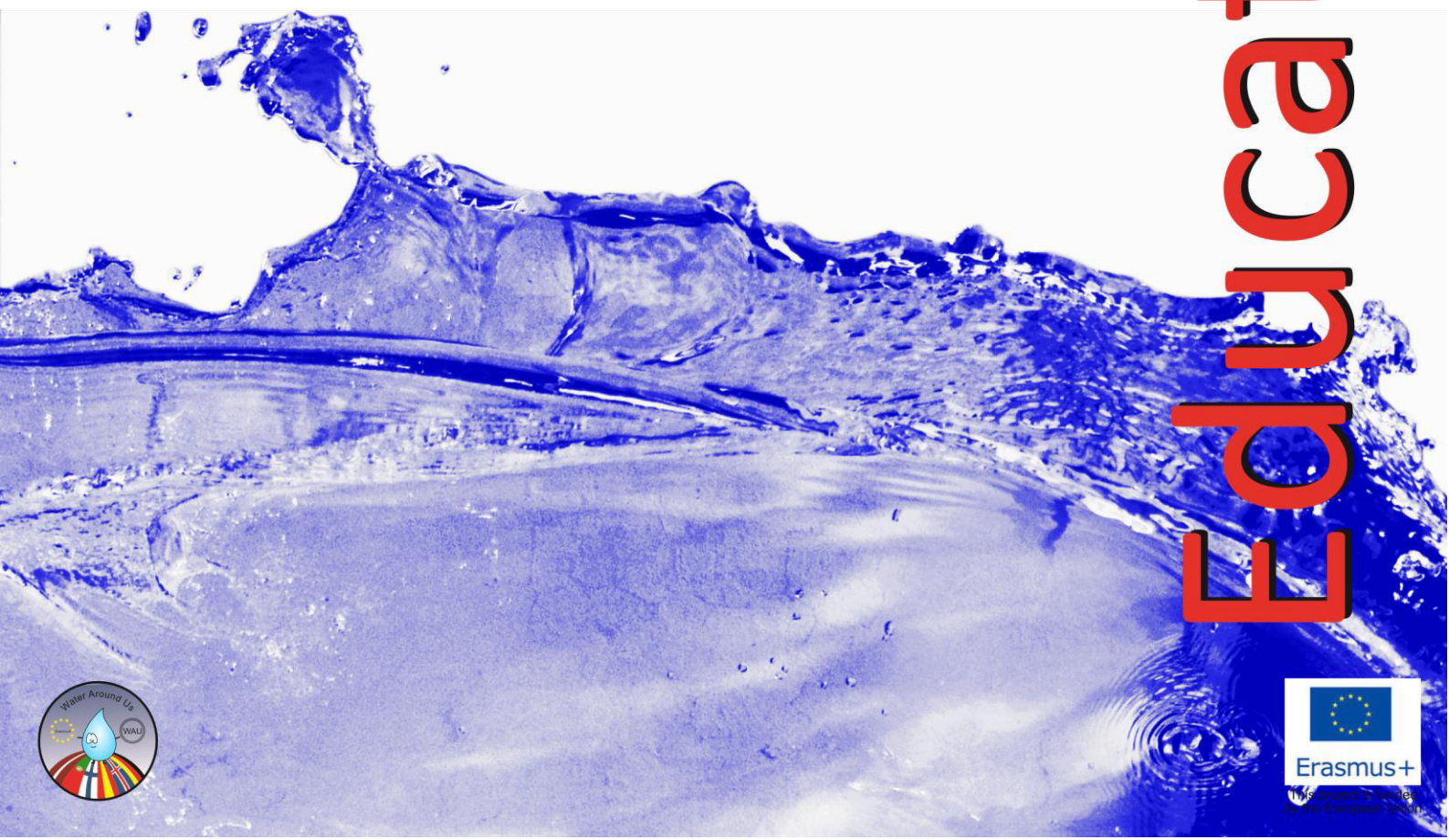
Educational Units

Water Around Us



Erasmus+

This project is funded from European Union

Contents

Introduction

Right from the beginning, even before finishing the Erasmus+ application in spring of 2014, it was pretty clear that some kind of educational unit had to be one of our main products. Having picked „water“ as a topic, it seems quite obvious that you can´t deal with this theme without exploring its physical, chemical and biological properties.

All participating schools´ curricula imply the properties of water somewhere - almost at every grade. This booklet is intended to support every day teaching in physics, chemistry and related subjects at any school type and at almost every level. It is also a compilation of our common effort to install and practice cross-cultural, interdisciplinary and student-oriented learning.

Students and teachers of the participating schools collected scientific phenomena regarding water´s properties. After that, they tried to come up with experiments which highlight these effects. The aim was to compile a booklet with motivating scientific experiments to be used in science lessons across all school types. Educating and entertaining at the same time. Possibly being an example of good practice for other schools as well.

All experiments featured here were selected, tried out and chosen to become part of this compilation by students at the local schools. Each school elaborated 2-3 experiments in winter 2014/15. During our Learning Activity meetings in Finland and Latvia, most experiments were performed again by 2-3 students of each country for the international assembly. Since English is the project language and none of the participants´ native tongue, extra effort was needed to conduct and explain the experiments using proper English. Hence the English used is as simple as possible but as accurate as needed to be scientifically correct and still understood by the students.

The vast majority (unless otherwise stated) of all pictures was taken at our schools by participating students or teachers during experiments.
A three-column layout was used to keep the pages clear. Extra yellow boxes for involved subjects and key words also contribute to clarity. A spiral binding seemed to be useful for the intended use during lessons. The format DIN A 4 (21 cm x 29,7 cm) was chosen in favour of a smaller DIN A 5 for the same reasons of clarity and comprehensibility. It is also the format students use in their workbooks and folders so it´s easy to make photocopies.

Buoyancy

EXPERIMENT

Mittelschule Holderhecke

Involved subjects
Chemistry
Physics

Age group
10-16 years

School
Mittelschule Holderhecke
Bergrheinfeld, Germany

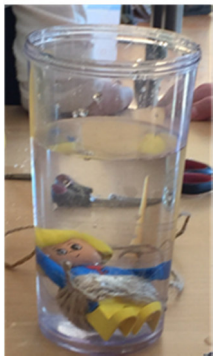
Salt changes the density of water

Normally, if we jump into water, we sink. So how can you explain that someone swimming in the dead sea can just lie on the water and float.

