

'An Element of fun'

An entertaining way to teach Mendeleev's Periodic Table of elements

This activity has a simple objective: to provide an engaging way for a class of students to become familiar with Dmitri Mendeleev's Periodic Table of elements and to improve their research and creative abilities whilst working in a group.

The Periodic Table design is explained simply in terms of groups (elements with similar characteristics) and rows (increasing in atomic number). For simplicity the Lanthanides and Actinides are assigned to Group 3 (Figure 1 & Appendix 2) and the special position of Hydrogen in Group 1 noted.

Figure 1: The Periodic Table of elements
(Source - <https://sciencenotes.org/blank-periodic-table-pdf/>)

Students are then divided into 18 'Groups' to represent a positive characteristic associated with each specific group of elements. For example, the teacher might ask: "Which of you think you are independent?". The students who accept will be assigned to the noble gases, that are known to remain alone without bonding with other elements. "Who thinks they're generous?". The chosen students are assigned to the elements of Groups 1 and 2 respectively which freely give up electrons. Continuing in this way, each student is assigned to a group of between 4 to 7 chemical elements (depending on the number of students in the class) according to the table (Appendix 1), which can be adapted to suit the students in a class. An alternative is to let each student research and come up with his own group characteristics based on research.

To avoid including elements that are uncommon in chemistry (and sometimes difficult to pronounce), the teacher may decide to only include 6 rows and end the Periodic Table with the element Rn (atomic number 86).

Each student must learn and memorize his group sequence of chemical elements and research their characteristics using books and the internet – so each student has no more than 7 to learn. When everyone has been given sufficient time (in class and/or as homework) the teacher shows a

blank Periodic Table on a whiteboard or equivalent and the students representing each group of the Periodic Table are asked to fill in the table in the right order from memory. As they do so they are asked to introduce the characteristics of the Group to the rest of the class in whatever way they chose according to their research. This could be as a practical lesson using hand specimens, acting out the characteristics in a drama, song or mnemonic or showing artistic representations of the elements as drawings or paintings: the emphasis being on fun and creativity.

Further lesson reinforcement

1. Repetition: There is merit, at least in the first instance, for students to recite the Periodic Table out loud with the teacher helping with pronunciation of the more difficult elements. The teacher might then ask for a "speed test": each group reciting the periodic table in the shortest time possible (but the chemical elements must always be spelled out clearly). The teacher will use a stopwatch to measure the time taken. In this case the team spirit will be amplified, the students will cheer for each other, it will be a team effort.
2. At the end of the repetition students might be asked to discuss why the Periodic Table has been called the '**Alphabet of the Universe**' – *The alphabet is a list of letters that can make all the words of our language whilst the Periodic Table is a list of elements that can make all the substances in our Universe.* After which the teacher may ask "Do you know why the Periodic Table is so important? Because it explains**everything**" (the word **everything** is recited out loud by the class in chorus).
3. 'Mendeleev Bingo'!
Students are given a blank table (Appendix 3) and asked to fill in 10-25 elements of their choice (depending upon time), **in their correct place** on the table, **from memory**. A caller randomly chooses element names from a hat and states the group and row number. A student can only cross off this element as having been 'found' if they have the correct element in the correct position. The winner is the student who crosses off 5 correctly positioned elements first. This can be further developed by concentrating on selected areas of the table e.g. just the metals or non-metals or by considering only a stated number of Groups. This is to reinforce previous learning.

This very simple exercise has 2 great advantages:

- it makes studying the Periodic Table, which students might consider boring, simple and fun;
- it includes all students, even the less engaged or those who might have a learning disability, to feel an integral part of the group.

The back up

Title: 'An Element of fun'

Subtitle: An entertaining way to teach Mendeleev's Periodic Table of elements.

