Te Kura
Te Aho o Te Kura Pounamu
THE CORRESPONDENCE SCHOOL

CHEMISTRY CHO3031Y1A
TOPIC RESOURCE INFORMATION

ACHIEVEMENT STANDARD 91389 (VERSION 2) CHEMISTRY 3.3
Demonstrate understanding of the chemical processes in the world around us
Level 3, Internal assessment
3 credits

A. OCEAN ACIDIFICATION

Achievement	Achievement with Merit	Achievement with Excellence
The student submits a report that: • Describes the historical context of ocean acidification. • Identifies, describes or gives an account of the chemical processes involved in the acidification of the oceans with dissolved CO_2. • This includes chemical equations for the reactions occurring. • Describes the effect of increased CO_2 on the different equilibria. • Writes K_a expressions for each of the weak acids involved. • Describes the effect of dissolved CO_2 on marine life. • Is supported by the use of typical chemistry vocabulary, symbols, conventions and equations. You should have at least three equations supporting your discussion.	The student submits a report that: • Explains the historical context of ocean acidification. • Explains the links between the chemical processes involved in dissolved CO_2 and pH. • This includes using chemical equations and equilibrium principles to show the links between CO_2 and pH. • Identifies and explains the links between increasing CO_2, pH and the impact on carbonate-based marine life. • This includes chemical principles involved in the formation of marine skeletons. • Has explanations integrate chemistry vocabulary, symbols, conventions and equations.	The student submits a report that: • Comprehensively explains the historical context of ocean acidification and links to the carbon cycle. • Has a comprehensive review of the equilibrium principles that link dissolved CO_2 to pH. • AND the how this affects the chemical processes of marine skeletons. • Elaborates on the consequences of environmental change on the chemical processes involved in this marine ecosystem. • Has consistent integration of chemistry vocabulary, symbols, conventions and equations.

ASSESSMENT TIPS

To achieve this standard, you need to present your report **in your own words** and **show your understanding of level 3 chemistry**.

TIP 1

If you have difficulty in transforming the text given in the links into your own words, then it is useful to ask yourself questions, such as those listed below. You can get friend or family member to ask you the questions and then record your answers. Transcribe your answers and then weave them into your report.

Please note that these questions are only **some** of the questions you could ask yourself, so don't limit your report to these only!

Background

1. What recent development is causing the oceans to become less basic?
2. Why is increasing acidity of oceans a problem?
3. Is this problem the same across all oceans?

Chemistry: How oceans are becoming more acidic

1. Can I explain terms like 'pH', 'weak acid', 'conjugate acid and base', 'equilibrium', 'K_a', 'Le Chatelier's principle' and 'solubility equilibrium'?
2. Can I write equations and K_s expressions for the solubility calcium carbonate and Ka expressions for all the weak acids involved?
3. Have I written my equations using correct chemical language (e.g. using subscripts)
4. Can I use Le Chatelier's principle to explain the effect of increasing CO2 on all the different equilibria?
5. Can I use ionic product (I.P. or Q)?
6. Have I drawn my own molecules and not just copied and pasted pictures from the internet?
7. What effect does temperature have on the solubility of CO2?
8. Do different polymorphs of calcium carbonate dissolve at the same rate?

Advantages and disadvantages

1. Can I describe at least two issues associated with ocean acidification?
2. Can I explain some of the interventions that are carried out to minimise harm?

TIP 2

When you read through the links or watch the videos given on *My Te Kura* or in the task, make notes using key words or phrases in your log book, CHO3031A. When you write your report, use these key words rather than the text given in the links.

TOPIC RESOURCES
OCEAN ACIDIFICATION

Your first source is the modules you should have completed – CHO3001, CHO3061, CHO3062.

EXTRA SOURCES FOR MORE DETAIL

GENERAL OVERVIEW

1. www.sciencelearn.org.nz/resources/1862-the-ocean-co-and-climate-change-timeline
2. www.sciencelearn.org.nz/videos/221-increasing-atmospheric-carbon-dioxide
3. www.sciencelearn.org.nz/resources/684-carbon-dioxide-in-the-atmosphere
4. www.sciencelearn.org.nz/resources/682-carbon-dioxide-in-the-ocean
5. www.sciencelearn.org.nz/resources/2231-carbon-dioxide-and-climate
6. www.sciencelearn.org.nz/videos/30-ocean-acidification
7. www.sciencelearn.org.nz/resources/689-the-ocean-and-the-carbon-cycle
8. www.sciencelearn.org.nz/resources/688-ocean-dissolved-gases
9. www.sciencelearn.org.nz/resources/2280-temperature-salinity-and-water-density

CHEMISTRY OF OCEAN ACIDIFICATION (THIS SHOULD BE YOUR KEY FOCUS)

10. www.whoi.edu/home/oceanus_images/ries/calcification.html Requires Flash
11. www.compoundchem.com/2016/06/30/ocean-acidification/ Good summary
12. www.youtube.com/watch?v=ObiJIuRYr3g Good but see comment below about equations!
13. www.youtube.com/watch?v=GYPX24RUF30 Long, but great chemistry. Just be careful of the equations – don't use = instead of arrows, use correct subscripts and superscripts and write each equation separately instead of joined together.
14. www.carboeurope.org/education/CS_Materials/CO2solubility.pdf
15. http://butane.chem.uiuc.edu/pshapley/GenChem1/L25/web-L25.pdf VERY GOOD
16. Also look at the 2012 Chemistry scholarship paper

ISSUES AROUND OCEAN ACIDIFICATION

17. www.sciencelearn.org.nz/resources/682-carbon-dioxide-in-the-ocean
18. www.youtube.com/watch?v=evfgbVjb688 Long but gives a good discussion
19. www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F
20. www.compoundchem.com/2016/06/30/ocean-acidification/

OTHER POSSIBLE SOLUTIONS

21. https://blog.nationalgeographic.org/2012/10/18/iron-fertilization-savior-to-climate-change-or-ocean-dumping/
22. https://phys.org/news/2016-03-seeding-iron-pacific-carbon-air.html
23. www.nsf.gov/news/news_summ.jsp?cntn_id=130129

Additional sources may be used and must be quoted (full web link) in the bibliography to verify the source.