Periodic Table and Electron Shell Configuration

Author: Simona Maggini

School: High School

Year/Class: Second

Subject: Chemistry

CLIL language: English

Student group profile: A2/B1

Estimated Time: 2 hours (minimum)

Topic of the lesson:	Periodic Table and Electron Shell Configuration This is the first lesson of the Unit "The Periodic Table". The purpose of the lesson is to introduce the Periodic Table and explain how useful classification is as a tool, specifically how the position of an element in the Periodic Table is linked to the electronic configuration of an atom of that element and so the properties of the element.
Future lessons in the Unit "The Periodic Table":	Atomic Rays and Ionization Energy: Trends Among Group and Period; Metals, Metalloids and Nonmetals.
Previous lesson:	Atoms and Subatomic Particles; Bohr Model.

	Subject	**Language**
Prerequisites:	States of matter, melting and boiling points of a substance, difference between elements and compounds, chemical formulas, difference between physical and chemical properties. Atoms, protons, electrons, neutrons, atomic and mass numbers, atomic mass. The Bohr model and orbits of electrons. Energy levels. Electron configurations, outer shells and valence electrons. Lewis structures.	Basic vocabulary referring to the physical states of matter: *solid, liquid, gas.* Basic vocabulary referring to the structure of an atom: *nucleus, proton, electron, neutron, atomic mass, mass and atomic number, orbit, shell, energy, valence electron, electronic configuration.* Ability to ask and answer questions, read and write numbers and listen and read for key words. Ability to share ideas: compare, explain, define, describe, summarize and predict using conditional tenses. Ability to report back to the class.

Objectives of the lesson

Main objective

The students should learn the basic principles of how the Periodic Table is organized and how to predict the properties of an element basing on its position in the Periodic Table and its electronic configuration. They should be familiar with a few specific examples of common elements and their physical properties in relation to position in the table and other similar elements.

Operationalized sub-objectives

Cognitive

At the end of the lesson the students should be able to:

- Determine the physical state of an element by knowing its melting and boiling point.
- Determine the number of protons, electrons and neutrons of an atom by knowing its atomic and mass number.
- Write the electronic configuration of the element using the Bohr model.
- Write the Lewis structure of an element.
- Recognize when an element has a complete outer shell.
- Know the meaning of “period” and “group”.
- Know that the number of valence electrons increases as you move left to right across a period.
- Know that all the elements in a group have the same number of valence electrons.
- Recognize in which group an element should belong by observing its electronic configuration.
- Know the trend of the melting and the boiling points in the Periodic Table.
- Associate the main group of the Periodic Table to a family.
- Know some properties of a family.

Linguistic

At the end of the lesson the students should be able to:

- Use the correct terminology involved in the description of the structure of an atom (*subatomic particles, energy levels, electronic configuration, valence electrons, outer shells, atomic mass, atomic number*, etc.) and the physical and chemical properties of a substance.
- Know and write the name of some elements of the Periodic Table.
- Define and describe observations in terms of physical and chemical characteristics of an element.
- Share an idea with their group partner.
- Report the group's idea.
- Express a prediction or hypothesis.
- Use the correct terminology for the structure of the Periodic Table.
- Summarize using key words related to the lesson's topic.

Methodology

For this lesson, the students will work in pairs. Working in pairs has been chosen to overcome inhibitions using English and to facilitate the collaboration.
The focus of the lesson lies in the explanation of how the Periodic Table can be used as a model to predict the properties of elements basing on the electronic configuration of the outer shell of atoms.

The lesson consists of the following stages:

- Introduction .
- A problematization stage and production stage in pairs followed by plenary.

- A second problematization stage and production stage in pairs followed by plenary.
- A third production stage in pairs followed by plenary.
- A conclusion stage.

In the **introduction** stage, the students will be divided in pair and presented with the topic of the lesson, together with the activity they will carry out.

The song “The Elements” by Tom Lehrer will be played to introduce the lesson.

