# WHAT IS THE OCEAN ACIDIFICATION ?

Biology | Mother Language | Chemistry

MED EDUC

Erasmus+

CLIMATE CHANGE

## PEDAGOGIC CONTENT:

- Acidity and pH meaning
- CO2 emissions
- Ocean acidification impacts
- Marine species conditions
- Food chain modifications

## PRE-REQUISITES:

Knowledge about climate change and pH concepts (O1 draft)

## NEW COMPETENCIES TARGETED/LEARNING OUTCOMES:

**STUDENTS WILL BE ABLE TO:**

- Carry out a scientific protocol (hypothesis, experiment, observation)
- Relate the experiments carried out with the functioning of the ocean acidification
- Understand how CO2 emissions have an impact on the ocean and its marine species

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## DESCRIPTION:

**PREPARATION**

Ensure students have protective gowns.

**IMPLEMENTATION**

#1:The teacher introduces the topic and asks to the students what «ocean acidification» is and which consequences on the marine environment is it responsible for.

#2: According to the answers, the teacher explains to the students the meaning of acidity (which is due to the presence of H + ions) and pH (chemical measurement used to assess the concentration of hydrogen). The teacher precise the values of acidic and basic solutions and the sea pH (8.2). The purpose of this step is to make sure that the students have all the necessary tools to understand the rest of the activity.

#3: The teacher asks to the students if they know why ocean pH is decreasing. After students debate, he/she explains them the principal cause of oceans acidification: CO2 releases into the atmosphere, which has become more important since the industrial revolution (1850). About 25-30% of the CO2 in the atmosphere is absorbed by the ocean.

#4: The teacher divides students in 2-scholars groups

#5: The students begin the first experimental activity, which goal is to highlight the CO2 absorption by water, following the instructions below:

*"Put lime water into a container and then use a straw to blow into the lime water."*

#6: The teacher lets the students debate about what they observe, trying to explain the observed phenomenon (a white precipitate (CaCO3) appears, highlighting the CO2 formation).

#7:The students begin the second experimental activity, which goal is to demonstrate pH reduction, and therefore the environment acidification, because of the CO2, following the instructions below:

*"Put water into a container and then immerge the pH probe into it. Note the value displayed on the pH meter. Place the straw in the container and blow to introduce CO2 into the water. Observe the value displayed on the pH meter throughout the exhalation."*

#8: The teacher lets the students debate about what they observe, trying to explain the observed phenomenon (the higher the CO2 concentration is, the more pH value decreases during the experiment) which shows the water acidity due to CO2 increases.

DESCRIPTION:

**IMPLEMENTATION**

#9: The students begin the third experimental activity, which goal is to highlight the acidity impacts on corals and shelled species development, following the instructions below: *"Take a container, put some water in and a few drops of hydrochloric acid (or vinegar). Then put a mollusk shell into the container (or another invertebrate such as mussels, oysters, snails etc.). Wait 10 minutes to observe the first results".*

#10: The teacher lets the students debate about what they observe, trying to explain the observed phenomenon: shells are considerably attacked by the acid.

#11: The teacher asks to the students the following questions :

1 – What does ocean acidification mean for you ?

2 – Do you think it has positive or negative impacts ?

3 – Which are these impacts ?

#12:The teacher debate with students about the consequences of the ocean acidification on marine species. For example, crustaceans have difficulties to shell, impacting the food chain, and corals are directly affected by this acidification.

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| Type of activity | | Experimental activity |
| Target audience | | From 14 years old |
| Place | | Lab room, classroom |
| Material needed | | *Experimental activity 1* : container, limewater, straws<br>*Experimental activity 2* : container, water, pH meter, straws<br>*Experimental activity 3* : container, snail or mussel or oyster shell, hydrochloric acid (or vinegar), water |
| Duration of activity | | Implementation : 2-3 hours |
| Authorship | | CPIE Bastia U Marinu<br>No authorization required |
| Links | | Acidification information: https://fr.oceancampus.eu/cours/Ajw/acidification-des-oceans; http://lemonsea.org/<br>Experimental activities : https://sites.google.com/site/acidificationdesoceans/les-experiences |
| Notes by author | | None |