your fingers. You have to try to raise that finger! It isn't easy at all: When you cross your hands over one another, it confuses your brain: Your left and right hands are reversed, and the fingers of the two hands are switched around. To wiggle the right finger, your brain first has to mentally untangle the entire knot of fingers!



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