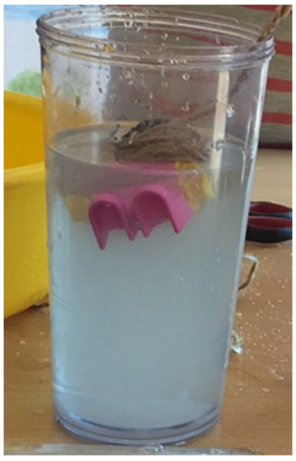
So if you add salt to water you change the physical forces that water has on things so that they can float.

When you drop something on the water, gravity pulls it down and and the fluid pushes the object up again. It just depends on the magnitude of the object and the fluid how far it is pushed up.

Before salt



After salt



Description of the experiment

Material

- a beaker or jar
- water
- salt
- small figures, e.g. lego

Experiment

1. Fill a beaker with water
2. Drop the figure into the water.
3. Take the figure out again.
4. Add a few tablespoons of salt.
5. Drop the figure into the water again.
6. If the figure doesn't float, add some more salt.

How does it work?

Buoyancy depends on the density of the object and the density of the fluid it is in.
By adding salt to the water you increase the density of the water. The salt ions are placed between the water molecules. The mass of the salt water increases and the volume is only slightly greater so it is much denser than fresh water. So if you drop the same object into salt water as into fresh water the buoyancy of the salt water is much bigger.

Key words:

BUOYANCY

DENSITY

MASS

FLOATING

FRESH WATER

SALT WATER

The sticky CD

Mittelschule Holderhecke

Involved subjects
Chemistry
Physics

Age group
10-16 years

School
Mittelschule Holderhecke
Bergrheinfeld, Germany

Wet things stick to the surface

If you walk in the rain and your clothes get wet and soaked, they start sticking to your body. It's the same when you sweat.

Also when you put your finger into a glass of water and pull it out again, waterdrops stick to it. And if you watch raindrops on your window they seem to be stuck on the pane.

So why is it that wet clothes stick to the surface while dry things don't?

And why does water seem to be "glued" on windows and fingers?

Description of the experiment

Material

- a CD
- water
- a smooth surface (e.g. table)

Experiment

1. Put some drops of water onto an old CD.
2. Spread the water on the CD with your finger.
3. Put the CD onto the smooth surface with the wet side down.
4. Now try to lift the CD.

How does it work?

So when you try to lift the CD from table it seem to stick to the table.
That's'due to two properties of water: Adhesion and cohesion.
Adhesive forces make the CD glue to the table. Adhesion means the ability of one substance to stick to another substance.
Cohesive forces prevent the film of water between the CD and the surface from getting torn.
Cohesion means that water molecules are attracted to water molecules (by the positive and negative charges of oxygen and hydrogen atoms).
The adhesive force of water is stronger than the cohesive one. So because of adhesion a small film of water can be like glue.

Key words:

ADHESION

COHESION

WET THINGS STICK

Ice cube towers

EXPERIMENT

Mittelschule Holderhecke

Involved subjects
Chemistry
Physics

Age group
10-16 years

School
Mittelschule Holderhecke
Bergrheinfeld, Germany

Salt makes water melt

Normally the freezing point of water is 0° C, so that water changes phase from a liquid to a solid at that temperature.

By adding salt to the water or putting salt on the ice you can lower the freezing point and make the ice melt.

This fact is also used when we sprinkle salt on icy and snowy roads in winter to make the ice melt and make roads safer.

Description of the experiment

Material

- ice cubes
- salt

Experiment

1. Take ice cubes out of the freezer and put them on the table.
2. Put a bit of salt onto one ice cube.
3. Press another ice cube onto the first one.
4. Repeat until you have a small tower.

How does it work?

By putting salt onto the ice cube we lower the freezing point of the water and make the ice melt immediately.
There is a thin layer of water on the ice cube.
The salt breaks apart the bonds of the water molecules in the ice causing it to melt.
By pressing the next ice cube onto the first one we lower the temperature again. So the thin layer of water refreezes . The two ice cubes stick together.

Key words:

MELTING POINT

SALT

AGGREGATE STATE

SOLID WATER

LIQUID WATER

FREEZING POINT

Erasmus+

Water's surface tension

EXPERIMENT

Agrupamento de Escolas de Valongo

- **INVOLVED DISCIPLINES:** Natural Sciences, Physics, Chemistry, Biology, BIO
- **AGE GROUP:** 12-17 years
- **SCHOOL:** Agrupamento de Escolas de Valongo

Surface tension is acting all around us

- Some animals can stand, walk, or run on water without breaking the surface.

- Water behaves as if covered by an invisible film.

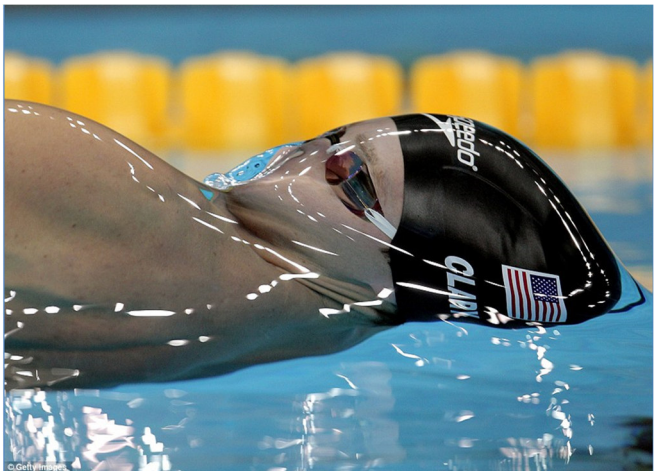


Photo from: www.dailymail.co.uk/news/

Photo from MailOnline with an US swimmer that perfectly shows the phenomenon of surface tension.

