Sequence n° 3: acid base reactions

Fiche de synthèse mobilisée (collection en français) :

- Fiche n°3 : acides, bases et réactions chimiques

Sommaire des activités ETLV :

ACTIVITY 1 : pH of sea water

Objective: understanding the problems due to ocean acidification

Part 1: Introduction

DOCUMENT 1: Acidification

http://www.youtube.com/watch?v=-3TF9qkQ8R4

Source: Plymouth Marine Laboratory

Watch video « Acidification »: from 0s-**57s**

Question 1: What is the main idea?

_____

Question 2: Which problems are linked to oceans?

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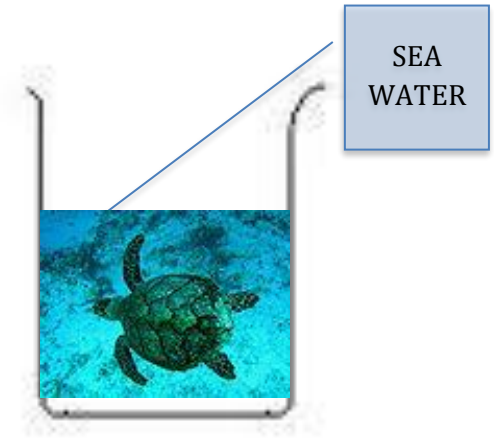
Part 2: pH of sea water

Experiment: *Sea water in a beaker*



Question 3: Which value do you expect? Why do you think this value is different from 7?

pH = _____

Sources : http://commons.wikimedia.org/wiki/File:Tortue_imbriqueeld4.jpg
Et
http://commons.wikimedia.org/wiki/File:PH_indicator_paper_roll.jpg?uselang=fr

Part 3: Composition of sea water

Question 4: Among the listed ions present in sea water, circle the ones involved in an acid/base couple.
Composition of sea water

Anions	mol/kg water	Cations	mol/kg water
chloride ion (Cl^-)	0,54586	sodium ion (Na^+)	0,46906
Sulfate ion (SO_4^{2-})	0,02824	magnesium ion (Mg^{2+})	0,05282
hydrogen carbonate ion (HCO_3^-)	0,00177	calcium ion (Ca^{2+})	0,01028
bromide ion (Br^-)	0,00084	potassium ion (K^+)	0,01021
carbonate ion (CO_3^{2-})	0,00026	strontium ion (Sr^{2+})	0,00009
hydroxyde ion (HO^-)	0,00001		

Reference : Encyclopaedia Universalis

Question 5: Circle the acid base couples involved

Pairs	Pairs
Acetic acid / acetate ion	CH_3COOH / CH_3COO^-
Water / hydroxyde ion	H_2O / HO^-
Hydrogen carbonate ion / carbonate ion	HCO_3^- / CO_3^{2-}
Hydrogen phosphate ion / phosphate ion	HPO_4^{2-} / PO_4^{3-}
carbonic acid / hydrogen carbonate ion	H_2CO_3 / HCO_3^-

ACTIVITY 2 : Ocean acidification

Objective: understanding the reasons to ocean acidification

Part 1: pH drop

Video « Acidification »: start at 2min29s-3min15s

Question 6: Choose a reason for acidification

pH decreased because there has been an increase in

a) concentration of sodium chloride Na^+,Cl^-
b) $CO_{2(aq)}$ dissolved
c) Concentration of hydroxyde ion

Question 7: Number the sequence

Order	Sentence
	Since the concentration $[H_3O^+]$ rises, pH of sea water decreases
	Carbon dioxyde reacts on water: $CO_{2\,(aq)} + H_20_{(l)} = H_2CO_{3\,(aq)}$
	There has been a 0.1 pH decrease in the past 200 years
	Carbon acid reacts on water: $H_2CO_{3\,(aq)} + H_20_{(l)} = HCO_3^-{}_{(aq)} + H_3O^+$

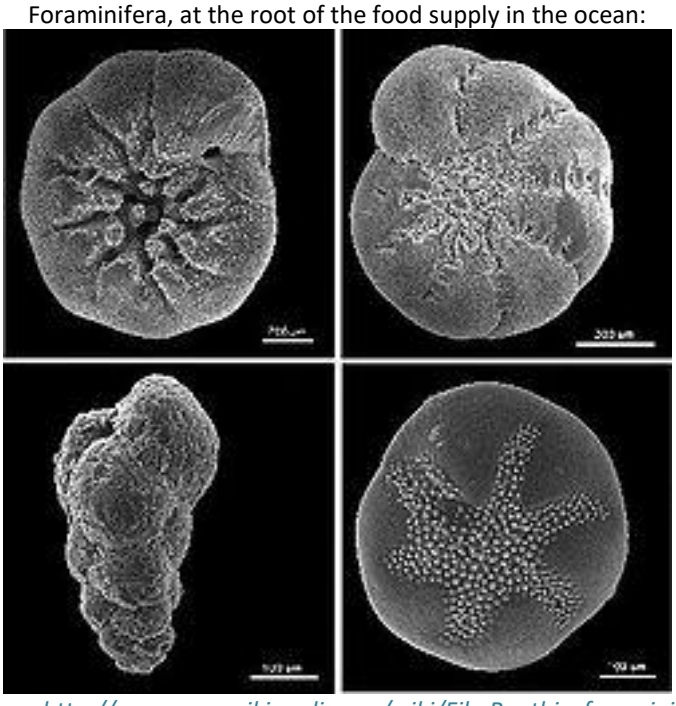
Part 2: Consequence on marine life

Video « Acidification »: start at 4min10s - 5min15s

Question 8: Which living organisms are affected by the change in pH? Link with arrows:

Species	Consequence
foraminifera	lack of food
coral reef	diminition of shell thickness by 30%
whales, dolphins, pinguins	disappearance

Foraminifera, at the root of the food supply in the ocean:



Référence : http://commons.wikimedia.org/wiki/File:Benthic_foraminifera.jpg

Question 9: The shell of foraminifera is composed of calcium carbonate $CaCO_{3(s)}$. In the presence of H_3O^+ (due to the acidity of sea water), this shell dissolves and carbon dioxyde is released. Complete the equation below:

$$CaCO_{3(s)} + \_\_\ H_3O^+_{(aq)} = CO_{2(g)} + \_\_\ \_\_\_\_\_(\ \ ) + \_\_\ \_\_\_\_\_(\ \ )$$

Activity summary

What you must remember:

- **pH of sea water**
- **ocean acidification**
- **shells**
- **carbon dioxide**
- **calcium carbonate**

Skills linked to the curriculum:

Compétences	Capacités à maîtriser	Où dans cette séquence ?
APP	Utiliser du vocabulaire spécifique	Activités 1 et 2
	Lire et comprendre des documents scientifiques	Activités 1 et 2
ANA	Mettre en lien des documents pour émettre des hypothèses en réponse à une question scientifique	Activités 1 et 2
COM	S'exprimer à l'écrit en utilisant le vocabulaire adapté	Activités 1 et 2