

## UNIT 2. THE PERIODIC TABLE.

### Activity 1. Be an expert. Reading Comprehension. Comparisons.



1.1.- Work in groups of four. Two of you will read the text and the other two look at the table. Make some conclusions and discuss them.

What differences and similarities in each classification have you found?



#### Structure of the Periodic Table.

In the **periodic table** elements are arranged in horizontal rows, or **periods**, in order of **increasing atomic number**. The elements with similar chemical properties fall directly beneath one another in the same column, **group or family**.

There are **7 periods** and **18 groups**.

Groups have different names: **alkali metals** (group 1); **alkaline earth metals** (group 2); **transition metals** (groups 3 to 12); **boron group** (group 13); **carbon group** (group 14); **nitrogen group** (group 15); **chalcogens** (group 16); **halogens** (group 17); **noble gases** (group 18) and **lanthanides** (14 elements after lanthanum) and **actinides** (the 14 elements after actinium).

**Hydrogen** occupies a unique position at the top of the periodic table. It does not fit naturally into any Group.

#### Comparing elements.

##### Statements.

.....is/are like .....in that/in so far as.....

.....is/ are similar to.....in that/in.....

.....and .....are similar in that/in so far as.....

.....is/are different from.....because

.....in contrast.....

.....differ from.....in that.....

##### Connectors.

and...too

just as

similarly

in comparison

like

similar to



1.2.-Go to the web site to find out about Dalton' biography.

<http://www.answers.com/topic/john-dalton>

Watch the video about Marti Franqués filmed by your fellow students and compare Dalton to Martí i Franqués as scientists.

## Periodic Table of Elements

1	IA																																2	0															
1	H																																	2	He														
2	3	4																	5	6	7	8	9	10																									
	Li	Be																	B	C	N	O	F	Ne																									
3	11	12																	13	14	15	16	17	18																									
	Na	Mg	III B	IV B	V B	VIB	VIB	VII				IB	IB	Al	Si	P	S	Cl	Ar																														
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																															
	K	Ca	Sc	Ti	Y	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																															
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54																															
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																															
6	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																															
	Cs	Ba	*La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																															
7	87	88	89	104	105	106	107	108	109	110																																							
	Fr	Ra	+Ac	Rf	Ha	106	107	108	109	110																																							

\* Lanthanide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu

+ Actinide Series

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Legend - click to find out more...

<b>H - gas</b>	<b>Li - solid</b>	<b>Br - liquid</b>	<b>Tc - synthetic</b>
Non-Metals	Transition Metals	Rare Earth Metals	Halogens
Alkali Metals	Alkali Earth Metals	Other Metals	Inert Elements

### Activity 2. Let's be interactive! Power Point: The Periodic Table.



1.- Watch the Power Point and check the web .

[http://www.chem4kids.com/files/elem\\_pertable.html](http://www.chem4kids.com/files/elem_pertable.html)



Answer the Hot Potatoes activities.

2. How many groups has the Periodic Table got? How many periods?

3. Where are the non-metals located in the periodic table:

a. left; b. right; c. centre.

4. The elements with characteristics of both metals and non-metals are called:

a. noble gases; b. metalloids; c. halogens; d. alkali earth metals.

5.- Give the name of the liquid elements in the Periodic Table.

6. Choose the right answer:

6.1. Which of the following elements are halogens?

- a. Iodine.
- b. Sodium.
- c. Iron
- d. Chlorine

6.2. Group 2 of the periodic table is called.

- a. Halogens
- b. Alkali metals
- c. Alkali earth metals
- d. Noble gases

6.3. Which element has the largest mass?

- a. Lithium
- b. Rubidium
- c. Sodium
- d. Potassium

6.4. Which element is a transition metal?

- a. Phosphorus
- b. Rubidium
- c. Copper
- d. Carbon

6.5. The elements known as the alkali metals are found in Group

- a. 14
- b. 2
- c. 1
- d. 16

6.6. At normal room temperature conditions, the majority of elements are

- a. Solids
- b. Liquids
- c. Gases
- d. Plasmas

6.7. How many naturally occurring elements are found on Earth?

- a. 117
- b. 92
- c. 90
- d. 104

6.8. The most common elements in Earth's crust are:

- a. Calcium and carbon
- b. Aluminium and iron
- c. Sodium and hydrogen
- d. Oxygen and Silicon