Description of the experiment

Material

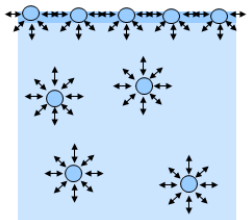
- 2 beakers
- 2 clips
- Water
- Small plastic bag piece
- Dishwashing soap

Experiment

1. Fill the two beakers equally with water.
2. Gently drop the paper clip into the plain water (use small piece of plastic bag).
3. In one of the beakers, add about 4 drops of dish soap gently in the water.

How does it work?

Surface tension results from the strong interactions between water molecules, called hydrogen bonding.
The molecules at the surface of the water have attractions for their neighbors but they don't have any molecules "above" them.



Consequently the molecules at the surface cohere more strongly to those directly associated with them.

Key words:

Water molecule

Atoms

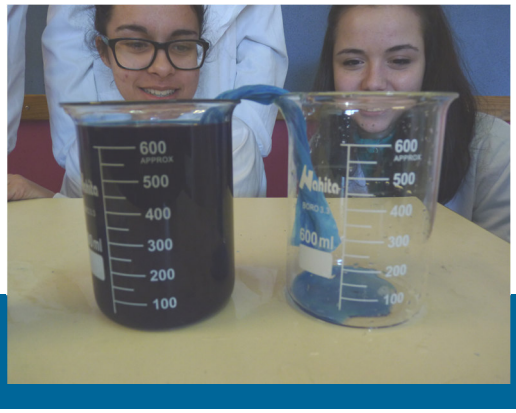
Hidrogene bonding

Cohesive Forces

Surface Tension

Erasmus+

Capillary action



EXPERIMENT

Agrupamento de Escolas de Valongo

- **INVOLVED DISCIPLINES:** Natural Sciences, Physics, Chemistry, Biology, Biotechnology
- **AGE GROUP:** 6-17 years
- **SCHOOL:** Agrupamento de Escolas de Valongo

Capillary action is acting all around us

- You can see capillary action in action when you place the bottom of a white carnation flower in a glass of water with food coloring and watch for the movement of the color to the top leaves.
- Paper towels absorb liquid through capillary action, allowing a fluid to be transferred from a surface to the towel, the small pores act as small capillaries, causing it to absorb a large amount of fluid.

Photo from: www.dailymail.co.uk/news/

Description of the experiment

Material

- 2 beakers
- Paper towels
- Water
- Food coloring

Experiment

1. Fill one beaker with water.
2. Gently drop food coloring in the water.
3. Place one end of the paper towels into the glass filled with water and the other into the empty beaker.

How does it work?

This process is called 'capillary action', the water uses this process to move along the tiny gaps in the fiber of the paper towels. It occurs due to the adhesive force between the water and the paper towel being stronger than the cohesive forces inside the water itself. This process can also be seen in plants where moisture travels from the roots to the rest of the plant.

Key words:

Water molecule

Atoms

Capillarity action

Adhesive Forces

Cohesive forces

Density of water

EXPERIMENT

Agrupamento de Escolas de Valongo

- **INVOLVED DISCIPLINES:** Natural Sciences, Chemistry, Biology
- **AGE GROUP:** 6-12 years
- **SCHOOL:** Agrupamento de Escolas de Valongo

Density of water is acting all around us

- When the liquid water freezes the bottle breaks.

- The icebergs floats above the surface of the see water.

Description of the experiment

Material

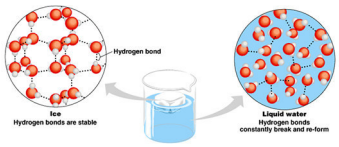
- 1 glass trough
- Ice cubes
- Water

Experiment

1. Fill one beaker with water.
2. Gently put the ice cubes in the water.

How does it work?

As water gets colder the hydrogen bonds override the motion of the molecules and water begins to crystallize forming water's solid state ice.



Ice is formed at 0° C. Ice is about 10% less dense than liquid water at 4ºC because it expands as it freezes causing the molecules to grow farther apart.

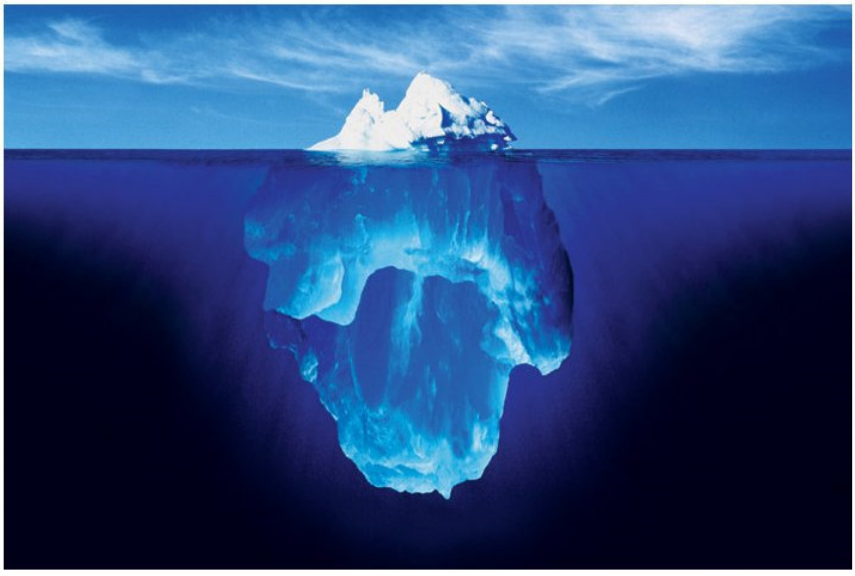


Photo from: http://stocktouch.com/blog/just-the-tip-of-the-greek-iceberg/attachment/iceberg

Key words:

Water molecule

Ice

Density

Light bulb lit with water

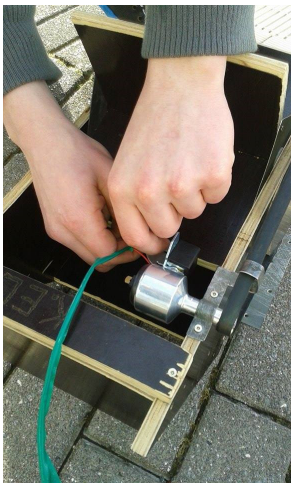
EXPERIMENT

Grunnskolinn i Borgarnesi

Renewable Energy

- **Involved subjects**
  Physics
- **Age Group**
  14-16 years
- **School**
  Grunnskolinn Borgarnesi, Iceland

We can use water to produce electricity. In this experiment we will use water to light a LED bulb. We are equipped with a small dynamo, which to start with was part of a bigger experiment. A small spring was dammed, which caused a lake to form. Water from the lake was directed to a propeller which powered the dynamo. We have the propellers and the dynamo, but we were unable to bring with us the spring, therefore we will use a water hose to power the dynamo.