In 1959, the Harvard mathematician Tom Lehrer recorded this song that would become an anthem for the elements known at the time (up to number 102). Since that time, 16 more elements have been discovered. Lehrer began performing at Harvard and then the song quickly spread. In the song, the final rhyme of "Harvard" and "discovered" is delivered as a parody of a Boston accent.

The song is meant to help students to develop the central question of the lesson (Periodic Table as a tool to classifying the elements). The song should also motivate the students and draw their attention to the variety of elements and to the difficulty to remember their name and their properties.

At this point the teacher will introduce how classification can be used to better remember and work with the elements. Stressing the meaning and the importance of classifying is necessary to make the task engaging. To help the students understand what classifying means, examples of classification will be given, from the simple arrangement of the clothes in a wardroom to the organization of historic periods as well as the classification of the different levels of the atmosphere.
Each pair group will receive a set of 18 cards of elements. The cards add a sort of playfulness to the lesson and make it easier for the students to focus on what is important. The pair groups should receive their cards at this stage to ensure they are not distracted during the lesson.

It is necessary, before moving to the problematization phase, to refresh the material of previous lessons such as: the structure of an atom, the types of sub particles, the meaning of mass and atomic number, and to link them with the concept of an element. This can be done explaining to the student how the card of elements should be filled in and thus asking questions about the meaning of the previous concepts.

The **problematization stages** and the **production stages** can be organized as follows. In the first problematization stage, a problem is givento triggers the student’s curiosity. Then some information is given which will be used by the students in the production stage to classify the element. In the second problematization stage, additional information is given which the student uses to expand on the solution from the first part. The production stages should last a maximum of 10 minutes to keep the lesson flowing. After each of the two production stages, the different classifications reported by the pair groups will be discussed in plenary. Each classification together with the explanation on why it has been adopted should be recorded by each pair group. The intention behind discussing the findings of each group in plenary is to make the students aware of the different possible classifications and in the attempt to reinforce the weaker students through comparison.

In the first two problematization stages, the following information should be given to the class:

> *Information given in the <u>first</u> problematization stage:* The reactivity and the use of the elements, the mass, and the melting and boiling points. The students need to write the name of the element on each card and add also the information on the physical state of the elements at room temperature obtained from the melting and boiling point values.

Information given in the <u>second</u> problematization stage: The atomic number of each element from which the student will obtain the information of the number of protons, electrons, neutrons, and draw the electronic configuration of the atom.

As an alternative, the reactivity and use of the elements, the melting and the boiling points, and the mass could be previously written on the cards by the teacher before the beginning of the lesson to optimize the lesson time. Instead, in order to refresh previous knowledge it is important to let the students find out the physical state of the elements at room temperature, the number of subatomic particles and the electronic configuration of every atom. This also serves to engage the student by starting with a simple achievable task.

After the second plenary, the worksheet "Periodic Table Basics 2" is given to the students. The students start the activity from step 9 of the worksheet and answer the questions proposed (the class have been already done steps 1 to 7 during the previous phases of the lesson; step 8 is optional).

During this work, the student will learn about the organization of the Periodic Table and how the outer shell of an atom is responsible for the reactivity of an element. At the end of the worksheet the students will use the knowledge acquired to make predictions about the number of electrons in the outer shell of unfamiliar elements.

In the review and summation stage, the teacher compares in plenary the answers given in the worksheet by the different pair groups and highlights the key points of the lesson.

At this stage, a brief story on the Periodic Table and Mendeleev should be related to make the lesson more complete.

