Te Kura
Te Aho o Te Kura Pounamu
THE CORRESPONDENCE SCHOOL

CHEMISTRY CHO3031Y1D
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

D. CHLORINATION OF WATER SUPPLIES

Achievement	Achievement with Merit	Achievement with Excellence
The student submits a report that: • States the reasons why many cities chlorinate their water supplies. • Describes how disinfectants work. • Explains pH and describes how chlorination affects the pH of water. • Explains the reaction of chlorine with water using oxidation-reduction principles. • Describes issues arising due to chlorination of water supplies, including those that happened at Flint. • Is supported by the use of typical chemistry vocabulary, symbols, conventions and equations. • Shows understanding of Level 3 chemistry.	The student submits a report that: • Explains the reasons why many cities chlorinate their water supplies. • Explains how chlorine acts as a disinfectant • Explains pH and describes how chlorination affects the pH of water. • Explains the reaction of chlorine with water using oxidation-reduction principles. • Explains how chlorine reacts with organic matter. • Explains issues arising due to chlorination of water supplies, including those that happened at Flint. • Has explanations integrate chemistry vocabulary, symbols, conventions and equations. • Shows in-depth understanding of Level 3 chemistry.	The student submits a report that: • Comprehensively explains the reasons why many cities chlorinate their water supplies. • Explains how chlorine acts as a disinfectant. • Explains pH and describes how chlorination affects the pH of water. • Comprehensively explains the reaction of chlorine with water using oxidation-reduction principles. • Explains how chlorine reacts with organic matter. • Comprehensively explains issues arising due to chlorination of water supplies, including those that happened at Flint. • Has consistent integration of chemistry vocabulary, symbols, conventions and equations. • Shows comprehensive understanding of Level 3 chemistry.

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. Why is chlorine added to water?
2. How is chlorine added?

Chemistry: How chlorination works

1. Can I explain terms like 'pH', 'weak acid', 'equilibrium', 'oxidation', 'reduction', 'haloalkanes' and 'solubility'?
2. Can I write equations and Ka expressions for the solubility of chlorine and related acids?
3. Have I written my equations using correct chemical language (e.g. using subscripts and states)?
4. Can I use Le Chatelier's principle to explain the effect of pH on the solubility of chlorine?
5. Can I use ionic product (I.P. or Q)?
6. Can I explain the effect of sunlight on the concentration of chlorine?
7. Can I explain the reaction of chlorine with organic matter?
8. Can I explain how chlorides can react with metals in pipes?
9. Have I drawn my own molecules and not just copied and pasted pictures from the internet?

Advantages and disadvantages

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

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

CHLORINATION OF WATER SUPPLIES

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

EXTRA SOURCES FOR MORE DETAIL

GENERAL OVERVIEW

1. http://indysoftwater.com/bizarre-history-chlorine-drinking-water/ History of chlorination of water
2. https://www.lenntech.com/processes/disinfection/chemical/disinfectants-chlorine.htm What is chlorine?
3. http://www.compoundchem.com/2016/04/21/water-treatment/

CHEMISTRY OF CHLORINATION (THIS SHOULD BE YOUR KEY FOCUS)

4. https://en.wikipedia.org/wiki/Water_chlorination
5. www.ncbi.nlm.nih.gov/books/NBK506936/ History and chemistry of chlorination of water
6. www.scientificamerican.com/article/how-does-chlorine-added-t/ How does chlorine kill bacteria
7. www.youtube.com/watch?v=AH84LOwnhUU disinfection breakpoint chlorination
8. www.youtube.com/watch?v=rrdnnF1wQ5U chlorination and oxidation numbers
9. www.youtube.com/watch?v=CB4glN76bEc effect of pH and temperature on chlorination

ISSUES AROUND CHLORINATION

10. www.waterprofessionals.com/learning-center/chlorination/
11. www.cancerwa.asn.au/resources/cancermyths/chlorine-cancer-myth/ chlorine and cancer
12. www.stuff.co.nz/national/100831286/Can-you-taste-it-All-your-water-chlorination-questions-answered Can you taste it?
13. www.compoundchem.com/2016/01/25/flint-water/
14. www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/2016-2017/december-2016/flint-water-crisis.html
15. www.scientificamerican.com/video/corrosive-chemistry-how-lead-ended-up-in-flint-s-drinking-water1/

OTHER SOLUTIONS

16. www.wcponline.com/2009/06/13/chlorine-chloramine-removal-activated-carbon/
17. www.wqpmag.com/abcs-bacteria-removal

DRINKING WATER IN NEW ZEALAND:

Untreated water

18. www.stuff.co.nz/national/health/83307932/positive-e-coli-tests-not-surprising-in-christchurch-untreated-water-supply
19. www.nzherald.co.nz/hawkes-bay-today/news/article.cfm?c_id=1503462&objectid=11695587
20. www.sciencemediacentre.co.nz/2016/08/15/hawkes-bay-campylobacter-outbreak-expert-reaction/
21. www.arphs.govt.nz/Portals/0/About%20us/Technical%20summaries/Technical%20summaries%202012/Jan%202012/Roof%20collected%20water%20-%20Technical%20Summaries.pdf Roof collected water (2006–2007)

Treated water

22. www.drinkingwater.esr.cri.nz/general/nzprocesses.asp
23. www.teara.govt.nz/en/sewage-water-and-waste/page-4 history of water supply in New Zealand
24. See also link in Lesson 2 about the treatment of Wellington water

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