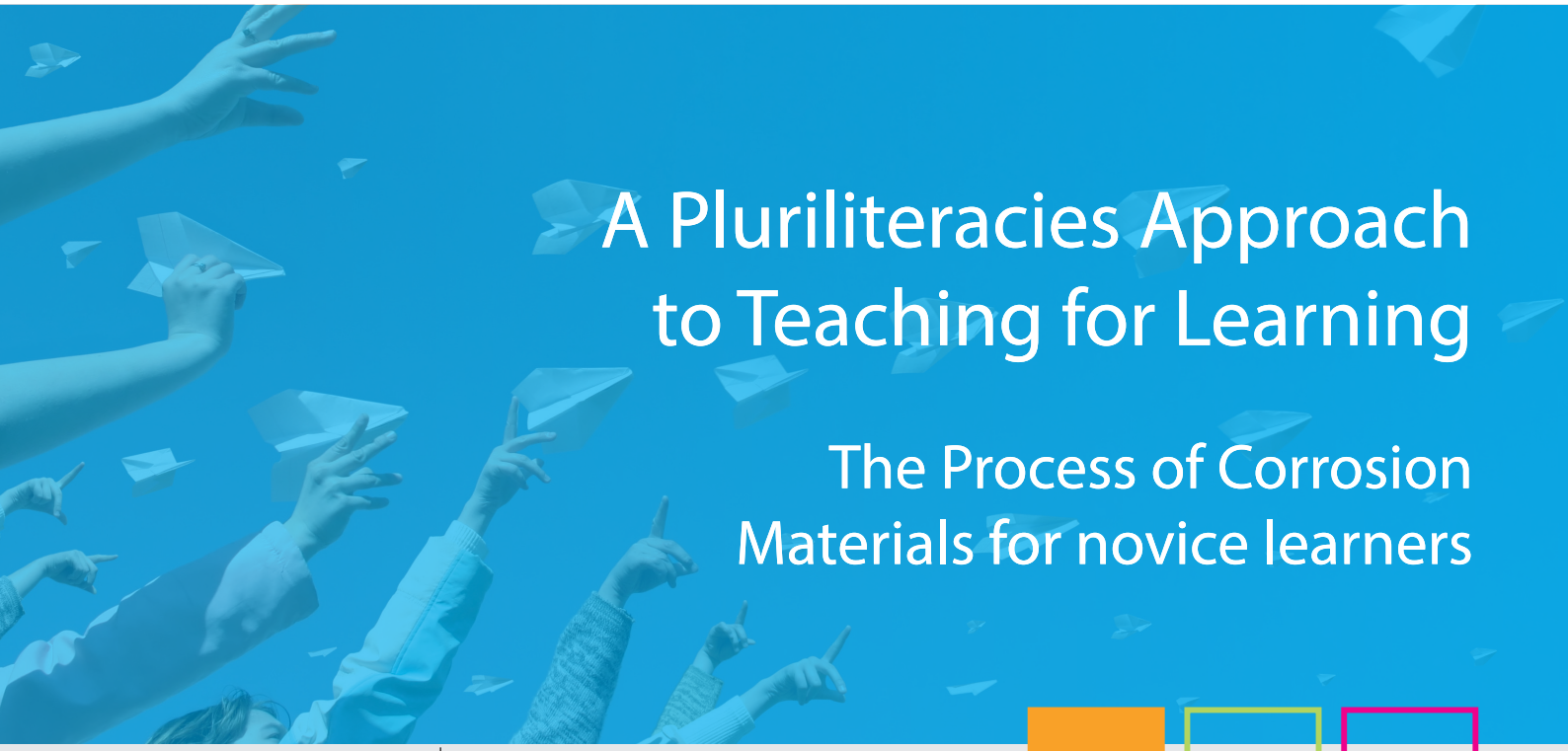
Pluriliteracies making meaning happen



# A Pluriliteracies Approach to Teaching for Learning

## The Process of Corrosion Materials for novice learners

Novice learners

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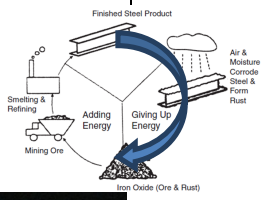



1) Describe the images below and explain what they have in common.

