
TOPIC: Water cycle and the energy of water



SUBJECT: NATURAL SCIENCES – BIOLOGY-
CHEMISTRY-PHYSICS (The lesson can be held by the
chemistry, physics and biology teachers together)

LEVEL/AGE: Secondary school/14-15 years old

FOREKNOWLEDGE: Solubility, mole mass, chemical
bonds, number of moles, density, speed, power,
energy

LENGTH: 6 PAGES (DURATION: 50 MINUTES)

LEARNING OUTCOMES

At the end of the lesson, the students should know:

- The process of the water cycle in nature
- The role of water in the life of living organisms
- The definition and calculation formulae of
speed, power and mechanical energy
- The practical application of the formulae
- The international units of measurement of the
physical quantities studied



RESOURCES

The periodic table, video
projector, computers or
students' phone, [Pond5](#)
[free video library](#)

TEACHING METHODS

Problematization

Discussion

Instructional video

Feedback, evaluation

Illustrations

ACTIVITIES

INTRODUCTION (5 minutes)

Start with short brainstorming and making a mind map about the things we have previously learnt about water during chemistry, biology and physics lessons. (It can be held by the three teachers together).

THEORY PART (15 minutes)

Based on the keywords written in the mind map, we remind students of the main aspects of the theory connected to water and its biological and chemical characteristics and energy (frontal work, questions - answers).

BIOLOGY

The role of water in the life of living organisms:

- It is the main component of cells and is present as an internal environment, making up a significant percentage of the living organism's body and the processes necessary for life functions.
- It is one of the basic materials for photosynthesis in plants.
- It is the living space for some organisms (fish, algae, etc.)

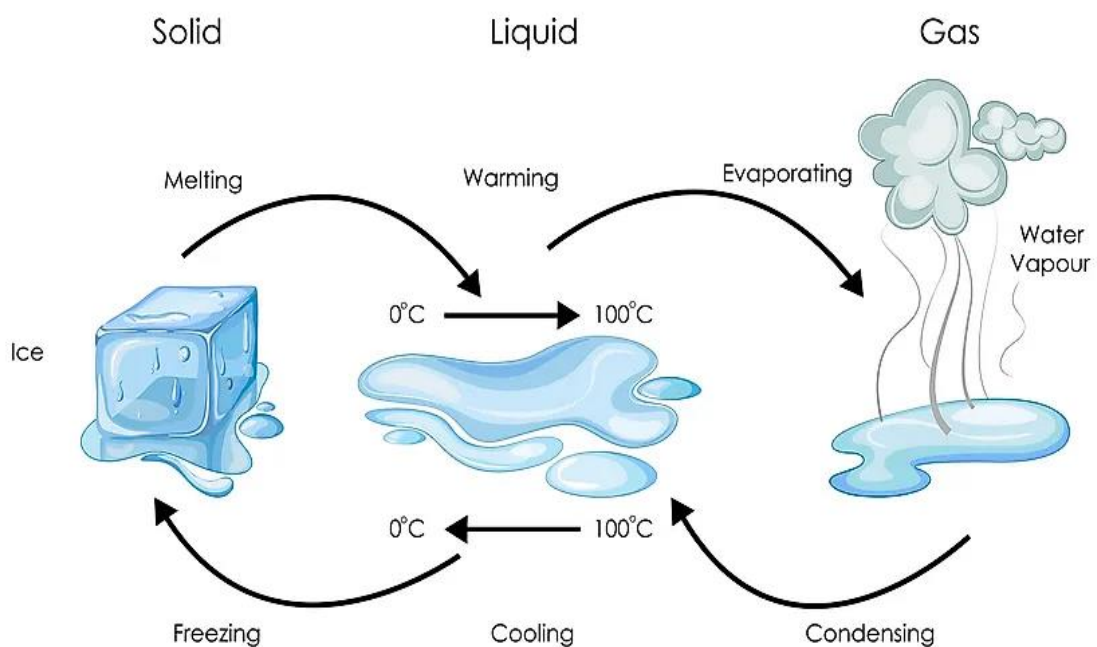
CHEMISTRY

Water in nature: based on the picture shown below, we sum up the chemical characteristics of water:

- Water is one of the most important conditions for life.
- It is essential for plants, animals and humans.
- It is found everywhere in our environment, above and below the surface, be it rivers, sea, air, soil or rocks.
- It is a substance that occurs naturally in liquid, solid and gaseous forms.
- It is in constant circulation in our environment.

