

School: IIS Gobetti Marchesini – Casale- Arduino – Torino

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CLIL MODULE - CHEMISTRY

Unit Title: **The periodic table of the elements**

Topic: Organization of periodic table- Periodic properties of the elements

Subject area: Chemistry

Language: English

Language level : A2

Target students: Ages 15-16 – 2nd year of upper secondary school

Time: 18 hours

Objectives:

a. Subject objectives:

- to be able to identify the various blocks and main families of elements;
- the periodic properties of the elements
- main features of the groups of elements
- to be able to relate the properties of the elements to their locations in the periodic table;
- to use electron configurations of atoms to classify elements in the periodic table;
- content specific vocabulary

b. Language skills:

- LISTENING represents a normal input activity, vital for language learning
- READING using meaningful material is the main source of input
- SPEAKING focuses on fluency. Accuracy is seen as subordinate. Vocabulary range and control, phonological control (pronunciation)
- WRITING is a series of lexical activities through which grammar is recycled. Grammar and vocabulary accuracy; orthographic control (spelling and punctuation).

To be able to:

- compare the different groups of elements
- recognize the chemical elements in everyday-life objects
- recognize the features of the elements on the basis of their position in the periodic table Ex. The number of electrons in the outer shell with the group number and the number of shells with the period number.
- distinguish between metals, non metals
- collect info from different sources, analyse and rielaborate them in a personal way

Knowledge:

- Students should have prior knowledge on:
- The atomic structure
- Protons, neutrons, electrons
- Valence electrons
- Electronic shells

- Electronic structure
- Relative atomic mass
- Atomic (proton) number
- Ionic charge
- Octet rule

Learning Outcomes

- At the end of the lesson, students should be able to:
- Describe the Periodic Table as an arrangement of the elements in order of increasing proton (atomic number).
- Describe the relationship between Group number (number of valence electrons) and Period number (number of electron shells).
- Explain the similarities between elements in the same group of the Periodic Table in terms of their electronic structure.
- Describe the change from metallic to non-metallic character from left to right across a period in the Periodic Table.
- Describe the relationship between group number, number of valency electrons and metallic/non-metallic character.

Common preconceptions or difficulties

Common preconceptions or difficulties for this section include:

- Students often are confused between the terms atomic number and atomic mass and do not know which is the one that governs the arrangement of elements in the Periodic Table.
- Students may only associate similarities in chemical behaviour with group names without understanding that electronic structure is the basis of such similarities.

Resources:

Laptop, Textbook, Powerpoint, Lesson Notes, Youtube videos, Whiteboard/blackboard and Visualizer.

Final product : didact video with group work prepared by the students

Methodology, classroom activities

- Teacher's lesson
- Multimedia laboratory activity
- Cooperative learning

Assessment tools

- Completing exercises and open questions
- Oral presentation of group work by members of the group
- Listening tests

Evaluation criteria both for language and content:

The students should be able:

- to understand and use properly scientific terminology
- to demonstrate knowledge and understanding of the topic
- to organize and present information clearly in appropriate forms.

INTRODUCTION : Revision of vocabulary			Activity sheet (1)
INSTRUCTIONAL MOVES	QUESTIONS TO ASK	RATIONALE	RESOURCES / REMARKS
Teacher recaps atomic structure and electronic structure with students. Students will be asked questions that will elicit key ideas previously learnt leading to the topic for the day.	<ul style="list-style-type: none"> What is the structure of an atom? <i>An atom consists of a small positively charged nucleus (protons and neutrons) with negatively charged electrons moving around it in specific shells or energy levels.</i> What is the atom made up of? <i>Protons, neutrons and electrons.</i> How many protons, neutrons and electrons does a sodium atom contain? <i>11 protons, 11 electrons and 12 neutrons.</i> <i>Where do you derive such information?</i> 	To recap atomic structure. It is important for students to know that information such as mass number, proton number and electron number can be derived from the Periodic Table. It is important to engage and activate students' prior knowledge based on constructivist theory.	Powerpoint (A) Activity sheet (2a,2b)
Teacher will state the lesson overview.	<ul style="list-style-type: none"> What is a Periodic Table? What important information can we derive from the Periodic Table? 	Stating the lesson overview explicitly at the beginning of the lesson would prepare students on what is to be expected for the lesson. It gives them a clear goal in mind and draw them to the focus of the lesson.	(Textbook) Video (B) Activity sheet (3,4)
Students will discuss the question on what patterns exist between elements.	Scientists always search for patterns or regularities in nature. What patterns do you think exist between elements? (Discuss question)	Appreciate that classification is an important skill in the study of Science.	
Group Activity: Each group of 4 students is given cards of unidentified elements. Information such as atomic mass, atomic number, on each card. These cards are mixed up. Students are supposed to arrange them in order that they deem fit and explain the reasons for the arrangement. Teacher will conduct discussion with the class. Students may come up with different ways of	Imagine you are a scientist trying to arrange all these elements into an order: <ul style="list-style-type: none"> How would you arrange these cards? Why? Is there a repeating pattern? How are the elements organised across the rows and down the columns? How many rows and columns are there? 	Appreciate that classification is an important skill in the study of Science. Group activity is incorporated to engage students in active learning. With this activity, students will make use of classification (pattern recognition).	Element cards (5) Activity sheet (6)

