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| **Title of Unit – SACE Stage 1 Topic 3: Metals and Metal Extraction** |  |  |  |
| **Subject** | `Metal and Metal Extraction | **Timeframe** | 3 Weeks |
| **Developed By** | Christine Kusznir | | |

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| **Key Ideas:**  ***Students should know and understand the following:*** | **Student outcomes:**  ***Students should be able to do the following:*** |
| **Minerals are natural resources that are important to Australia’s economy** | * **Define the term mineral** * **State how minerals are mined from the ground in the form of an ore** * **Discuss the economic considerations of mining an ore deposit** |
| **Many metals are extracted from minerals** | **State the uses of some common metals and their importance to our everyday life.** |
| **The activity/reactivity series of metals is a list of some of the most common metals in order from most to least reactive** | * **Conduct displacement reactions in order to determine the order of metals in the reactivity series** * **Predict whether a metal is likely to occur in nature as either an element or a compound, given its relative position in the reactivity series.** |
| **The method of metal extraction from its mineral is determined by the metals reactivity** | **Compare the methods (including cost) for extracting aluminium and iron based on their relative reactivities.** |
| **Iron (obtained from haematite) is alloyed with various substances to product different types of steel which has a wide variety of uses** | * **Understand and write equations for the processes that occur in a blast furnace.** * **Describe the Basic Oxygen Steelmaking (BOS) Process.** |
| **Aluminium (obtained from bauxite) is a strong, lightweight, rust resistant metal, used in items such as saucepans, bicycles, window frames and aeroplanes.** | * **Understand and write equations for the purification of aluminia from the bauxite ore (Bayer Process)Describe and write equations for the redox process that occurs in the Hall-Heroult Cell.** |
| **Precipitation reactions are when an insoluble compound (solid) is formed from two solutions mixing. These are sometimes used in metal extractions.** | **Observe some precipitation reaction and write fully balanced equations for the reactions that occur.** |

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| Learning Plan **SACE Stage 1 Topic 3: Metals and Metal Extraction**  T**eaching and learning lessons and activities** | | | | |  |
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| **Lessons per week: 3**  **Lesson Duration: 80 minutes** | | | | |  |
| # | **Title** | **Lesson Activities/key ideas and intended student learning** | **Task and Assessment Opportunities** | **Resources** | **Homework** |
|  |  | **Week 6** |  |  |  |
| **3**  **Fri 9:00-10:20 AM** | Introduction  40 minutes (half lesson) | Assessment of prior knowledge of topic and getting to know students through a game of “Verbal Volleyball” | Gamification: “Verbal Volleyball”  Extra activities:  Time on issues investigation write up  Chicken Picks game or 20 questions | Paper  Chi Ball | Continue with Issues Investigation – draft due Tuesday |
|  |  | Notes:  Invite student participation of ideas and suggest themes/topics.  Have a score keeper | Reflection:  Lesson activity was a really nice way to introduce a topic and get to know the students. They were a little reserved to start but as the lesson went on and I encouraged them, they opened up and were really engaged.  I needed to prompt ideas to start, students were on task but a little stuck but eventually got into the swing of it! The game worked really well, no additional rules needed and after about 15 mins I could see it was winding up so I finished the activity and had a quick game of chicken picks to finish.  Very positive feedback from students and mentor. |  |  |
|  | **Week 7** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **1**  **Tues**  **2:10-3:30**  **PM** |  | Content: Definition of a mineral  Mining techniques  **Key Idea 1 - Student outcomes:**   * **Define the term mineral** * **State how minerals are mined from the ground in the form of an ore** * **Discuss the economic considerations of mining an ore deposit**   Metals and their uses  **Key Idea 2 - Student outcomes:**  **State the uses of some common metals and their importance to our everyday life.**  Metals and their uses  **Key Idea 3 - The activity/reactivity series of metals is a list of some of the most common metals in order from most to least reactive** | Face to face, using powerpoint slides  Student questioning  Pass around earrings  Student activities:  Note KI 1 – definition of mineral in own words  Table of common metals and their uses  Reaction of alkali metals with water  <https://www.youtube.com/watch?v=HvVUtpdK7xw>  The activities series song  <https://www.youtube.com/watch?v=DLlykUHHAcQ> | Powerpoint slides  ‘Diamond’ earrings | Work on issues investigation |
|  |  | Reflection:  Slides and information was good but pace a bit rushed. Need to be clearer about letting students know which points to note down.  Lesson finished early, free time at the end as I judged students had had enough content.  Showing my diamond stimulants and speaking about my experience at Santos had the students engaged. A few chances for students to formulate some ideas – works well but won’t use too often.  You tube clips were a nice way to end the lesson. |  |  |  |