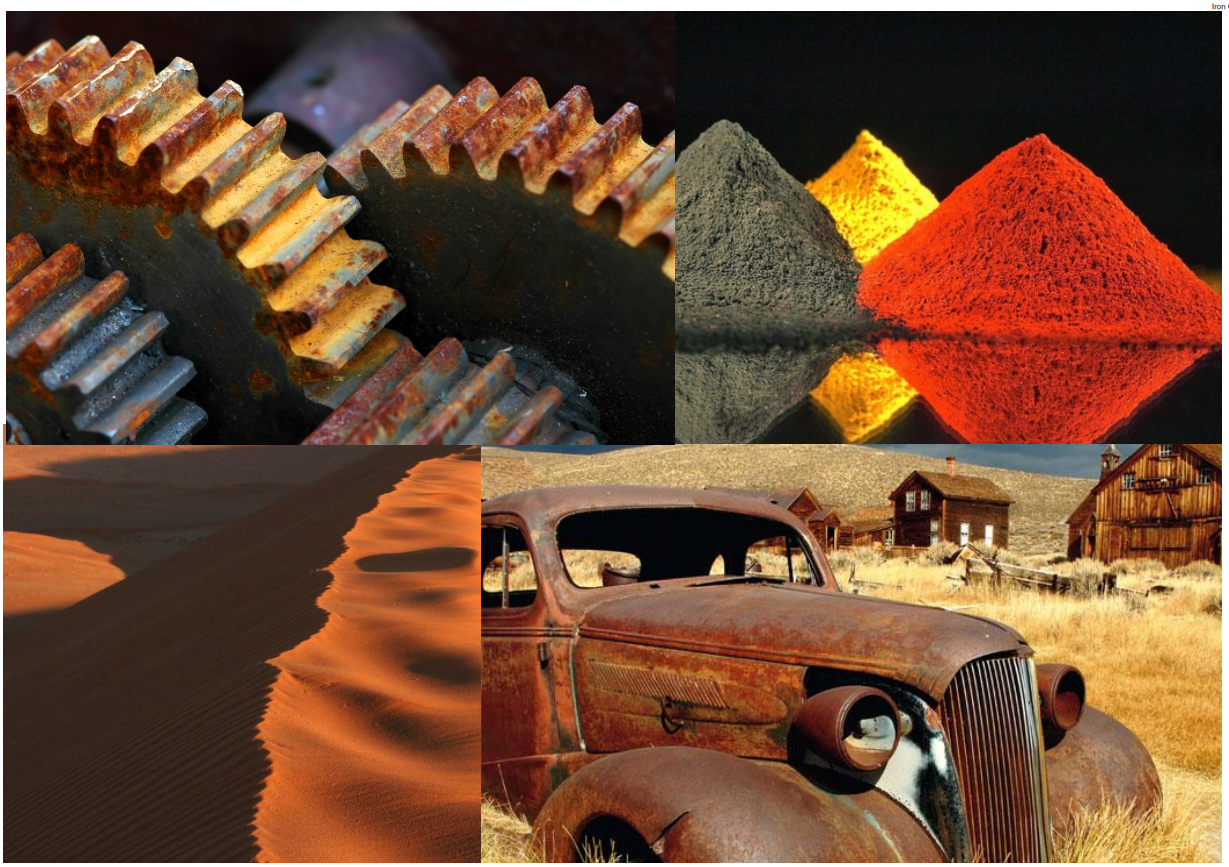


Abbildung 1

- Mindmap of possible answers:

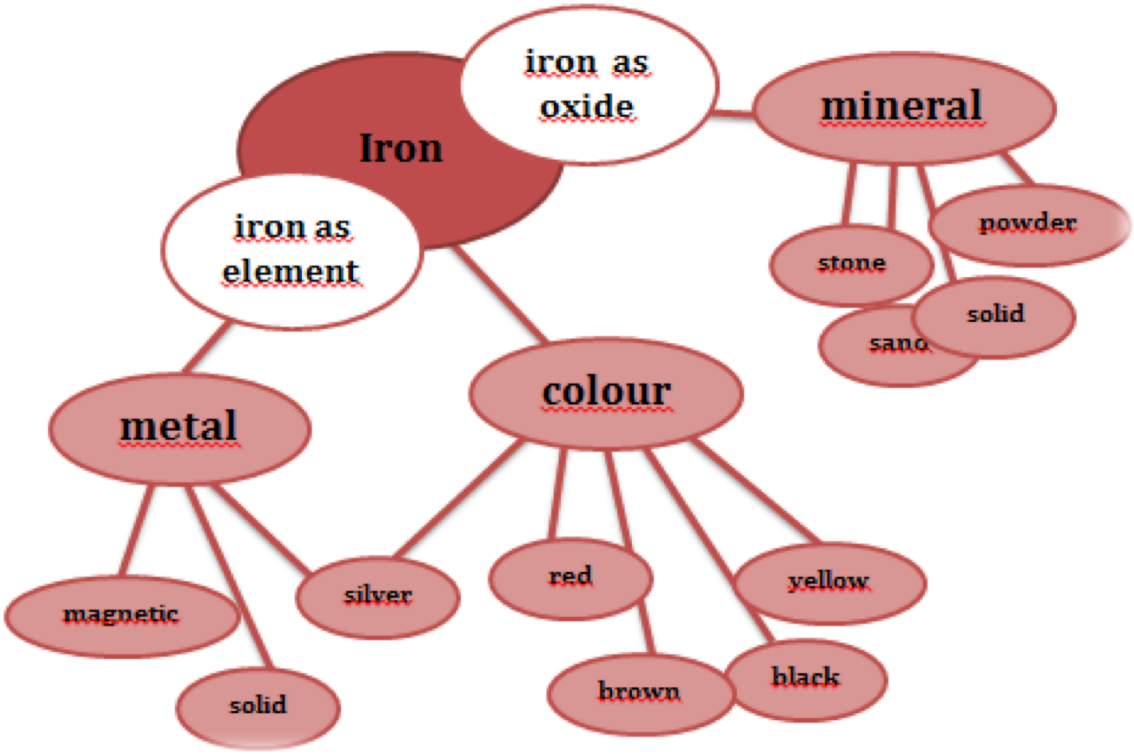



Abbildung 2

2) Read the following text and explain the process of corrosion in your own words.

CORROSION is a natural process. Just like water flows to the lowest level, all natural processes tend toward the lowest possible energy states. Thus, for example, iron and steel have a natural tendency to combine with other chemical elements to return to their lowest energy states. In order to return to lower energy states, iron and steel frequently combine with oxygen and water, both of which are present in most natural environments, to form hydrated iron oxides (rust), similar in chemical composition to the original iron ore. Figure 1 illustrates the corrosion life cycle of a steel product.

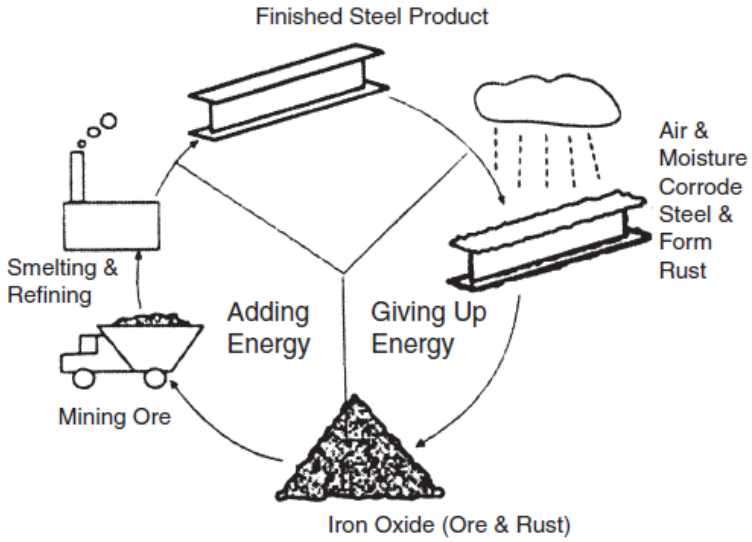



**Fig. 1** The corrosion cycle of steel

Abbildung 3

_____

_____

_____

_____

3) Design and carry out your own experiment to visualize the process of corrosion. *Work in groups of four and use the material provided in the baskets. For the analysis of your findings, fill out the worksheets similar to the sample lab report.*

*Note: This page is not part of the actual material section and was only inserted for a better understanding.*

## Experiment 1: Combustion of Steel Wool

Material: lighter, beam balance

Chemicals: steel wool (mostly iron)

- Students can prove that a new substance is formed during the chemical reaction of iron and oxygen as the steel wool gets heavier.