6.9. The most common elements in Earth's atmosphere are:

- a. Oxygen and hydrogen
- b. Nitrogen and oxygen
- c. Oxygen and carbon
- d. Oxygen and Silicon

6.10. In the Periodic Table, elements are arranged by:

- a. Number of protons
- b. Atomic number
- c. Atomic mass
- d. Physical properties

6.11. Elements in the same group of the Periodic Table are arranged by:

- a. Number of protons
- b. Atomic number
- c. Atomic mass
- d. Physical properties

**Activity 3. The Periodic Table: Get familiar with the elements and atoms.**



3.1.-Write the symbol of the following elements, also give the catalan name:

<b>Name</b>	Potassium	Selenium	Manganese	Iodine	Hydrogen	Carbon	Phosphorus
<b>Symbol</b>							
<b>Name</b>	Calcium	Lithium	Tin	Sulphur	Strontium	Helium	Osmium
<b>Symbol</b>							
<b>Name</b>	Boron	Lead	Silicon	Sodium	Cobalt	Rubidium	Thallium
<b>Symbol</b>							

3.2.- Write the name of the following elements

<b>Name</b>								
<b>Symbol</b>	Cs	Ra	Al	Fe	Fr	Ni	Ir	N
<b>Name</b>								
<b>Symbol</b>	V	Be	Cd	Ga	Cr	Mg	Ba	Au
<b>Name</b>								
<b>Symbol</b>	O	W	Sb	Pt	Cl	In	Zn	As



### 3.2.-Write a song using the first paragraph for the lyrics.

An **atom** is the smallest particle of an element.

After 1932, when neutrons were discovered, we knew atoms were made of **electrons**, **protons** and **neutrons**. Protons and neutrons are located in the nucleus of the atom, and electrons are moving in orbits around the nucleus.

A **proton** has mass and a single positive electrical charge. **Neutrons** also have mass; approximately equal to the proton's mass, but they do not have an electrical charge.

**Electrons** are extremely light, its mass is 1/1840 of a proton, and have a negative electrical charge equal to the charge of protons.

We define **atomic number** as the number of protons found in the nuclei of an element and **atomic mass number** is the total number of neutrons and protons.

An atom with a charge is called an **ion**, if it has positive charge is called **cation**, but if it has a negative charge, it is called **anion**. For example, when sodium, loses an electron it becomes an ion with a +1 charge ( $\text{Na}^+$ ), but if one electron is added to chlorine, it becomes an ion with a -1 charge ( $\text{Cl}^-$ ).

#### Activity 4. The Periodic Table: Electron configuration.



#### Correlation with electron configuration

Elements in the same **Group** have the same **valence electrons\*** but at different levels.

The number of the period is the same as the number of the energetic level of the valence shell.

**Note:** \***Valance electrons** are the electrons on the outermost principal energetic level.



1. Choose the right answer:

- 1.1. An atom with an element belonging to the alkali metal family has
  - a. One outer shell electron.
  - b. Two outer shell electrons.
  - c. Three outer shell electrons.
  - d. Four outer shell electrons.
- 1.2. An atom with an element belonging to the alkali earth metal family has
  - a. One outer shell electron.
  - b. Two outer shell electrons.
  - c. Three outer shell electrons.
  - d. Four outer shell electrons.
- 1.3. An atom with an element belonging to the halogen family has

- a. One outer shell electron.
  - b. Two outer shell electrons.
  - c. All outer shell electrons but one.
  - d. Three outer shell electrons.
- 1.3. An atom with an element belonging to the noble gas family has
- a. One outer shell electron.
  - b. Two outer shell electrons.
  - c. All outer shell electrons.
  - d. Three outer shell electrons.
2. What have the elements of the same group got in common?
3. What have the elements of the same period got in common?
4. The electron configuration of the elements, A, B, C, D, E, F and G is:
- A:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$
- B:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^{10} 4p^6 5s^1$
- C:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^{10} 4p^6 5s^2 4d^4$
- D:  $1s^2 2s^2 2p^6 3s^1$
- E:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^1$
- F:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^{10} 4p^3$
- G:  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^{10} 4p^6 5s^2 4d^1$

Name the element and give the group and period it belongs to.