In the mid-1700s, chemists began actively identifying elements but it was only in 1869 that the Russian chemist Dmitri Mendeleev proposed what we call now the Periodic Table. At the time only 60 elements had been discovered and were normally grouped either by their atomic mass or by their common properties. Mendeleev, who was also a professor at the Technical Institute in St. Petersburg, knew that a critical reason for peoples' difficulty in understanding chemistry was the lack of a clear system for classifying the known elements. The story says that Mendeleev made up a set of cards, one for each of the elements known at the time. Mendeleev wrote the atomic mass and the properties of each element on a card and set to work organizing the elements with his cards. The story says that after three days and nights of continually arranging and rearranging the cards in various sequences he fell asleep. In his dream he saw a table, where all the elements fell into place as required. Once awake he wrote the arrangement of the table down. In the table, the elements were arranged in order of increasing atomic mass and their properties were repeated. Because the properties repeated themselves regularly, or periodically, the system became known as the periodic table.
The atomic numbers were not known yet since the subatomic particles were still undiscovered. We now know that it is the atomic number, not the atomic mass, that governs an element's position in the Periodic Table but in most cases the two result in the same order.
The greatness of Mendeleev was that he found the right arrangement of the elements in the face of noisy and incomplete data. In other words, by not matching completely the order of the atomic mass and leaving spaces for elements that were not yet discovered, he helped change chemistry from a collection of empirical facts to a theoretical science.

Optionally, instead of the teacher explaining the history of the periodic table, a short video can be shown. In the conclusion stage the students will receive homework. **The homework is intended to review the work done in class and act as a form of consolidation**. The video of the Fuse School:

"What are Periods and Groups in the Periodic Table?" is to recall what has been done in class. It is a short video (3 minutes long) which explains the concept of the periodic table from the same point of view of the lesson. The history of the Periodic Table can be then deepened hrough the reading of the webpage: "The development of the Periodic Table - Dmitri Mendeleev" of the Royal Society of Chemistry. The document is not excessively long and can be easily connected to the video shown in class at the end of the lesson on Dimitri Mendeleev.
After having read the text the student can read the questions at the bottom of the document and match their answers with the ones available in the page (see "click here to see the answers").
The online quiz, set on the platform Quizizz.com, is then used **to check the achievement of learning goals**. The quiz is composed of questions which are built to check if the material presented in class and expanded at home has been understood and acquired. The Quizizz platform is similar to the Kahoot! platform. It is a game-based learning platform which engage the students and it is used in this case to make the homework fun.

Alternatively, a revision map could be proposed (see map of the Royal Society of Chemistry), especially if the students manifest difficulties in concentrating and learning through just electronic data. To help the weaker students to compile the revision map the linking sentences could be given. The students in this case will have to match the sentence with the correct link in the map.

During the lesson the technique of recasting and sentences will be used to help the students in their verbalization. If linguistic difficulties emerge during the lesson, especially during the production stage, a list of words (such as the one on page 12 or a more extensive one as necessary) will be supplied. If this type of scaffolding is not enough, a list of word chunks or parts of phrases will be added.

Analysis of the lesson

In the first part of the lesson the students will have to use their knowledge and demonstrate basic understanding of concepts by filling the element cards. Low order thinking skill such as: remembing, understanding and applying knowledge are required.
High order thinking skills such as analyzing, evaluating and creating are fostered in the classification tasks.
Intercultural content will be introduced in the lesson through the Tom Lehrer song and the history of the development of the periodic table.

Resources

Video: "*Elements Song by Tom Lehrer*" http://www.teachertube.com/video/elements-song-by-tom-lehrer-145369

Alternative link: "*The Elements – Sung by Tom Lehrer*":
https://www.youtube.com/watch?v=6b2Uy1TDAl4

"Periodic Table Basics 2 cards" and "Sample card", downloaded for free at "The Science Spot" website:
http://sciencespot.net/Pages/classchem.html#Anchor-ptable

The worksheet "Periodic Table Basics 2", downloaded for free at "The Science Spot" website:
http://sciencespot.net/Pages/classchem.html#Anchor-ptable

Ted-Ed Video: "*The genius of Mendeleev's periodic table - Lou Serico*"
https://www.youtube.com/watch?v=fPnwBITSmgU&t=185s

Ted-Ed Video: "*Solving the puzzle of the periodic table - Eric Rosado*"
https://www.youtube.com/watch?v=O-48znAg7VE

Fuse School Video: "*What are Periods and Groups in the Periodic Table?*"
https://www.youtube.com/watch?v=7mLPC74GHMo

"The development of the Periodic Table - Dmitri Mendeleev" from the Royal Society of Chemistry:
http://www.rsc.org/education/teachers/resources/periodictable/pre16/develop/mendeleev.htm