## Experiment 2: Corrosion of Iron Nails

Material: test tubes, test tube rack, cork

Chemicals: iron nails, oil, calcium chloride

- With this experiment, is can be shown that the two substances water *and* air are both necessary components to trigger corrosion.


Abbildung 4: Combustion of Steel Wool

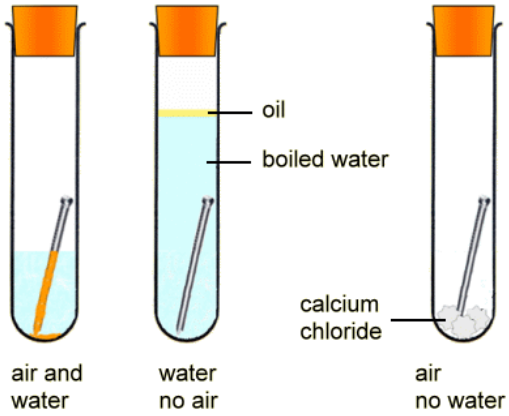



Abbildung 5: Corrosion of Iron Nails

# Sample Lab Report

aim

**Title** **The Combustion of Steel Wool**

**Introduction** The purpose of the experiment was to test whether a new substance evolves out of steel wool when exposed to oxygen after ignition. Previous research has shown that wood and charcoal do combust in a chemical reaction and according to Konopka (2010) this can be done with metals as well. Since this has not been tested yet, further research is still needed.

background information

motivation/ justification

**Problem** What happens if iron and oxygen react together?

cause and effect relation
If . . . then . . . because . . .

independent variable is changed

**Hypothesis** **If** iron combusts in the presence of oxygen, **then** a new substance evolves **because** oxides form during combustion reactions.

dependent variable is affected by this change

**Apparatus**

- lighter
- beam balance
- analysis scale

list of all materials used

hazard and precautionary statements

**Chemicals**

- steel wool

Attention  H228, P210, P240

past tense, passive, third person impersonal pronoun

**Procedure**

Two palm size pieces of steel wool were fluffed up and hocked onto each side of the beam balance. One of the two pieces was ignited with a lighter. The samples were weighted with an analysis scale before and after the reaction.

each step is described precisely and ordered chronologically, no irrelevant information is given

**Results** It was found that the ignited steel wool changed its colour from silver to black in the course of the

reaction, whereas the other piece remained silver. The visual change was accompanied by an increase in weight which can be seen in the table below.

nominalization (verb changed into noun)

Tabelle 1: weight of steel wool before and after the combustion reaction

| | weight of unchanged steel wool | weight of ignited steel wool |
|---|---|---|
| before | 17,29g | 17,46g |
| after reaction | 17,29g | 18,91g |

**Discussion**

summary of research aim and findings

It was the main aim of this experiment to prove that a new substance is formed during combustion. From the results it can be concluded that the hypotheses is to be retained as the steel wool got heavier during the reaction due to the bonding with oxygen. The results were thus expected and agree with previous research. It might also be of interest for further research to investigate whether there is another option to oxidize iron besides burning it.

connection of previous and future research

**Definition**

**An** oxidation **is a** chemical reaction during which oxygen bounds to another substance (ion/ element or ion) . The resulting product is called oxide.

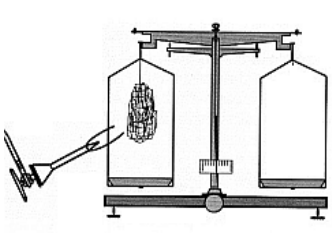
A . . . is a . . . . that . . .

**Sources**

Konopka, Hans-Peter. Netzwerke Naturwissenschaften 5/6 Rheinland-Pfalz. Braunschweig: Schroedel, 2010.

List of all sources used (books, internet, articles, ...