|  | **Week 7** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **2**  **Wed 10:40-12:00 PM** |  | **Key Idea 3 - The activity/reactivity series of metals is a list of some of the most common metals in order from most to least reactive**   * **Predict whether a metal is likely to occur in nature as either an element or a compound, given its relative position in the reactivity series.**   **Key Idea 4:The method of metal extraction from its mineral is determined by the metals reactivity**  **Key Idea 5: Iron (obtained from haematite) is alloyed with various substances to product different types of steel which has a wide variety of uses**   * **Understand and write equations for the processes that occur in a blast furnace.** * **Describe the Basic Oxygen Steelmaking (BOS) Process.** | Kahoot Quiz – recap last lesson  <https://play.kahoot.it/#/k/feaf514c-c3d9-4ff2-ba0c-fb76e8dbea9a>  Questions: 8.3 From Ore to Metal  Q 4-5 |  |  |
|  |  | Reflection:  Email students powerpoint slides for reference as requested.  Had some problems with the projector so had to switch lesson sequence until IT arrived.  Got Kahoot quiz up and running, major success! Students loved it, competitive and engaging, a great way to revise topic. Will do again!  Much better pace, had key for noting down information which helped me and the students a lot.  Great feedback from mentor as well. | Note: got up to starting the blast furnace. |  |  |
| **3**  **Fri 9:00-10:20 AM** |  | STUDENT FREE DAY |  |  |  |
|  | **Week 8** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
|  |  | **Week 8** |  |  |  |
| **4**  **Tues**  **2:10-3:30**  **PM** |  | **Key Idea 5: Iron (obtained from haematite) is alloyed with various substances to product different types of steel which has a wide variety of uses**   * **Understand and write equations for the processes that occur in a blast furnace.**   **Describe the Basic Oxygen Steelmaking (BOS) Process.**  *Prac: blast furnace – reduction of a metal oxide*  **Student worksheet** | Questions: 8.3 From Ore to Metal  Q 4-5 | Powerpoint slides  [CAK Reduction of a metal oxide practical student worksheet.docx](CAK%20Reduction%20of%20a%20metal%20oxide%20practical%20student%20worksheet.docx) | Finish prac questions.  Questions: 8.3 From Ore to Metal  Q 4-5 |
|  |  | Reflection:  Perhaps a little too much theory in one lesson.  Students have notes down but will spend time next lesson going over again and having students create some flowcharts and do some practice questions.  Felt a little rushed to do the prac, allowed half a lesson as suggested but could have had a little longer.  Good feedback from mentor, really good planning and demonstration of prac and also so things to revisit next lesson. | Notes:  Finished extraction of iron and BOS but will revise next lesson and repeat some key ideas. Will also talk about prac observations and finish worksheet. |  |  |
|  | **Week 8** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **5**  **Wed 10:40-12:00 PM** |  | Reduction of metal oxide prac questions (homework)  Talk about prac, link to metal reactivity, suggest sources of error.  Review blast furnace theory  Questions: 8.3 From Ore to Metal  Q 4-5(homework)  Displacement reactions theory and practice  **Key Idea 3: Conduct displacement reactions in order to determine the order of metals in the reactivity series**  30 mins - Concept map assignment: talk through and have students start it. | *Student homework Task*: Create a concept map of metal and metal extraction topic including first 6 key ideas.  [using bubbl\_us](file:///D:\PE%202%20Sacred%20Heart\Lesson%20resources\3.6%20Chemical%20industry%20mind%20map%20example%20bubbl_us.jpg)  <https://www.mindmup.com>  Create flow chart  Worksheet  [Resources\Blast\_furnace\_basic\_worksheet.doc](Resources/Blast_furnace_basic_worksheet.doc)  Concept map assignment |  | Concept map assignment  [SACE Stage 1 Chemistry 2015 - concept map assignment.docx](SACE%20Stage%201%20Chemistry%202015%20-%20concept%20map%20assignment.docx) |
|  |  | Reflection:  Felt not quite on top of my game after spending longer then I wanted trying to navigate mindmup after discovering bubbl.us doesn’t work well on students laptops. Creating a board flowchart helped link the theory from yesterday and talking though the prac helped students with writing equations.  Concept map assignment should be interesting, the students worked the technology easily and picked it up quick.  Now to work out how to share the finished products!  Feedback was a good lesson and things to work on were learning some more names. | Notes:  Mindmup for chrome books.  Have worksheet questions ready for students next lesson.  Students requested another kahoot quiz – prepare one ready. |  |  |
|  | **Week 8** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **6**  **Fri 9:00-10:20 AM** | 15  30  30 | **Key Idea 3: Conduct displacement reactions in order to determine the order of metals in the reactivity series**  *Prac: Displacement Reaction of Metal*  Theory and prac, homework finish equations  Electrolytic reduction (bauxite) – The Bayer Process  Check on homework assignment, see how students are going/app working | Displacement reactions practice writing equations  Displacement Prac  [CAK Metal displacement prac.doc](CAK%20Metal%20displacement%20prac.doc)  Student handout  [CAK Topic 3 Student handout\_Aluminium.docx](CAK%20Topic%203%20Student%20handout_Aluminium.docx) | Hand out worksheet  [CAK Metals REVISION 2015.docx](CAK%20Metals%20REVISION%202015.docx) | \*Finish Displacement reaction of metals Prac for homework  \*Assignment |