### Activity 5. The Periodic Table: Metals, non-metals and semi-metals.



#### Metals, non-metals and semi-metals

The elements of the Periodic Table are also divided into three groups: on the left you find **metals**. **Non-metals** are located on the right; and **metalloids** are situated on the stair-step line.

Most elements are **metals**. They are **shiny and good conductors** of heat and electricity. They have a high **density**, **high melting** and **boiling point**. They are **ductile** (they can be made into thin wires) and **malleable** (they can be hammered into thin sheets). Metals lose electrons and corrode easily.

**Non-metals** are **dull, brittle** (breaks easily) and they are a **poor conductor** of heat and electricity.

They have a low **density**; a **low melting** and **boiling point**. They tend to gain electrons.

When metals and non-metals react an ionic compound is formed.

**Metalloids** are solids, **ductile** and **malleable**. They can be **shiny** or **dull**. They also conduct heat and electricity better than non-metals, but not as well as metals.

1 H																	2 He																												
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne																												
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar																												
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																												
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe																												
55 Cs	56 Ba	57 *La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn																												
87 Fr	88 Ra	89 +Ac	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110 110	111 111	112 112	113 113																																	
<table border="1"> <tbody> <tr> <td>58 Ce</td> <td>59 Pr</td> <td>60 Nd</td> <td>61 Pm</td> <td>62 Sm</td> <td>63 Eu</td> <td>64 Gd</td> <td>65 Tb</td> <td>66 Dy</td> <td>67 Ho</td> <td>68 Er</td> <td>69 Tm</td> <td>70 Yb</td> <td>71 Lu</td> </tr> <tr> <td>90 Th</td> <td>91 Pa</td> <td>92 U</td> <td>93 Np</td> <td>94 Pu</td> <td>95 Am</td> <td>96 Cm</td> <td>97 Bk</td> <td>98 Cf</td> <td>99 Es</td> <td>100 Fm</td> <td>101 Md</td> <td>102 No</td> <td>103 Lr</td> </tr> </tbody> </table>																		58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu																																
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr																																



1.- Name and write the symbol of the metalloid elements.



2. Choose the right answer:

2.1. Which is not a characteristic of a metal?

- Shiny
- Malleable
- Insulators of heat and electricity
- Usually solid at room temperature.

2.2. Which of the following elements is not a non-metal?

- Al
- He
- S
- Te

2.3. Which is the characteristic of a non-metal?

- Usually solid at room temperature
- Malleable
- Insulates heat and electricity
- Ductile.

2.4. Which of the following elements is not a metal?

- Al
- K
- I
- Be



3.- Complete from the following word bank:

*heat, react, bridges, airplanes, suitable, aluminum, hard, jewelry, good conductor, copper.*

The properties of metals make them .....for different uses in daily life: Copper is a ..... of electricity and is ductile. Therefore ..... is used for electrical cables. Gold is used to make ..... because is malleable, ductile and difficult to..... Iron is ..... and strong. Therefore iron is useful to construct..... Aluminum is used to make saucepans because it is a..... . Because the density of..... is low, it is also used to make .....



4. Use this table to make four sentences about unusual metals and non-metals.

Mercury	is an unusual	metal	Because	it conducts electricity
Carbon graphite				it is soft and floats on water
Sodium		non-metal		it is liquid at room temperature
Aluminium				it has a low density

### Activity 6. Self assesment.

#### STUDENT SELF-EVALUATION CHECKLIST:(WHAT STUDENTS HAVE LEARNT)

1.- When you know the meaning of the following words, tick the box:

Alkaline <input type="checkbox"/>	Actinides <input type="checkbox"/>
Halogen <input type="checkbox"/>	Lanthanides <input type="checkbox"/>
Noble gases <input type="checkbox"/>	Metal <input type="checkbox"/>
Transition metals <input type="checkbox"/>	Non-metal <input type="checkbox"/>
	Metalloid <input type="checkbox"/>

2.- What ideas or parts of this unit do you think are:

- More interesting. - Not well explained.

- More difficult. - Most understood.

- Boring

3.- Write the tasks you think you have done the best at.

4.- Write the tasks you think you have done incorrectly.

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