Online quiz on the periodic table – Quizizz.com: "Periodic Table" (60 multiple choice questions)
https://quizizz.com/admin/quiz/58f215ef18101214009963c6

Periodic table revision map from the Royal Chemical Society website:
http://www.rsc.org/education/teachers/Resources/aflchem/resources/27/index.htm

Games on the families of the periodic table:
http://education.jlab.org/elementcrossword/

The Bitesize - "Periodic table groups":
http://www.bbc.co.uk/schools/gcsebitesize/science/add_edexcel/periodic_table/groupsrev1.shtml

In the Appendix: list of the properties and uses of the elements, pictograph vocabulary, student feedback form.

Appendix

Detailed Lesson Plan

T – teacher; S – students; Class discussion - Teacher-led class discussions.

Stage	Activity aim	Content	Interaction	Materials and Media
Introduction/ presentation of the lesson and aims	Motivate the students and sharing with them expected outcomes.	T presents the topic of the lesson and the activity that the student will do. The song "The Elements" by Tom Lehrer will be played to introduce the lesson. T will introduce how classification can be used to remember and work with the elements. Each pair group will receive a set of 18 cards of elements.	Class discussion (transactional)	Link to the video: http://www.teachertube.com/video/elements-song-by-tom-lehrer-145369 otherwise as alternative "The Elements – Sung by Tom Lehrer": https://www.youtube.com/watch?v=6b2Uy1TDAl4 "Periodic Table Basics 2 cards" can be downloaded for free at "The Science Spot" website: http://sciencespot.net/Pages/classchem.html#Anchor-ptable The "sample card", available from the same website, can be used by the teacher as reference.
Warm up questions	Recall previous knowledge and scaffolding.	The structure of an atom, the types of sub particles, the meaning of mass and atomic number are reviewed and linked with the concept of an element.	Class discussion. Question-and-answer (interactional)	

Problematization stage 1 and 2	Introduce the idea of the periodic table as a classification of elements.	T asks the students the question: "*Is it possible to find a useful classification for the different elements?*" T gives the students the information in two different problematization stages. After each problematization stage there is a production stage and a review of the production. <u>In the first problematization stage,</u> T gives information on: name and mass of the element, chemical reactivity and use, melting and boiling point (the students will then determine the physical state of the element at room temperature). <u>In the second problematization stage,</u> T gives information on: atomic number (the students will then determine the number of protons, electrons and neutrons, and the electronic configuration of the atom).	Class discussion (interactional)	List of the properties and uses of the Elements - page 10 + pictograph vocabulary – page 12
Production - stage 1 and 2	Learn how the method of classifying can change basing on the different information available.	Ss find a method of classification and explain their choice.	Pair work	
Review of the production stage 1 and 2	Summarize the findings.	T discusses with the class the classification adopted by each group	Class discussion (interactional)	

Production stage 3	Learn about the organization of the periodic table and how the external electronic configuration is linked to the properties of the elements.	Ss start from the step 9 of the worksheet and answer to the questions proposed (the class hasalready done steps 1 to 7 during the previous phases of the lesson; step 8 is optional).	Pair work	The worksheet “Periodic Table Basics 2” can be download for free at “The Science Spot” website: http://sciencespot.net/Pages/classchem.html#Anchor-ptable
Review and recap	Review the key points of the lesson.	T compares with the class the answers given and the key points of the lesson are discussed. Optionally, a brief video can be used to show the history of the periodic table.	Class discussion (interactional)	Link to the video Ted-Ed: “The genius of Mendeleev's periodic table - Lou Serico” https://www.youtube.com/watch?v=fPnwBITSmgU&t=185s otherwise as alternative the video Ted-Ed: ” Solving the puzzle of the periodic table - Eric Rosado” https://www.youtube.com/watch?v=O-48znAg7VE
Conclusion	Consolidate the learning outcomes	Ss receive the homework: watch a video and answer to an on-line quiz+ fill periodic table revision map.	Individual work	To recall what has been done in class, S can watch the video of the Fuse School: “What are Periods and Groups in the Periodic Table?” https://www.youtube.com/watch?v=7mLPC74GHMo “The development of the Periodic Table - Dmitri Mendeleev” from the Royal Society of Chemistry: http://www.rsc.org/education/teachers/resources/periodictable/pre16/develop/mendeleev.htm Online quiz on the periodic table – Quizizz.com: “Periodic Table” https://quizizz.com/admin/quiz/58f215ef18101214009963c6 Periodic table revision map from the Royal Society of Chemistry website:http://www.rsc.org/education/teachers/Resources/aflchem/resources/27/index.htm

