

CHEMISTRY CHO3O31Y1F

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

F. BATTERIES

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|--|
| <p>The student submits a report that:</p> <ul style="list-style-type: none"> States the reasons why batteries are increasingly popular. Describes the historical background to the development of batteries. Describes the reduction potential values and strength of oxidant and reductant. Describes the lead-acid car battery. Describes the Tesla battery. Explains the chemistry of a battery while charging and discharging, using oxidation-reduction principles. Describes the issues arising due to the manufacture and disposal of batteries. Is supported by the use of typical chemistry vocabulary, symbols, conventions and equations. Shows understanding of Level 3 chemistry. | <p>The student submits a report that:</p> <ul style="list-style-type: none"> Explains the reasons why batteries are increasingly popular. Explains the chemistry of electrochemical cells (batteries when discharging). Explains the chemistry of electrolytic cells (batteries when charging). Explains the chemistry of the lead-acid battery and the Tesla battery. Explains the issues arising due to the manufacture and disposal of batteries. Has explanations integrate chemistry vocabulary, symbols, conventions and equations Shows in-depth understanding of Level 3 chemistry. | <p>The student submits a report that:</p> <ul style="list-style-type: none"> Comprehensively explains the reasons why batteries are increasingly popular. Comprehensively explains the chemistry of electrochemical cells (batteries when discharging). Comprehensively explains the chemistry of electrolytic cells (batteries when charging). Comprehensively explains the chemistry of the lead-acid battery and the Tesla battery. Comprehensively explains the issues arising due to the manufacture and disposal of batteries 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. What is a battery?
2. Why are there different kinds of batteries?

Chemistry: How batteries work

1. Can I explain terms like 'battery', 'cell', 'anode', 'cathode', 'primary battery', 'secondary battery', 'oxidation', 'reduction', 'oxidant', 'reductant' and 'oxidation number'?
2. Have I used oxidation numbers and the number of electrons transferred to explain oxidation and reduction?
3. Can I write half-equations and full equations for each of the redox reactions?
4. Have I written my equations using correct chemical language (e.g. using subscripts and states)?
5. Have I identified issues in manufacturing the batteries?
6. Have I identified issues in using the batteries?
7. Have I identified issues with the disposal of the batteries?
8. Have I drawn my own diagrams and not just copied and pasted pictures from the internet?

Advantages and disadvantages

1. Can I describe at least two issues associated with the manufacture and disposal of batteries?
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

BATTERIES

Your first source is the modules you should have completed – CHO3001, CHO3071, CHO3072.

EXTRA SOURCES FOR MORE DETAIL

GENERAL OVERVIEW

1. www.youtube.com/watch?v=9OVtk6G2TnQ How batteries work
2. https://en.wikipedia.org/wiki/List_of_battery_types List of battery types
3. www.youtube.com/watch?v=rhIRD5YVNbs General introduction
4. www.youtube.com/watch?v=eO-X8Gw2nXY Sustainability of lead-acid batteries
5. www.explainthatstuff.com/how-lithium-ion-batteries-work.html How do Lithium ion batteries work
6. https://en.wikipedia.org/wiki/Lithium-ion_battery Lithium ion batteries
7. www.youtube.com/watch?v=gfCRWOa9gQk Tesla Battery 101, How does it work?

CHEMISTRY OF BATTERIES (THIS SHOULD BE YOUR KEY FOCUS)

8. www.youtube.com/watch?v=teTkvUtW4SA Introduction to electrochemistry
9. <https://courses.lumenlearning.com/boundless-chemistry/chapter/batteries/> Batteries in general
10. https://en.wikipedia.org/wiki/Lead%E2%80%93acid_battery
11. www.youtube.com/watch?v=HhxtfULIO7c Working principle of lead acid battery
12. www.youtube.com/watch?v=_dvBcek5NUY Lead-acid storage battery theory 1959 US Navy training film; Chemistry of electric batteries
13. www.youtube.com/watch?v=P7GR5fERXNY Chemistry of the Tesla battery
14. www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/archive-2012-2013/electric-car.html
15. [https://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Electrochemistry/Exemplars/Rechargeable_Batteries](https://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry/Exemplars/Rechargeable_Batteries) Chemistry of rechargeable batteries
16. <https://courses.lumenlearning.com/introchem/chapter/lead-storage-battery/>
17. <https://courses.lumenlearning.com/introchem/chapter/other-rechargeable-batteries/>
18. [https://chem.libretexts.org/Textbook_Maps/Introductory_Chemistry/Map%3A_Introductory_Chemistry_\(Tro\)/16%3A_Oxidation_and_Reduction/16.6%3A_Batteries%3A_Using_Chemistry_to_Generate_Electricity](https://chem.libretexts.org/Textbook_Maps/Introductory_Chemistry/Map%3A_Introductory_Chemistry_(Tro)/16%3A_Oxidation_and_Reduction/16.6%3A_Batteries%3A_Using_Chemistry_to_Generate_Electricity)

ISSUES AROUND BATTERIES

19. www.mpoweruk.com/leadacid.htm
20. https://batteryuniversity.com/index.php/learn/archive/can_the_lead_acid_battery_compete_in_modern_times
21. <https://waste-management-world.com/a/1-the-lithium-battery-recycling-challenge>
22. www.greentechmedia.com/articles/read/is-there-enough-lithium-to-maintain-the-growth-of-the-lithium-ion-battery-m#gs.oV3YgVE

TOPIC RESOURCES

23. https://ac.els-cdn.com/S2214993714000037/1-s2.o-S2214993714000037-main.pdf?_tid=82331583-b4dd-4150-af3b-83b9432d465d&acdnat=1536279634_f9071dbe7a8fce925f2fo67odo1bcae PDF
24. www.ecofriendlylink.com/blog/batteries-and-the-environment/
25. www.rechargebatteries.org/knowledge-base/environment/
26. www.batterycompany.co.uk/blog/the-facts-environmental-impact-of-disposable-and-rechargeable-batteries/

OTHER SOLUTIONS

27. www.youtube.com/watch?v=5Wi5zWSD-6I How do solar cells work, solar driven cars?
28. www.youtube.com/watch?v=UJ8XW9AgUrw
29. www.scientificamerican.com/article/how-does-solar-power-work/

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