**Appendix**




list of al hand written notes, graphics, data,...

Abbildung 6: sketch of experimental setup

Abbildung 7: photographed observations

## Title

In this section, you tell your reader what your lab report is all about. Very often, the title has one of the following formulations:

| | | |
|---|---|---|
| The reaction of … and … | The effect of … on … | The … (action) of … (substance) |

1. Decide on a title with your partner.

_____

## Introduction

Now, the purpose and the context of the experiment is described. Included are: important background information like names, formulas, previous research detection methods and why this experiment is carried out.

2. Brainstorm your background knowledge concerning this topic.
   *You may choose a mind map, bullet points or a table to write down important facts.*

3. Formulate a coherent introduction on the topic using the sentence chunks from the word bank.

| | |
|---|---|
| The purpose/ aim of the experiment was to test … | [aim] |
| According to XYZ (2014), … | [previous research] |
| It is know from the lecture that … | [background information] |
| Further research on … is still needed | [motivation/ justification for research] |

_____

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## Problem

If a task is already given, it belongs to this section. If not, simply use the following frame.

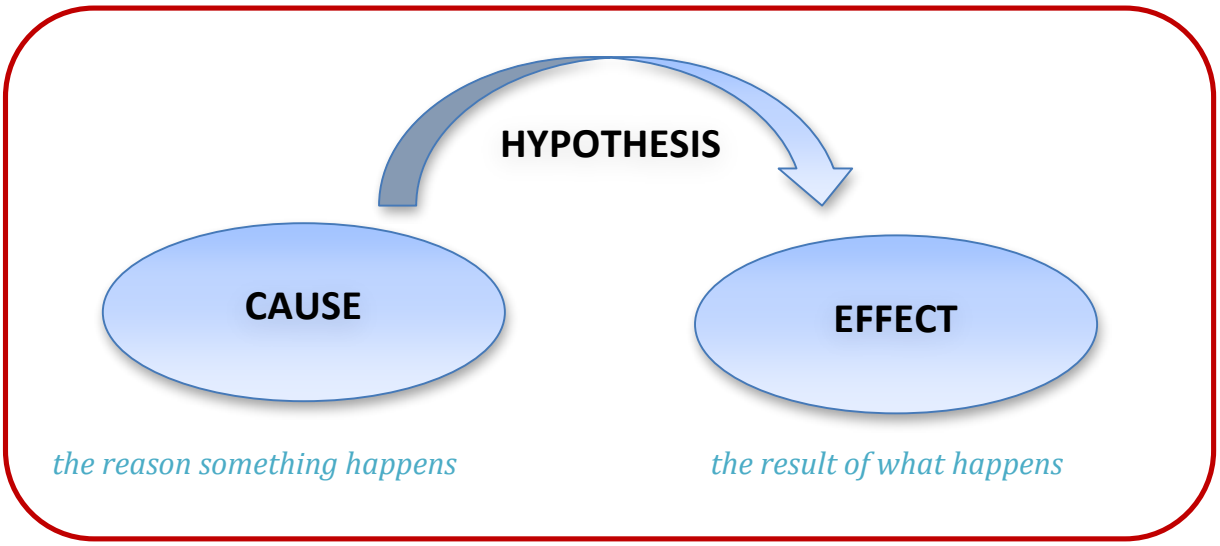
| |
|---|
| What happens if … and … react together? |

4. Formulate the problem of your experiment.

_____

## Hypothesis

After you have described what you want to do and why, you need to provide assumptions of what might happen in the course of your experiment and which results you expect. You could for example say: "I believe this is going to happen and here is the reason why…" Professional scientists use a special construction for such hypotheses as you can see in the diagram and the wordbank.




**If** *... [this is done ]...* **then** *...[this will happen]...* **because** *...[reason/ explanation]...*

A hypothesis also needs to be testable. Therefore, the independent and dependent variables need to be given.

**If** the *independent variable* is changed, **then** the *dependent variable* will change, **because** of the reason the result happens.

Example hypothesis:

Spoken/ informal version:

first person singular | present tense → active | verb

- If I drink more milk, then I will get strong bones because milk contains a lot of calcium which is important for bones.