				Additional material: Games on the families of the periodic table: http://education.jlab.org/elementcrossword/ To deepen the knowledge on the families of the periodic table - Bitesize “Periodic table groups”: http://www.bbc.co.uk/schools/gcsebitesize/science/add_edexcel/periodic_table/groupsrev1.shtml

Properties and Uses of the Elements

H - **properties:** is the most abundant chemical substance in the universe (It is found in the sun and most of the stars), it is highly flammable and burn in air forming H_2O, it forms compounds with most elements. **Uses:** industrial production of ammonia (NH_3), methanol (CH_3OH) and hydrochloric acid (HCl).

Li - **properties:** conducts electricity and heat, reacts with oxygen to form the metal oxide Li_2O and vigorously with water to form the metal hydroxide LiOH. **Uses:** anti-depressant, batteries.

Na - **properties:** conducts electricity and heat, reacts with oxygen to form the metal oxide Na_2O and vigorously with water to form the metal hydroxide NaOH. **Uses:** street lamps, table salt (NaCl)**.**

Be - **properties:** conducts electricity and heat, reacts with oxygen to form the metal oxide BeO which acts as protective oxide layer preventing the reaction with water (otherwise $Be(OH)_2$ will form). **Uses:** emeralds, telescope mirrors.

Mg - **properties:** conducts electricity and heat, reacts with oxygen to form the metal oxide MgO and with water to form the metal hydroxide $Mg(OH)_2$. **Uses:** alloy wheels, flares.

B - **properties:** is a poor conductor of electricity and heat at room temperature but its conductivity improves markedly at higher temperatures, reacts with oxygen to form the metal oxide B_2O_3. **Uses:** glassware, detergent.

Al - **properties:** is the third most abundant element in the earth's crust, conducts electricity and heat, reacts with oxygen to form the metal oxide Al_2O_3. **Uses:** drink cans, aircraft bodies.

C - **properties:** reacts with oxygen to form CO_2 or CO, reacts with hydrogen to form the hydride CH_4. **Uses:** diamonds, carbon dating.

Si - **properties:** reacts with oxygen to form SiO_2 and with hydrogen to form the hydride SiH_4. **Uses:** glass, electronics.

N - **properties:** is the most abundant element in the earth's atmosphere, reacts with oxygen to form various nitrogen oxides, reacts with hydrogen to form the hydride NH_3. **Uses:** explosives, fertilizers.

P - **properties:** phosphorus containing calcium phosphate $Ca_3(PO_4)_2$ compound make up 70% of human bone, reacts with oxygen to form various phosphorus oxides, reacts with hydrogen to form the hydride PH_3. **Uses:** safety matches, smoke bombs.

O - **properties:** makes up 65% of the human body, reacts with hydrogen to form the hydride H_2O. **Uses:** making steel, rocket fuel.

S - **properties:** reacts with oxygen to form SO_2 or SO_3, SO_3 reacts with water vapor to form sulfuric acid and cause acid rain. Reacts with hydrogen to form the hydride H_2S. **Uses**: gunpowder, sulfuric acid.

F - **properties:** reacts with oxygen to form OF_2 and with hydrogen to form HF. Reacts with metals to form metal halides. **Uses**: toothpaste, refrigerant gases.

Cl - **properties:** reacts with oxygen to form Cl_2O and with hydrogen to form HCl. Reacts with metals to form metal halides. **Uses**: bleach, chemical warfare.

He - **properties:** is the second most abundant element in the universe, glows pale peach when an electric current run through it, it is very unreactive and rarely form compounds. **Uses**: balloons.