Description of the experient:

http://tse1.mm.bing.net/th?&id=OIP.Ma354a11a03018ea20dec12babd349d22o0

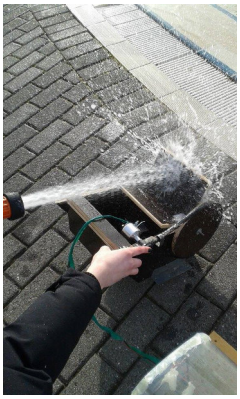
Material

- Dynamo
- Propeller
- A stand for the dynamo and propeller
- A lace between dynamo and propeller
- Electric cords
- LED bulbs
- Wooden box
- A wheel

Preparation:

Build a wooden box. Place the propeller in the box so it can easily turn and water is able to flow away. Put a wheel beside the propeller and a dynamo is also put in the box, put a lace between the wheel and the dynamo. Electric cords are connected between the dynamo and the LED light. Be careful to place the cords so no water has acess to it. Water is then directed on the propeller.

Experiment



The power from the water forces the wheel to turn, the wheel is attached to the dynamo with a lace which leads to the dynamo beeing powered also. The energy from the rotation is transformed to electricity in the dynamo which is connected to the LED

How does it work

The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law of induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. The motion of the wire within the magnetic field causes the field to push on the electrons in the metal, creating an electric

Key words:

- ELECTRICITY
- DYNAMO
- PROPELLER
- LED BULB
- ELECTON
- MAGNETIC FIELD
- FARADAY'S LAW OF INDUCTION

Water eruption

EXPERIMENT

Grunnskolinn i Borgarnesi

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

6-14 years

- **School**

Grunnskólinn I Borgarnesi, Iceland

Description of the experiment:

Did you know that one kind of water can float on top of another? You can witness this by making a volcano and making it erupt under water.

Material

- a bowl of water
- a small bottle with a lid on
- ink or food colouring
- a pitcher

Experiment

1. Pour cold water in a clear bowl until 3/4 is full.
2. Fill the small bottle with hot water, add a few drops of ink or food colouring.
3. Put the lid on and shake the bottle well.
4. Put the bottle at the bottom of the bowl. Unscrew the lid.

How does it work?

Hot water is lighter than cold water. So when the lid comes of the hot water goes up. The hot water should stay at the top of the water bowl until it is as cold as the rest of the water. Then the colour should mix all around the water.

Step 1

Step 2

Step 3

Step 4

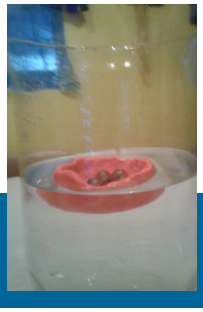
Key words:

COLD WATER

HOT WATER

FLOATING

Sink and Float



EXPERIMENT

Grunnskolinn i Borganesi

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

6-14 years

- **School**

Grunnskólinn í Borgarnesi, Iceland

Description of the experiment:

How can big and heavy things float, like ships, but really light things sink in water?

Material

- Clay
- Marbles
- Bowl of water

Experiment

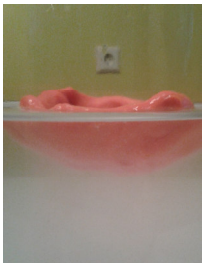
1. Put the marbles in the water. They should sink to the bottom. Put a ball of clay in the water.
2. The ball of clay also sinks to the bottom. Neither the ball of clay nor the marbles push a lot of water away from them. This means that there isn´t enough pressure from the water to make them float.
3. Take the marbles and the clay from the water. Make a boat from the clay.
4. Put the clay in the water again. And now it floats. The boat is bigger than the ball and it pushes a lot more water away from it. Now the boat gets enough pressure from the water to float.
5. Add the marbles to the boat. The boat sinks a little but should still float.

How does it work?

It all depends on how much water a thing pushes. Things that push a lot of water get a lot of pressure from the water, pushing upwards. This pressure helps things to float.

Step 1

Step 2



Step 3

Step 4

Key words:

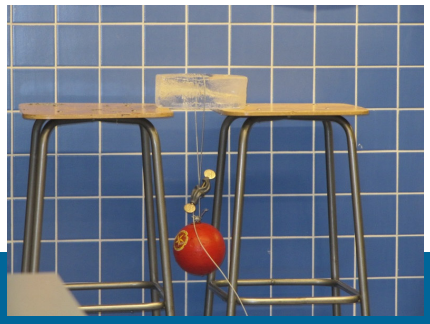
DENSITY

WEIGHT

FLOAT

SINK

Pressure and the phase of water



EXPERIMENT

Lauritsalan koulu

Involved subjects
Chemistry
Physics

Age Group
12-16 years

School
Lauritsalan koulu, Finland

Pressure changes the phase of water from solid to liquid

You can observe something similar when we skate on the ice. The pressure of the skate blade on the surface of the ice causes the ice to melt and that produces a thin layer of water between the solid ice and the edge of the skater's blade. The thin water layer freezes back to solid ice as soon as the blade has passed through.

Description of the experiment:

Material

- an one-litre carton or similar
- water
- freezer
- a wire
- a weight: we used a three-kilogram ball, but it was a bit too light

Preparation

A few days earlier fill the carton with water and seal it. Put it in the freezer.

Experiment

1. Wrap a wire around a piece of ice, preferably a big cube or a rectangle.
2. Tie up the weight at the loose ends of the wire.
3. Place the piece of ice on two stools so that that the weight can hang freely.
4. The pressure from the wire will melt the ice, but it will freeze again as soon as the wire has passed through.