<p>arranging these elements. However, they must explain the reasons for their arrangement.</p> <p>Teacher will build on and explain the importance of key scientific process skills such as classifying and predicting in the discovery of the periodic table. Consequently, it is important to develop such important dispositions as science students.</p> <p>Teacher will conclude activity by mentioning that elements in the table are arranged and grouped according to trends and patterns. There are many variations of periodic table because scientists observed different trends and patterns in different arrangements. The current periodic table that is most widely accepted across the scientific community is the one first developed by Mendeleev.</p>	<p>Discussion question:</p> <ul style="list-style-type: none"> What are some important scientific process skills needed to derive the Periodic Table? <p>Classification.</p>	<p>Students will identify important scientific process skills for the study of Science. This will prepare them to develop key skills for further science education.</p>	<p>Activity sheet (7)</p>
<p>Brief history of periodic table and of the scientists who were involved in its discovery will be presented. From the invention of Periodic Table we draw a lesson: when a new idea is developed in Science, it will be challenged, improved and sometime proved wrong.</p>	<p>Who invented the Periodic Table?</p>	<p>Encouraging students to be critical and to challenge what they learn in Science.</p>	<p>Powerpoint (C) Activity sheet (8)</p>
<p>The definition of the Periodic Table and how elements are arranged will be recapped.</p>	<p>How are the elements in Periodic Table arranged? What is a group and what is a period?</p>	<p>Understanding of Periodic Table and how elements are arranged are important for students to have a general overview of the structure of a Periodic Table.</p>	<p>Video (D) Activity sheet (9)</p>
<p>Periods on the Periodic Table with different colour for each period will be shown. Periods are rows of a table.</p> <p>Students will be asked to draw full electronic structure of elements to illustrate important features of Periodic Table.</p>	<p>Can you draw the full electronic structure of sodium, aluminium and chlorine?</p> <p>Why do elements in the same group have similar chemical properties?</p>	<ul style="list-style-type: none"> to have a general overview of the structure of a Periodic Table; To clearly show the distinction of the different periods and groups. 	<p>Powerpoint (E) Activity sheet (10 a)</p>

<p>General trends across a period will be explained and expounded. Students will be asked to come forward to draw the full electronic structure of Na, Al and Cl (period 2). Their answers will be used to illustrate that there is increasing number of valence electrons across a period. In addition, elements have same number of electronic shells across a period.</p> <p>Groups on the Periodic Table with different colour for each group will be shown.</p> <p>General trends down a group will be explained and expounded. Students will be asked to come forward to draw the full electronic structure of elements (H, Li and K; Group I). Their answers will be used to illustrate key ideas such as: Increasing number of electronic shells (The atom becomes bigger) . Same number of valence electrons down group (The number is the same as the Group number represented by the roman numerals). Elements in the same group form compounds with similar formulae, and using Periodic Table we can derive some other information: Relative atomic mass Atomic (proton) number Element symbol Element name These are some other information that can be derived from Periodic Table directly.</p>	<p>What is a Periodic Table? - <i>Table of elements</i> - <i>The elements are arranged in the Periodic Table in order of proton number.</i> - <i>Using properties of some elements in a group or period, we can make predictions about other elements.</i></p> <p>Can you draw the full electronic structure of H, Li and K?</p> <p>Since H has one valence electron in the outermost shell, is H a metal? <i>The truth of the matter is H is not placed in any particular group. The hydrogen atom has one outer electron and it behaves like a metal in Group I. However, hydrogen can behave like a non-metal by reacting with more reactive metals to form metal hydrides.</i></p>	<p>The understanding of general trends across a period and a group allows students to be able to use the table effectively</p>	<p>Activity sheet (10b)</p> <p>Powerpoint (F)</p> <p>Activity sheet (10c)</p>
<p>Class Exercises on using Periodic Table to find important information of an element will be conducted. Magnesium will be used as an example for this class exercise.</p>	<p>What are some other important information that can be derived from the Periodic Table? What is the proton number? What is the electronic structure? Which group does Mg belongs to? What is the number of valence electrons? Is Mg metal or non-metal? Which period does Mg belongs to?</p>	<p>The in-class exercises act as a consolidation of concepts taught during the lesson and teacher is able to assess students' understanding.</p>	<p>Activity sheet (11)</p>

	<p>What is the number of filled electronic shells? What is the ionic charge? Can you draw the electronic configuration of Mg ion?</p>		
<p>Teacher will re-visit key points.</p>	<p>Who invented the Periodic Table? What is a Periodic Table? How are the elements in Periodic Table arranged? What is a group and a period? What important information can we derive from the Periodic Table?</p>	<p>Revisit key ideas and concepts so that students consolidate key points learnt.</p>	<p>Powerpoint (G) Activity sheet (12,13)</p>
<p>Module overview</p>			<p>Final Test (14)</p>