Ar - **properties:** glows rich sky-blue when an electric current run through it, it is very unreactive and rarely form compounds. **Uses**: medical laser, light bulbs.

Ne - **properties:** glows bright red when an electric current run through it, it is very unreactive and rarely form compounds. **Uses**: neon lights, refrigerant.

Pictograph Vocabulary (free images downloaded from pixabay.com)

A

Aircraft Body 

Alloy Wheel 

Anti-Depressant 

B

Balloon 

Battery 

Bleach 

C

Carbon Dating 

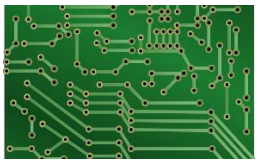
D

Detergent 

Diamond 

Drink Can 

E

Electronics 

Emerald 

Explosives 

F

Fertilizer 

Flares 

G

Glassware 

Gunpowder 

L

Light Bulb 

M

Medical Laser 

N

Neon Light 

R

Rocket 

S

Steel 

Street Lamp 

T

Table Salt 

Telescope Mirror 

Toothpaste 

W

Warfare 

FEEDBACK FORM

1. Subject matter……

2. Information / unclear aspects……

3. Difficult encountered……

4. Any suggestions……

B

P=_
N=_
E=___

O S
O L
O G

M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure

B

H

P=_
N=_
E=___

O S
O L
O G

M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure

H

O

P=_
N=_
E=___

O S
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M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure

O

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O G

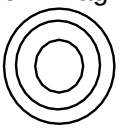
M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure



P

C

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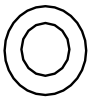
M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure



C

Mg

P=_
N=_
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O S
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O G

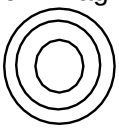
M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure



Mg

F

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Properties

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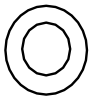

F

Ar

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O G

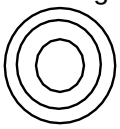
M.P. = _____

B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure



Ar

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P=_
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B.P. = _____

Properties

Uses

Bohr Diagram Lewis Structure

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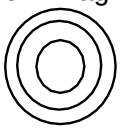
Properties

Uses

Bohr Diagram Lewis Structure



Al

N

P=
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O S
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M.P. =

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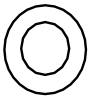
Properties

Uses

Bohr Diagram Lewis Structure



N

S

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Properties

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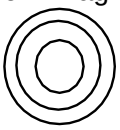

S

Li

P=
N=
E=

O S
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M.P. =

B.P. =

Properties

Uses

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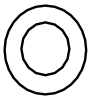