How does it work?

The weight at the end of the wire will create pressure great enough to melt the ice underneath the wire. As the wire sinks into the ice, the water freezes again above the wire. This happens simply because there is less pressure on top of the wire.

Key words:

PHASE CHANGES OF WATER

PRESSURE

Lowering the Freezing Point

EXPERIMENT

Lauritsalan koulu

Involved subjects
Chemistry
Physics

Age group
12-16 years

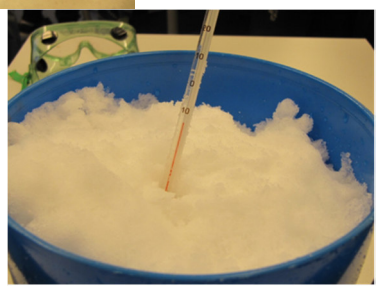
School
Lauritsalan koulu, Finland

Impurities lower the freezing point of water

Normally, we can observe how liquid water becomes solid i.e. freezes at 0 °C and the other way around, solid snow or ice becomes liquid at the same temperature. Impurities, however, can lower the freezing point. When we sprinkle salt (sodium chloride) on the roads during the winter it lowers the freezing point of water and in this way reduces the likelihood of water freezing to form slippery ice on the road. Sea water also freezes at a lower temperature (if at all) than freshwater in lakes.

Before salt

After salt



Description of the experiment

Material

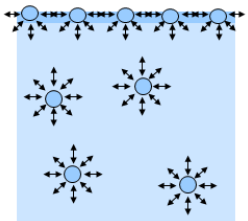
- a bowl or a small bucket
- ice / snow and water
- a thermometer
- salt

Experiment

1. Fill a bowl with either ice or snow and some water.
2. Measure the temperature.
3. Add some salt, a few teaspoons to start with, if nothing happens then add some more.
4. Measure the temperature again. In our case it was -12 °C.

How does it work?

Adding the salt lowers the temperature of ice / snow several degrees below zero. In other words, snow starts melting although the temperature is well under zero degrees Centigrade, because melting will take up energy and the loss of energy from the snow causes it to cool.



Key words:

PHASES OF WATER

FREEZING POINT

IMPURITIES

Erasmus+

Refraction of Light in Water

EXPERIMENT

Lauritsalan koulu

Involved subjects
Chemistry
Physics

Age Group
12-16 years

School
Lauritsalan koulu,
Finland

Water in a rounded bottle forms a convex lens.

You can use a water bottle as a magnifying glass or you can focus and intensify light from an external source with it, for example candlelight.

Historically, this was widely used by craftsmen who needed help with their fine work such as shoemakers, tailors and lace makers.

Description of the experiment

Material

- Water
- Bottomed flask

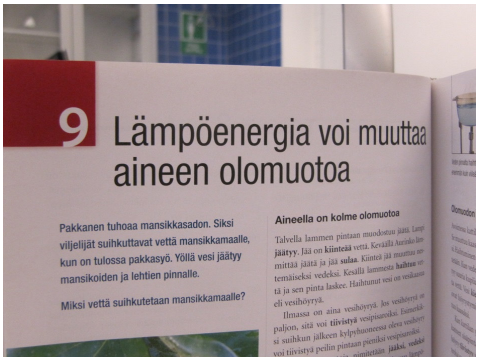
Experiment

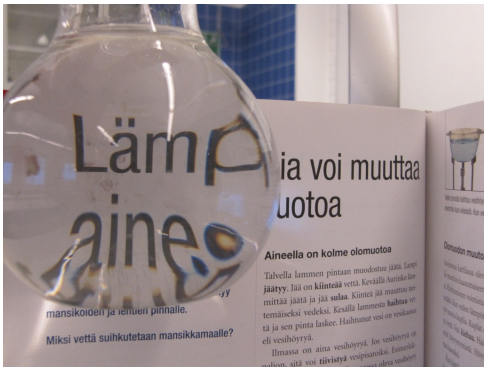
1. Fill a bottomed glass with water.
2. Hold the flask in front of a text and observe how the letters become bigger.

How does it work?

A round, spherical bottle filled with water works as magnifying glass because as light enters the water, it slows down and bends into a new path. Also, the rounded shape of the bottomed flask bends the light outwards. As the light spreads out, the text you see gets larger.

The bottomed flask forms a convex lens just like the one in a magnifying glass. The convex lens creates an enlarged image of a nearby object.





Key words:

DENSITY

REFRACTION OF LIGHT

WATER AS TRANSMISSION MEDIUM

Rainbow

EXPERIMENT

Rūjienas vidusskola

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

12-14 years

- **School**

Rujiena Secondary School, Latvia

Dispersion of Light

A beam of light goes through water and splits into the spectrum of white light. As a results a band of seven colours is formed which we know as a rainbow.

http://dziedava.lv/daba/izveleta_daba.php?ftips1=22

Material

- a bowl of water
- a mirror
- plasticine or sticky tack
- a torch (a device to produce a light beam)
- a sheet of white paper

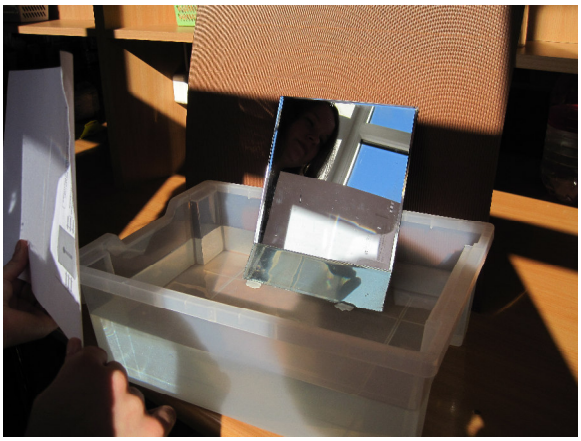
Description of the experiment:

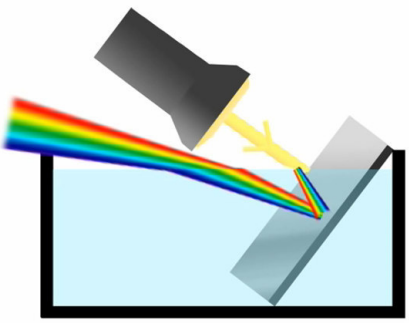
Experiment

- Fill up the bowl with water close to the rim.
- Fix the mirror with the sticky tack or plasticine at the bottom of the bowl in a slanting position.
- Move the light beam at the surface of water where it meets the mirror (you can move the bowl, too).
- The rainbow appears on the white paper sheet.