Translation into academic language:

past tense → passive | noun

- The increased intake of milk has a positive impact on the firmness of bones as calcium is a necessary trace element for the development of bones.

5. Write the hypothesis of your experiment in informal and then academic language.

_____

_____

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## Material

The material section describes how the hypothesis will be tested. All materials, tools and chemicals must be listed. If you work with dangerous substances, all chemical hazard and precautionary sentences must also be added. Also include a precise sketch of your experimental set up to support the reader's understanding.

6. List all tools and chemicals used in your experiment.

_____

_____

_____

7. Draw your experimental set up.

## Procedure

The procedure is a detailed and chronological description of each step carried out during the experiment. It needs to be precise enough that the reader can carry out the experiment afterwards.

Keep the following rules in mind whenever you write a procedure!

| rule | incorrect | correct |
|---|---|---|
| **order steps chronologically** | at the end …, at the beginning... | first, second, then, next |
| **omit standard procedures** | put the beaker on the hotplate and turn on the switch. Wait until the water bubbles... | water is heated up to 100°C |
| **use 3rd person singular** | I, we, you,... | it or agentless |
| **write concisely** | well under 20 grams<br>for a few minutes<br>like it is written in the internet | 5 to 10 grams<br>for at least 3minutes<br>according to the procedure of Prof. Dr. XYZ |
| **use the passive voice** | I heated up the liquid | The liquid was heated up |
| **omit any observations** | and the I saw pink bubbles | / (part of the result section) |

8. Tell your group members what your experiment was about and what you did.

9. Arrange the following steps in the right order and assign numbers accordingly.

Experiment 1:

| | |
|---|---|
| | Then I take two small pieces of iron wool |
| | We hooked the two pieces on either side of the old balance in the teacher's room. |
| | It has been observed for a little bit. |
| | Steel wool can cause serious damages to your skin. |
| | The iron wool will be slightly pulled apart and fluffed up. |
| | One piece of iron wool was ignited with a lighter |
| | The steel wool burns with yellow flames. |
| | You need a lighter for the next step. |

Experiment 2:

| | |
|---|---|
| | Anna put a little bit of water in each test tube. |
| | The oil can no longer be used as food because it has been used in the laboratory. |
| | I put three test tubes in the test tube holder. |
| | Then we waited until the Tim's alarm clock went off. |
| | Test tube 2 was covered with oil to avoid any possible air contact which causes oxidation. |
| | Then I asked my teacher what to do next and she said close one test tube with a cork. |
| | The nail in calcium chloride did not change its color and was still silver. |
| | In the three test tubes we put one iron nail in each of them. |

10. Write down the procedures in chronological order and correct any mistakes according to rules on the previous page (some steps might be irrelevant, have the wrong personal pronoun, do not belong to the procedure section and so on).

Experiment 1:

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Experiment 2:

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_____

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## Results

This is a raw collection and description of all data (equations, calculations, graphs, tables,…). Do not include any explanations or interpretations yet.

**If** *… [this is done ]…* **then** *…[this will happen]…*

Useful sentence chunks for an observation:

| | | | | | |
|---|---|---|---|---|---|
| It was | found<br>shown | that … | X | increased<br>decreased | Y |
| The | experiment<br>investigation<br>study | showed<br>revealed | that… | | |

How to order multiple adjectives before a noun:

| **Determiner** | **Opinion** | **Size** | **Shape** | **Condition** | **Age** | **Color** | **Pattern** | **Origin** | **Material** |
|---|---|---|---|---|---|---|---|---|---|
| a, the, my, 5 | useful | big | square | broken | old | green | spotted | Irish | wooden |

Handy expressions to describe a substance or a process.

| | |
|---|---|
| color | faint, bright, metallic, silvery looking, spotted, shaded, checked |
| aggregate state | solid, liquid, gaseous |
| smell | stench, lemony aroma, odor of rotten eggs, smelled like soil |
| texture | hard, slimy, crystalline, porose, melted, burned, pulverized, |
| weight, length, … | light, heavy, massive, tiny, 20 cm, 2 kg, 100 ml |
| noise | exploded with a loud noise, deteriorated under silent bubbles<br>monotonous, beeping sound, cracked into thousand pieces |
| chemical process | oxidation, reduction, polymerization, condensation, distillation, gas formation, crystallization, combustion |

11. Write down your observations using the word boxes below.

Describe the substances before the reaction (color, aggregate state, smell, texture, weight,…).