Topic: This activity can fix in the mind of young students an image of the Periodic Table and help them to learn some characteristics of the chemical elements

Age range of pupils: 12-16 years

Time needed to complete activity: 1 hour (plus)

Pupil learning outcomes: Pupils can:

- identify the position, characteristics and details of a group of elements in the Periodic Table;
- understand the design features of the Periodic Table;
- work together planning, preparing and delivering as a team.

Context: The Periodic Table is fundamental to the classification of all known materials in the Universe.

This activity provides an example of how this might be taught simply in a classroom in order to emphasise the main features of the table's design, function and the properties of the chemical elements.

Following up the activity:

Further lesson extensions are outlined in the activity. This activity may lead to a study of Earth minerals to compare their physical characteristics with those predicted by the Periodic Table (e.g. the lustre, conductivity and pliability of metals – aluminium, copper, compared to non-metals – sulfur, carbon).

Underlying principles:

- Elements in the Periodic Table are arranged by increasing atomic number (number of protons).
- The elements are arranged left to right in rows (Periods) and top to bottom in columns (Groups).
- Metals are found on the left side and in the middle of the table, nonmetals on the right, and metalloids along the diagonal line between the two.

Thinking skill development:

This is a group exercise and the students need to work as a team to complete the full Periodic Table. The success of the exercise depends upon the contribution made by everyone. The design of the Periodic Table allows students to establish the patterns upon which it is based. The variations in the pattern, e.g. Hydrogen and possibly the position of the Lanthanides and Actinides, may result in cognitive conflict. Explaining and discussing the results of the Group research involves metacognition. Applying the characteristics of the table to real world examples involves bridging.

Resource list:

- copy of the Periodic Table (Appendix 2)
- blank copy of the Periodic Table (Appendix 3)

Useful links:

<https://sciencenotes.org/colored-periodic-table/>
<https://sciencenotes.org/blank-periodic-table-pdf/>
https://www.youtube.com/watch?v=rz4Dd1I_fX0 - The Periodic Table Song
https://www.earthlearningidea.com/English/Earth_Materials.html#minerals

Source: This activity was devised by Mauro Martelli, a geologist and a secondary school teacher from Palermo (Italy), with Pete Loader of the ELI Team.

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Appendix 1

Periodic Table Group	Group characteristics
<i>Group 1</i>	students who feel generous (because in chemical bonding these elements tend to give up 1 or 2 electrons)
<i>Group 2</i>	
<i>Group 3</i>	students who know how to "enlighten others", i.e. knows how to give advice to others (the Sc is a bright and tender element)
<i>Group 4</i>	resistant and tenacious students (like Titanium - Ti), who do not get demoralized
<i>Group 5</i>	students who have strong and healthy teeth (Vanadium - V is important for dental health)
<i>Group 6</i>	students who are colourful (Chromium - Cr from the Greek for colour, is used in industrial pigments to produce different colours)
<i>Group 7</i>	students who are usually in good health (Manganese – Mn - helps the immune system)
<i>Group 8</i>	strong or sporty students (Fe is necessary to make steel, and to transport oxygen in the blood in order to allow long physical effort)
<i>Group 9</i>	students who particularly love the colour blue (Cobalt – Co is a strong blue colour)
<i>Group 10</i>	students who are not influenced by others (like Platinum - Pt, which resists corrosion)
<i>Group 11</i>	students who love jewellery (Silver - Ag and Gold -Au are in this group)
<i>Group 12</i>	students who take great care of their hair (Zinc - Zn helps maintain healthy skin and hair)
<i>Group 13</i>	students who love drinks in cans which are made of Aluminium – Al
<i>Group 14</i>	students with a range of interests (such as Carbon – C which forms an enormous variety of compounds in nature)
<i>Group 15</i>	students most involved in school activities (like Nitrogen - N which is the most abundant chemical element in the air we breathe).
<i>Group 16</i>	students who like to receive presents, (because in chemical bonding these elements tend to receive 1 or 2 electrons)
<i>Group 17</i>	
<i>Group 18</i>	students who are particularly independent (like the noble gases, which usually do not form bonds)