How does it work?

After rain the air is always full of water particles, and the rainbow appears as the reflection of the sun's light in these particles. The beams of the sun's light are broken entering each water particle, then they get reflected from the inner wall of each water particle, and they come outside again. That way the particles become visible in the eyes of an observer and people can see the sun beams according to their spectrum – they can see a band of seven colours forming the rainbow.





https://www.fizmix.lv/lat/eksperimenti/1_tema_eksperiments/3_liemna_sadala/

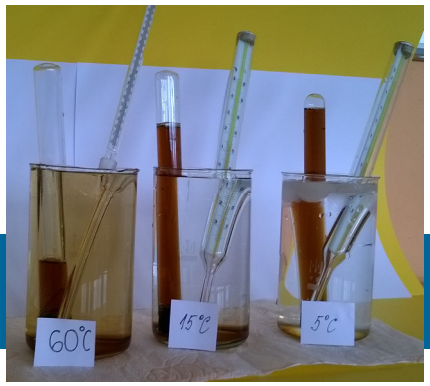
Key words:

SPECTRUM

DISPERSION OF LIGHT

REFLECTION OF LIGHT

Solubility of Gas in Water



EXPERIMENT

Rūjienas vidusskola

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

12-14 years

- **School**

Rujiena Secondary School, Latvia

Water as Solvent

Water is one of the best solvents, both gaseous and solid substances can dissolve in water. In the oceans and seas various dissolved salts can be found.

In water oxygen dissolves which ensures the breathing process of organisms living in water.

In the summer when the weather is really hot, the fish may suffer from lack of oxygen in the water because its solubility has decreased.

When opening a cold bottle of drink in a warm room, very often you can observe a very fast release of carbon dioxide which happens because of decrease of gas solubility in high temperature.

Description of the experiment:

Experiment

- Pour water in 3 beakers with different temperature (hot, room temperature, ice cold).

- Carefully pour the carbonated drink (e.g. Coca-cola) in the 3 test tubes.

- Cover the test tubes with a plug which has got a hole in it.

- Insert all the test tubes simultaneously in an upside down position into the beakers.

- You can observe the release of carbon dioxide and the reduction of the level of the drink in the test tubes.

Material

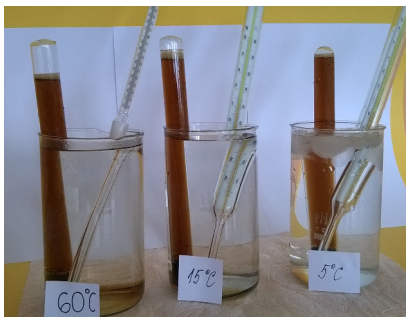
- 3 beakers 500ml
- a thermometer
- 3 test tubes
- 3 plugs with a hole (corks)
- carbonated drink (e.g. Coca-cola)

How does it work?

The solubility of gases in water in different temperatures is different. The experiment shows that the solubility of gases decreases with an increase of water temperature. In the test tube with the highest temperature the carbon dioxide was released the fastest, the gas rose up to the upper part of the test tube and quickly pushed the drink out of the tube. In the test tube with the lowest temperature (with ice), the release of gas (decrease of solubility) was very slow.
So, the higher the temperature of water, the solubility of gases is on the decrease.

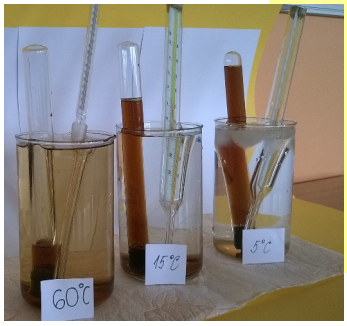
Key words:

- SOLUBILITY
- SOLVENT
- DEPENDANCE OF SOLUBILITY ON TEMPERATURE



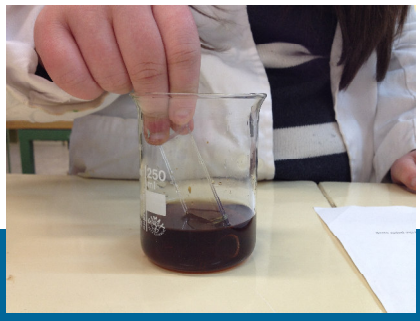
After 2 minutes

After 5 minutes



After 20 minutes

Capillarity 1 "Water rising"



EXPERIMENT

IES La Granja

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

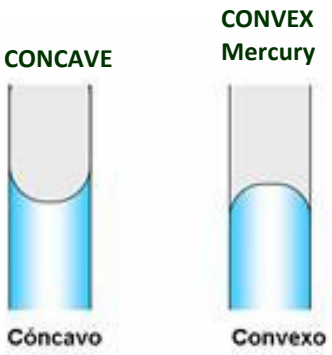
12-14 years

- **School**

IES La Granja, Spain

Capillarity makes water go up against the gravity force

Capillary action is the ability of a liquid to flow in narrow spaces without the assistance of, and in opposition to, external forces like gravity.



Description of the experiment:

Material

- a microscope slide
- three elastic bands
- a glass.
- Dyed water

Preparation

- Fill the glass with the dyed water.
- Put the elastic bands around two microscope slides.
- One of the elastic bands must be between the two small slides.

Experiment

1. Put the slides in colored water.
2. Observe the water rises slightly against the gravity force.

How does it work?

It occurs because of intermolecular forces between the liquid and surrounding solid surfaces. If the diameter of the tube is sufficiently small, then the combination of surface tension (which is caused by cohesion within the liquid) and adhesive forces between the liquid and container act to lift the liquid.