_____

_____

Give any observances during the reaction (processes, start/ duration and end of reaction, noises).

_____

_____

_____

_____

Describe the substance after the reaction.

_____

_____

## Discussion

In the result section, cause and effect relations have been established. In the discussion, these relations need to be explained.

**If** *... [this is done ]...* **then** *...[this will happen]...* **because** *...[reason/ explanation]...*

12. Explain the results and say whether or not they were expected.

_____

_____

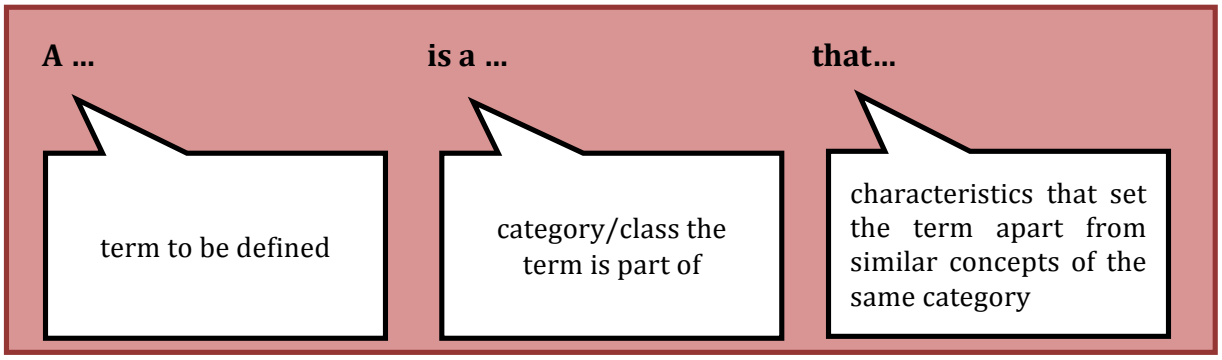
_____

13. Write down the appropriate word-equation including all aggregate states.

_____

## Definition

A definition is an important tool to explain unfamiliar key terms. The following diagram shows the underlying structure of a basic definition.




**Rules for a good definition:**

- avoid circular definitions (simple restatement of the term)
- do not start your definition with *X is when/ where*
- define a noun with a noun, a verb with a verb and so on
- use simple and familiar terms ( do not make the definition more complicated than the original term)
- do not include any personal details
- include cause and effect constructions, descriptions, processes, synonyms, antonyms, comparisons, contrasts and examples when suitable
- do not include hyperbolic absolutes like *always, never* or *everybody* if this is not true for every single case
- do not formulate your definition too narrow or too broad
- write in a positive manner whenever possible, instead of stating what your term is not

14. Find the mistake in the following definitions and correct them.

A jump rope is a rope you can jump with.

_____

Grey is the opposite of pink.

_____

A soccer ball is a physical object used in sport of association football which mostly consists of black pentagons and white hexagon made out of leather.

_____

A shoe is a leathery object covering human feet as my grandfather told me once.

_____

**15.** Describe the process of corrosion to your friend.

_____

_____

16. Now define the terms oxidation and corrosion in academic language. Use the word bank and information box below. Limit your definitions to a maximum of 15 words each.

| | | | |
|---|---|---|---|
| A… | is a … | that<br>who<br>which | is made up of . . .<br>has the following characteristics . . .<br>is used for . . . |

| | | | | | |
|---|---|---|---|---|---|
| oxygen | gain of oxygen | product = oxide | bound | metal | oxygen |
| corrosion | air | chemical reaction | water | | |
| | | oxidation | | | |

_____

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## Beyond your experiment . . .

**Establish a connection between your results and existing theories.**

*Do they contradict, support, modify, extend, … them?*

_____

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**Name probable practical implications of your obtained findings.**

*What needs to be changed in the future? What can stay the same?*

_____

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**Discuss areas of research which your experiment did not cover.**

*In which area is more research needed? Which further questions can be asked?*

_____

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_____

_____

*Which generalizations are possible based on your findings?*

_____

_____

_____

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