Li

Si

P=
N=
E=

O S
O L
O G

M.P. =

B.P. =

Properties

Uses

Bohr Diagram Lewis Structure

Si

Be

P=
N=
E=

O S
O L
O G

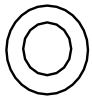
M.P. =

B.P. =

Properties

Uses

Bohr Diagram Lewis Structure



Be

Na

P=
N=
E=

O S
O L
O G

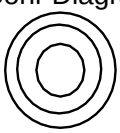
M.P. =

B.P. =

Properties

Uses

Bohr Diagram Lewis Structure



Na

Ne

P=
N=
E=

O S
O L
O G

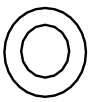
M.P. =

B.P. =

Properties

Uses

Bohr Diagram Lewis Structure



Ne

Cl

P=
N=
E=

O S
O L
O G

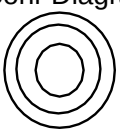
M.P. =

B.P. =

Properties

Uses

Bohr Diagram Lewis Structure

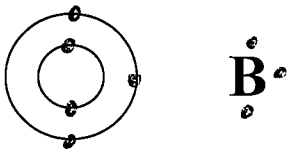


Cl

5
B
Boron
10.81

P = 5 N = 6 E = 5

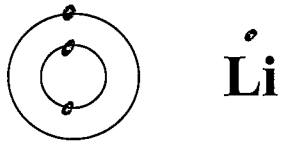
● Solid ○ Liquid ○ Gas



3
Li
Lithium
6.941

P = 3 N = 4 E = 3

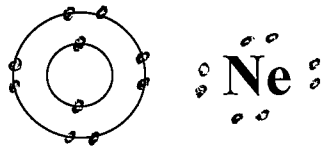
● Solid ○ Liquid ○ Gas



10
Ne
Neon
20.18

P = 10 N = 10 E = 10

○ Solid ○ Liquid ● Gas



2
He
Helium
4.003

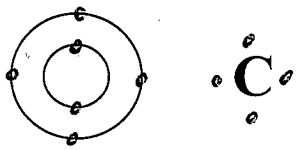
P = 2 N = 2 E = 2

○ Solid ○ Liquid ● Gas

6
C
Carbon
12.01

P = 6 N = 6 E = 6

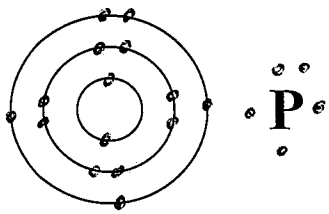
● Solid ○ Liquid ○ Gas



15
P
Phosphorus
30.97

P = 15 N = 16 E = 15

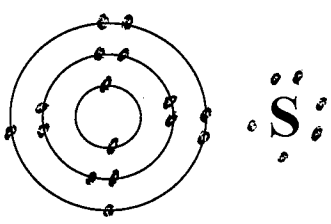
● Solid ○ Liquid ○ Gas



16
S
Sulfur
32.07

P = 16 N = 16 E = 16

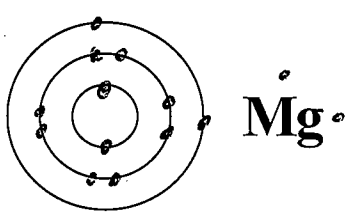
● Solid ○ Liquid ○ Gas



12
Mg
Magnesium
24.31

P = 12 N = 12 E = 12

● Solid ○ Liquid ○ Gas



1
H
Hydrogen
1.008

P = 1 N = 0 E = 1

○ Solid ○ Liquid ● Gas

7

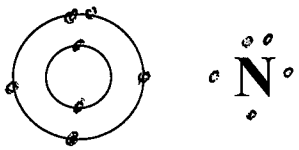
N

Nitrogen

14.01

P = 7 N = 7 E = 7

○ Solid ○ Liquid ◉ Gas



13

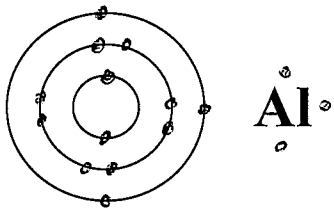
Al

Aluminum

26.98

P = 13 N = 14 E = 13

◉ Solid ○ Liquid ○ Gas



9

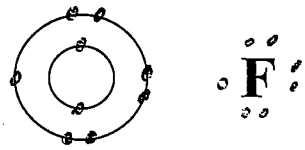
F

Fluorine

19.00

P = 9 N = 10 E = 9

○ Solid ○ Liquid ◉ Gas



18

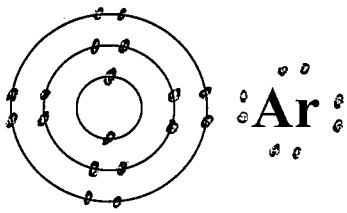
Ar

Argon

39.95

P = 18 N = 22 E = 18

○ Solid ○ Liquid ◉ Gas



14

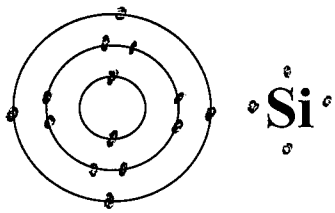
Si

Silicon

28.09

P = 14 N = 14 E = 14

◉ Solid ○ Liquid ○ Gas



11

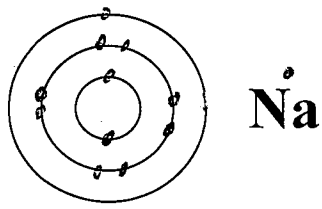
Na

Sodium

22.99

P = 11 N = 12 E = 11

◉ Solid ○ Liquid ○ Gas



4

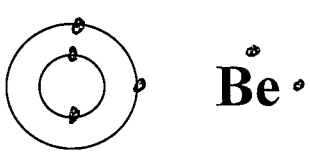
Be

Beryllium

9.012

P = 4 N = 5 E = 4

