Name: Due Date: Complete in practical lessons.

Advisory:

**Science: Why is Gold, Gold?**

***Learning Intentions:***

1. To recall that atoms are composed of protons, neutrons and electrons.
2. To find out how the atomic structure of an element can affect the way it reacts.

|  |
| --- |
| AUSTRALIAN CURRICULUM CONTENT DESCRIPTORS |
| **Science** |
| [**ACSSU174**](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACSSU177) All [matter](http://www.australiancurriculum.edu.au/glossary/popup?a=S&t=matter) is made of atoms that are composed of protons, neutrons and electrons |
| [**ACSSU178**](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACSSU178) Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed |
| **ACHIEVEMENT STANDARDS** |
| Students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. |

***Gold*** is an ***element*** that sparked the ‘Gold Rush’ of the 1850’s in Australia. It is a rare metal and interestingly can be found as a ***solid*** in nature, whereas are others metals are found in compounds and have to be extracted. Every ***metal*** reacts at a different rate. In this practical you will design your own method to work out the **order of reactivity** of the metals from the most reactive to the least.

*Space for student notes: Remember the atomic structure of atoms. (Sodium, Potassium and Iodine)*

**Prac 1 How do Metals React with Acid?**

***Design*** a practical to observe what happens to the following metals when placed in acid then try to put them in order from the fastest reacting to the slowest.

We can supply:

Magnesium Mg, Zinc Zn, Iron Fe, Copper Cu, Manganese Mn, Tin Sn, Aluminium Al, Lead Pb, Acid, Test tubes, safety glasses and aprons.

*Method: Ensure this is a fair test!!*

*Table of Results:*

***Complete this table when you have completed the practical. Include Sodium and Potassium.***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Most Reactive |  |  |  |  |  |  |  |  | Least Reactive |
|  |  |  |  |  |  |  |  |  |  |

**Activity: Density and reactivity of metals**

<http://www.rsc.org/periodic-table> or use the periodic table on the wall to complete table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metal**  | **Atomic Number** | **No of Electrons/****Protons** | **Symbol** | **Density** |
| Aluminium |  |  |  |  |
| Copper |  |  |  |  |
| Gold |  |  |  |  |
| Iron |  |  |  |  |
| Lead |  |  |  |  |
| Zinc |  |  |  |  |
| Potassium |  |  |  |  |
| Sodium |  |  |  |  |

**Questions:**

1. Put the metals in order from the lowest density to the highest density.

....................................................................................................................................................................................................................

1. Compare the order from number 1 to the order you have placed your table from prac 1.

....................................................................................................................................................................................................................

1. Write a statement (2 sentences) discussing what you discovered about density, atomic number and reactivity in metals. Are there examples that are behave differently?

....................................................................................................................................................................................................................

....................................................................................................................................................................................................................

....................................................................................................................................................................................................................

1. Answer the question, Why is gold, gold? (meaning: why is gold found as a metal in nature)

....................................................................................................................................................................................................................

....................................................................................................................................................................................................................

...................................................................................................................................................................................................................

**Prac 2: Observing Electron Shells**

**Learning intentions:**

1. To learn about the different levels in atoms.
2. To observe the coloured light produced when electrons jump from one level to another.

Student Notes: (Electron shells and configuration)

**Materials:**

* Cotton buds
* Compounds in solution provided
* 5 small beakers
* 1 large beaker of water
* Bunsen Burner
* Tongs

**Procedure:**

1. Pour 2-5ml of each solution into each beaker, ***label*** the beakers.
2. Light the Bunsen burner on a ***yellow flame***.
3. With the tongs, pick up the cotton ball and soak it in the first solution.
4. Place the bud in a ***blue flame.*** *Don’t let it catch fire!!*
5. Record the results in the table
6. Repeat for the remaining solutions.

|  |  |  |  |
| --- | --- | --- | --- |
| Solution | Metal element | Observation | Classify |
| Barium Chloride |  |  |  |
| Sodium Chloride |  |  |  |
| Copper Chloride |  |  |  |
| Potassium Chloride |  |  |  |
| Calcium Chloride |  |  |  |

1. Different coloured light is produced depending on whether the electron shells are far apart or close together.
* *When the electron shells are far apart, green, blue or violet light is produced.*
* *When the electron shells are close together, red, orange or yellow light is produced.*
* *Use your results to classify the compounds in your experiment as having electron shells far apart or close together.*
1. Propose what compounds you might use to make green and purple flames.

....................................................................................................................................................................................................................

1. Now test your proposition! Record what you observed.

|  |  |  |  |
| --- | --- | --- | --- |
| Solution 1 | Solution 2 | Prediction | Observation |
|  |  |  |  |
|  |  |  |  |

1. What is the electron configuration for Sodium, Helium and Carbon? (How many electrons in each shell?)

....................................................................................................................................................................................................................

**Prac 3: Common Reactions**

**Learning Intentions:**

* To learn about the everyday reactions: Rusting and Burning.
* To understand that during chemical reactions matter is not created or destroyed.

Demonstration and student notes: (Hydrogen balloon, Rusting and bonding)

**Materials**

* Magnesium strips
* Steel wool
* Bunsen burner
* Tongs
* Safety glasses and apron

**Procedure:**

1. Light the Bunsen burner on a ***yellow flame***.
2. Use the tongs to pick up the magnesium and place it into a ***blue flame***. Do not look directly at the light produced.
3. Use the tongs to pick up the steel wool and place it into a ***blue flame.***
4. Describe the difference in the **reactants** and the **products** in the burning metals reactions.

|  |  |  |
| --- | --- | --- |
| Metal | Reactant | Product |
| Magnesium |  |  |
| Iron (steel wool) |  |  |

**Elements combine to form compounds.** When this happens it is called ‘bonding’.

Iron and Oxygen bond to form rust. Fe + O2 ------ Fe2O3 *(Reaction of iron and oxygen forming Rust)*

When an element combines with another one element loses electrons and the other gains electrons.

If an element loses 1 electron it has a net charge of +1, if it loses 2 electrons it has a net charge of +2.

1. When Magnesium is burned it combines with oxygen. It loses 2 electrons and Oxygen gains 2 electrons. What is the change on each?

....................................................................................................................................................................................................................

1. You can’t create or destroy matter; therefore the number of atoms on each side of the equation must be the same. Try to balance these equations.

Mg + O2 -------- MgO

Al + O2 -------- Al2O3

H2  + O2 -------- H2O

1. Explain ***chemical bonding*** between 2 elements in terms of what happens with electrons. You may use examples and diagrams to support your answer.

....................................................................................................................................................................................................................

....................................................................................................................................................................................................................

....................................................................................................................................................................................................................

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **E** |
| Students record in detail all results from practicals clearly and accurately. | Students record results from practicals may lack some detail. | Students record results from practicals but may be missing some results. | Students record a few results from practicals. | Students didn’t record results from practicals. |
| Students can discuss the connection between atomic structure, density and reactivity and apply this to other examples. | Students can clearly discuss the connection between atomic structure, density and reactivity. | Students may discuss some parts of atomic structure and density and relate it to reactivity. | Students may mention atomic structure, density and reactivity with little understanding. | Students cannot discuss the connection between atomic structure, density and reactivity. |
| Students explain in detail using examples and or diagrams chemical bonding in terms of electrons. | Students explain chemical bonding in terms of electrons. | Students mention chemical bonding and may discuss electrons with some accuracy. | Students have difficulty explaining chemical bonding and may or may not mention electrons. | Students cannot explain chemical bonding in terms of electrons. |