- Water evaporating from the surface is released into the atmosphere, where part of it is transformed into clouds and then falls back to the surface in the form of precipitation.
- Water in nature, oceans and fresh water, water in the human organism.
- Water is a good solvent: it is also known as a "universal solvent" due to its ability to dissolve a wide range of substances, but there are some substances (such as oils) that do not dissolve well in water.

Change of State



Correlations:

1. 1 mole = M (g)
2. 1 kmole = M (kg)

3.
$$n = \frac{m}{M}$$

where: n – the number of moles
 m – substance mass
 M – molar mass

PHYSICS

Practical uses of the water power:

- The performance of water-using devices in relation to the mechanical work performed and the time needed.
- Flowing water's kinetic energy is derived from its speed and its potential energy from its distance from the earth's surface, which is generated during its fall.
- Speed calculation formula: $v = d/t$
- Performance calculation formula: $P = L/t$
- Kinetic energy formula: $E_m = m \cdot v^2/2$
- Potential energy formula: $E_h = m \cdot g \cdot h$

HANDS-ON PART (5 minutes)

Group work (divide students into groups of 3): Ask students to find a video about the water cycle using the [Pond5 free video library](#) (they may use school computers or their phones) and explain and discuss what happens in their groups.

EXERCISE PART (20 minutes)

1. Find the odd one out! Which of the plants and animals listed do not live in water? Sedge, reed, carp, trout, spring crocus, pond snail, squid, serpent-lizard, seaweed, mussel, fir, pike (Answer: spring crocus, serpent-lizard, fir).

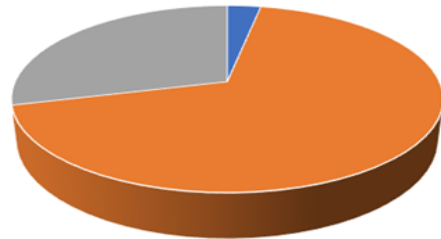
2. Determine the verity of the following statements, and if you find them incorrect, modify them partially to make them true.

- 70% of blood plasma is water. (False, 90%)
- Plants evaporate water through gas channels. (True)
- Amphibians reproduce in water. (True)
- Oxygen produced during photosynthesis derives from carbon dioxide. (False, from water)

3. Group the listed substances according to their solubility in water: sodium hydroxide, potassium permanganate, cooking oil, sodium chloride, calcium carbonate, iodine, potassium chloride, iron, hornwax, copper sulphate.

4. Place the letter of each concept in the corresponding slice of the circle diagram so that it represents the frequency of its occurrence on Earth.

- a) Salty water
- b) Mainland
- c) Freshwater



5. Quick Deer, while swimming in a river, completed the 2.817 km distance in 12 minutes. What was his average speed? Give the result in m/s, km/h and m/min.

6. The human heart does an average of 1 J of work per contraction. What is the work done at an average heart rate of 72 (heart rate is the number of contractions in 1 minute)?

7. A raven tries to crack a nut on a 4 m high branch of a tree but drops it. The weight of the nut is 20 g. What was the potential energy of the nut at the time of dropping?

SYNTHESIS/SUMMARY (5 minutes)

We use a big A1 paper poster, on which we have written the text below. We ask the students to fill in the blanks with the words written on paper strips. They have to pin them onto the poster.

Terms used: river, trout, carp, rocky, sandy, high, low, brooklet, under surface, evaporation, rivers, liquid, living organisms, solid, condenses, potential, kinetic, velocity, Joule.

The Olt is a The upper section of the river is called the plain and the lower section is called the plain. In the upper section, the bottom is and the oxygen concentration of the water is; in the lower flow zone, the bottom is and the oxygen concentration is.....

In nature, water is in a constant cycle. The initial phase of the cycle is The water of rivers, lakes and seas is constantly evaporating, but it is also evaporating in Then the light vapour rises, in high altitudes forming clouds. Precipitation falls from the clouds, which can be (rain) or (snow, ice). The falling raindrops are both absorbed by the earth and used by living organisms in their life processes. The water that seeps into the soil and into the depths, flows into the and accumulates. The water that flows below the surface, emerges to the surface again as finally, the small, then swells into and flows into the sea, while its water continues to evaporate.

Water in motion has and energy. If running water flows into a waterfall, it even has energy. Energy types, like mechanical work, are measured in

BIBLIOGRAPHY & RESOURCES

- Pond5 - Stock video & Royalty-Free Music. <https://www.pond5.com/>
- Collection of physics exercises -OFI
- Chemistry students' book, Intuitext Publishing House, Bukarest 2019
- Chemistry workbook, Mozaik Publishing House, Szeged 2016