Key words:

CAPILLARITY ACTION

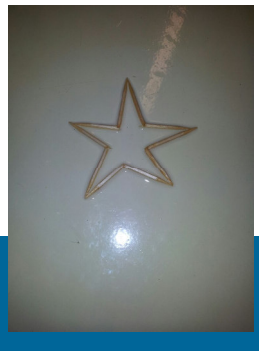
ADHESIVE FORCES

COHESIVE FORCES

GRAVITY FORCE

Water

Capillarity 2 “The star”



EXPERIMENT

IES La Granja

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

12-14 years

- **School**

IES La Granja, Spain

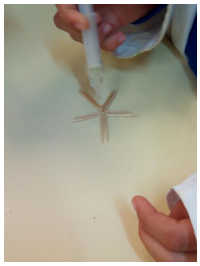
Capillarity can move or make the plants grow

Capillarity is a property of liquids (that depends on their surface tension which depends on their cohesion or intermolecular force of the liquids) which gives them the capacity of going up or down a capillary tube.

Step 1

Step 2

Step 3



Step 4

Description of the experiment:

Material

- 5 toothpicks
- a plate
- some water (can be a syringe with some water)

Preparation

- Bend the toothpicks and place them on the plate so that they look like a star.

- Drop a little water right in the middle of the toothpicks

Experiment

Capillarity makes the wood absorb the water and expand into a star. The water moves from the fracture to the ends of the toothpicks. The wood swells in contact with the water and expands.

How does it work?

In short the capillarity action is due to the pressure of cohesion and adhesion which cause the liquid to work against gravity

The smaller the width of a capillary, the greater the effect of capillarity.

Key words:

CAPILLARITY ACTION

CAPILLARY TUBE

WATER GOES UP

INTERMOLECULAR FORCE

Capillarity 3 “The flower”

EXPERIMENT

IES La Granja

- **Involved subjects**

Natural Sciences, Chemistry Physics, Biology

- **Age Group**

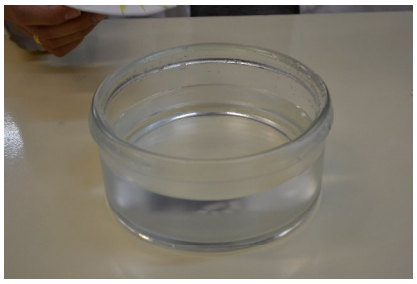
12-14 years

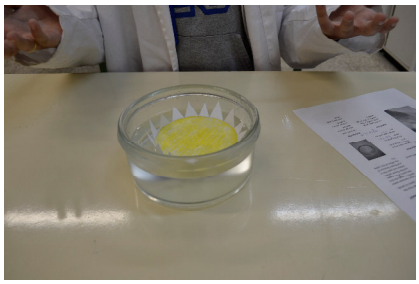
- **School**

IES La Granja, Spain

Capillarity as the key of the opening flowers

Capillarity is the property of a substance to adsorb another. It happens when the adhesive intermolecular forces between the liquid and the solid are bigger than the intermolecular cohesive forces of the liquid.





Description of the experiment:

Material

- a sheet of paper
- colour pencils
- a pair of scissors
- a bowl (with water)

Preparation

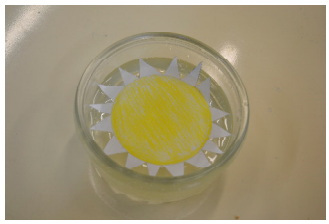
- Cut the sheet into a flower shape and colour it.
- Bend the petals inwards.
- Fill the bowl with water

Experiment

Put he flower on the water carefully . The petal must be looking upwards

How does it work?

You can see how the flower opens its petals.



It occurs because water enters through the broken parts of the paper, and the flower petals ínflate and open like a real flower because of the effect of the capilarity.

Key words:

CAPILLARY TUBE

INTERMOLECULAR ADHESIVE FORCE

INTERMOLECULAR COHESIVE FORCE

INTERMOLECULAR FORCE

Is water transparent?

EXPERIMENT

Balthasar—Neumann Mittelschule

Involved subjects

Chemistry
Physics

Age Group

11-16 years

School

Balthasar-Neumann Mittelschule Werneck, Germany

Phenomenon

What you see...

Look at a glass of water that has a spoon or straw in it.

It seems that the spoon is broken.

Description of the experiment:

What you do...

Material

- glass cube
- torch
- paper
- book

Experiment

Fill a glass cube open on top with water and place it on a thick book (for convenience).
If possible darken the room.
Ask a partner to keep a piece of paper in a small distance on one side of the cube.

1.Take a torch and let it shine straight through the water. Where does the light hit the paper?

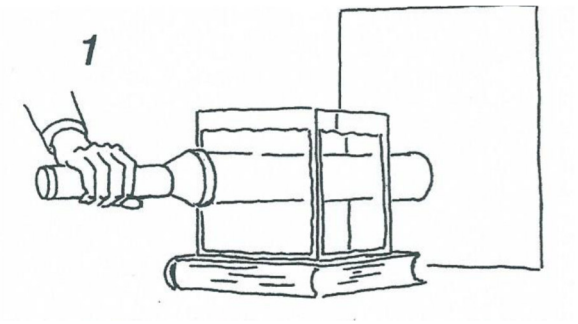
2. Now let the light get from different ankles through the water. Where does the light hit the paper now?

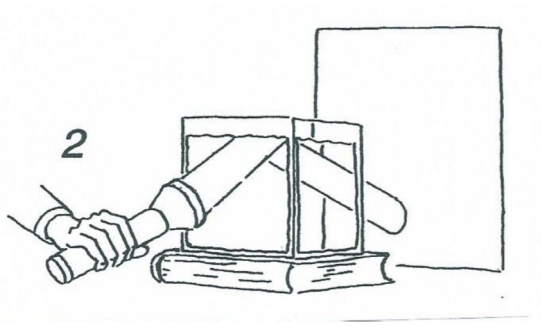
Explanation

What is happening...

When the beam of light passes the air into a denser medium like water this beam is broken.

The wider the ankle of incidence the stronger is the breaking of light.