|  |  | Reflection:  Good lesson, tidied up a few things from questions and impurities in hematite.  Had students practice displacement reactions, talked through prac.  Feedback – perhaps I could have done a demo for the prac? It was relatively simple so not vital. Students were working well, had to move materials to another bench for better access and find another bucket for waste. I had to remind students twice about safety glasses, warned them if one more time they wouldn’t be doing the prac.  I gave them a countdown, had to move some students along faster. They really enjoyed the prac, I decided not to go further with Al reduction but took a few mins to go through the prac and ensure they were writing correct reactions for the results.  Caught up with Indy about lesson material missed. | Notes:  \*Add note to use of limestone in blast furnace  \*Explain Question 4c) Devise an experiment to test reactivity of iron and copper - clip  Offer to email solutions?  Catch up with Rachel next lesson  Caught up with Indy  Homework Assignment Due:  Wednesday 16th Sept  TEST: Friday 18th Sept |  |  |
|  | **Week 9** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **7**  **Tues**  **2:10-3:30**  **PM** |  | Electrolytic reduction (bauxite) Hall-Heroult Cell  **Key Idea 6: Aluminium (obtained from bauxite) is a strong, lightweight, rust resistant metal, used in items such as saucepans, bicycles, window frames and aeroplanes.**   * **Understand and write equations for the purification of aluminia from the bauxite ore (Bayer Process)Describe and write equations for the redox process that occurs in the Hall-Heroult Cell.** |  |  | Check: Displacement reaction of metals Prac for homework |
|  |  | Notes:  Catch up with Rachel  Rescheduled assignment due date:  Friday 18th September  Test: Tuesday 22nd | Reflection:  Really good feedback on my lesson, I didn’t feel all that comfortable with the content but tried to present it confidently and feedback was that I was confident.  I challenged the students to assemble their notes into a flow chart and most struggled to start with, I had to scaffold it a little and then gave them my handout for help. I didn’t quite finish the key idea but would have revisited the idea next lesson anyway which I have found is a really good idea to recap and encourage student participation. |  |  |
|  | **Week 9** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **8**  **Wed 10:40-12:00 PM** |  | Revisit production of aluminium  Finish key idea 6  Homework questions  Precipitation reactions theory  Precipitation reactionsprac  Hand out test, time to work on revision questions. | Give students practice test 2014  [Past tests\Metal Extraction Test (APE-14).docx](Past%20tests/Metal%20Extraction%20Test%20(APE-14).docx) | Finish precipitation reaction equations | [Pracs\CAK Precipitation reactions practical student worksheet.docx](Pracs/CAK%20Precipitation%20reactions%20practical%20student%20worksheet.docx) |
|  |  | Notes:  Rescheduled assignment due date:  Friday 18th September  Test: Tuesday 22nd | Reflection:  Really good revisit of whole process of production of aluminium, must keep using names. Had students contribute without their notes and we worked through it all and they remembered a lot!  I had them list reasons to recycle aluminium and suggest uses for it and properties before giving them some more points and asking them to add two extra to their list.  I touched on precipitation reactions before we did the practical, this time I did a demonstration of a small amount of it and was a little better organized placing equipment around the room to help classroom traffic.  Feedback was to also have them check benches are clean before they go.  Students were asked to write equations for reactions as homework and try using the solubility table, I will go through that again next lesson before revision.  Students are really starting to ask questions and interact now ☺ |  |  |
|  | **Week 9** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **9**  **Fri 9:00-10:20 AM** |  | Finish precipitation reactions  Revision  Kahoot Quiz: Metal and metal extraction 2 | \*\*Homework Assignment due\*\*  Check precipitation reactions and recap using the solubility table – have students finish their reactions.  Talk through aluminium handout questions.  Students to work on 2014 test, assist students around the classroom.  Go through (some of) practice test 2014 as a class  Give students practice test 2013 [Past tests\metal extraction TEST (ASN-13).docx](Past%20tests/metal%20extraction%20TEST%20(ASN-13).docx)  Email solutions on Monday | Revision  Notes against key ideas |  |
|  |  | Notes: | Reflection:  Revision lesson went well, I tried to allow them time to work independently so I could get around and speak to students individually and help as needed. Because of this I wrote a few solutions on the board rather than talk through with the class, and I emailed them solutions later as we couldn’t go through in class.  We finished with a Kathoot quiz as promised for fun. |  |  |
|  | **Week 10** | **Key ideas and intended student learning** | **Lesson Activities, Task and Assessment Opportunities** | **Resources** | **Homework** |
| **10**  **Tues**  **2:10-3:30**  **PM** | Summative Assessment | Final Summative Test for Unit (written test paper)  Metal and Metal extraction |  |  |  |