Key words:

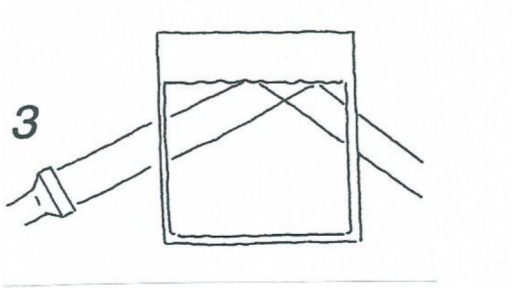
REFRACTION

MEDIUM

BEAM OF LIGHT

ANKLE OF INCIDENCE

DENSITY



Erasmus+

Does water have a skin?

EXPERIMENT

Balthasar-Neumann Mittelschule

- **Involved subjects**

Natural Sciences, Chemistry, Physics

- **Age Group**

11—16 years

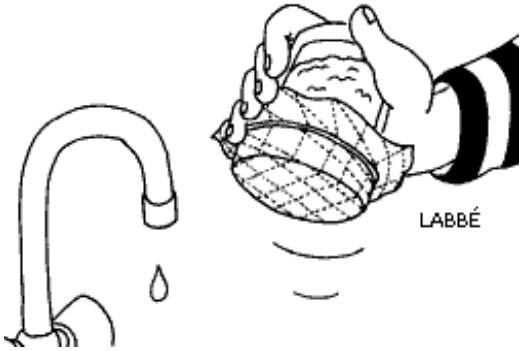
- **School**

Balthasar-Neumann Mittelschule Werneck Germany

Phenomenon What you see...

Watch the falling raindrops or water drops hanging at the water tap. The smallest drops are shaped as round as a ball.

The water surface is strongly held together by the surface tension. Water seems to have a thin elastic film.



Description of the experiment

What you do....

Material

- **drinking glas**
- **dish towel**
- **gums**

Experiment

1. Fill a glass with water. Then take a dish towel and cover the glass.

2. Hold the towel really tight or fix it with a rubber band.

3. Now turn the glass quickly upside down.

4. Does the towel leak?

Explanation

What is happening...

The towel is made of fabric with tiny holes .

The surface tension works like a film preventing the water running through the holes.

That's how an umbrella works

Key words:

SURFACE TENSION

SHAPE

COHESION

MOLECULES

Erasmus+

„The magic egg“

EXPERIMENT

Balthasar—Neumann Mittelschule

Involved subjects

Chemistry
Physics

Age Group

11-16 years

School

Balthasar-Neumann Mittelschule Werneck, Germany

Phenomenon

What you see...

Some solid things swim on the surface of water and some sink down. It depends on their density compared to the water's.

The same goes for liquids: oil floats on the sea after a shipwreck.

But you can also stack up other liquids and build some layers in a glass, e.g. to have a colourful drink in a bar or café . Do you like Latte Macchiato?

Description of the experiment:

What you do...

Material

- **2 glass mugs**
- **Salt**
- **2 raw eggs**
- **Tea spoon**
- **Spoon**

Experiment

Try to make an egg swim in a glass of water and it will sink to the ground.

Now solve a lot of salt in a second glass half full with water and put in the egg. It will swim. Then take the egg out again.

Pour tap water over the back of a spoon very slowly into the saltwater so that the water doesn't mix. Put the egg carefully back into the glass. It will sink down until it floats on the saltwa-ter surface.

Explanation

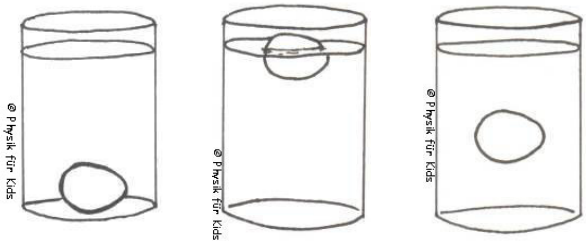
What is happening...

Different liquids all have different densities and that means one is heavier than the other.

If the liquids don't mix

you can see which is the heavier or lighter one.

The tap water is lighter than the saltwater.



Key words:

SWIM

SINK

SOLVE

DENSITIY

HEAVY

LIGHT

Conclusion

Most of the described experiments were performed by students during the learning activity meetings in Finland and Latvia again. All with huge success. The national student teams brought the necessary material along or asked the hosting countries to have it at hand. As a matter of fact, the students from Iceland brought a quite bulky custom made device to Latvia in order to prove that the power of water can be used to create electricity.

All indoor experiments were supported by powerpoint slides and documented on photos and videofilm. Usage of English and understandability of the given explanations were effective. However, students in higher grades and of more advanced schools performed significantly better explaining their experiments to the audience. Nevertheless all groups did their job and fulfilled their tasks.
It was also very interesting for the teachers to see how colleagues from different countries initiate and supervise the experiments, interact with the students and sum up the results.

Besides the mere didactic and scientific input/output, all involved students improved their social skills, their command of English and their self esteem by working for this booklet. Computer skills, layout, photo and video documentation were needed too.

To collect all experiments, harmonize the layouts, fonts, pictures etc. was quite a challenge. None of the executing and editing teachers for the booklet was a media-, layout- or print professional. Use of different formats, computer systems and know how turned out to be a major problem, we did not think of in the beginning at all – or did not foresee with the necessary precaution. Accordingly this small booklet – the result of all our work - was quite some work. After all, it was definitely worth the effort and will pay off in the future when used in classrooms across Europe.

If you find scientific mistakes, want to comment any given experiment or like to add your own experiment to a future booklet, please feel free to contact us on our website:

www.our-comenius.net

Educational Units

Water Around Us

A selection of Educational Units
made by teachers and students of the schools
Grunnskolinn í Borgarnesi, from Borgarnes, Iceland;
Lauritsalan koulu, from Lappeenranta, Finland;
Rujienas vidusskola, from Rujiena, Latvia;
Balthasar-Neumann-Mittelschule, from Werneck, Germany;
Mittelschule Holderhecke, from Bergrheinfeld, Germany
Agrupamento de Escolas, from Valongo, Portugal and
IES La Granja, from Jerez de la Frontera, Spain.

Erasmus+
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