◉ Solid ○ Liquid ○ Gas



8

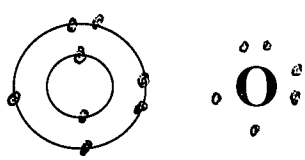
O

Oxygen

16.00

P = 8 N = 8 E = 8

○ Solid ○ Liquid ◉ Gas



17

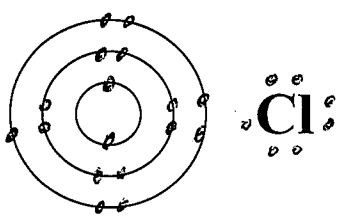
Cl

Chlorine

35.45

P = 17 N = 18 E = 17

○ Solid ○ Liquid ◉ Gas



Periodic Table Basics

Step 1: Complete the square for each element by filling in the atomic number, name, & atomic mass.

Step 2: Determine the number of protons, neutrons, and electrons in an atom of each element.

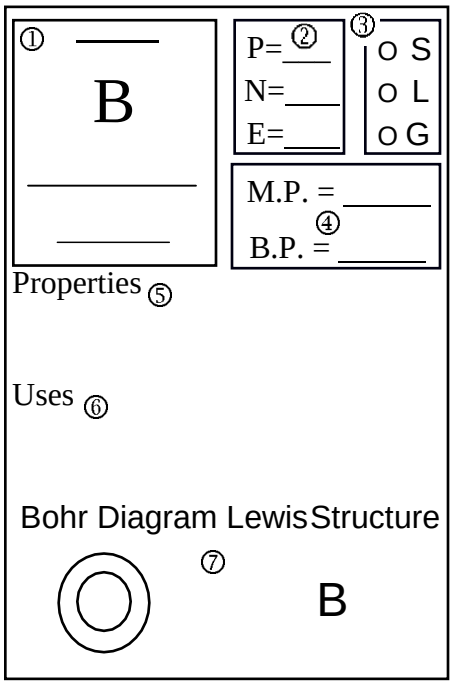
Step 3: Identify if the element is a solid, liquid, or gas at room temperature.

Step 4: Give the melting (M.P.) and boiling points (B.P.) in degrees Celsius.

Step 5: List at least three physical or chemical properties for each element.

Step 6: List at least three uses for each element.

Step 7: Draw a Bohr diagram and Lewis Structure to show the arrangement of electrons and the number of valence electrons.



Step 8: Use the following colors to shade in the square for each element. You should ONLY color the small square in the upper left-hand corner and not the entire card.

Green = Li & Na	Pink = O & S	Blue = Be & Mg	Purple = F & Cl
Orange = B & Al	Red = C & Si	Tan = N & P	Yellow = He, Ne, & Ar

Step 9: Cut the cards apart and arrange <u>according to atomic number</u> in the pattern shown. Once you have the cards arranged in the correct order, glue them to a large sheet of construction paper.

1							2
3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18

Done? Answer the questions on the worksheet using the information on your Periodic Table!

The Science Spot

Need information? Visit the Periodic Table links on the <u>Chemistry</u> page of the <u>Kid Zone</u>!

Go to http://sciencespot.net/
and click the Kid Zone graphic!

Periodic Table Basics Name _____

Use your periodic table to answer each question.

1. How many elements in your table were:

(a) solids? _____ (b) liquids? _____ (c) gases? _____

2. Which elements had complete outer shells? Give the name and symbol for each.

_____ _____ _____ _____ _____ _____

3. What do you notice about the location of the elements in Question #2?

4. Which elements had only one valence electron? Give the name and symbol for each.

_____ _____ _____ _____ _____ _____

5. What do you notice about the location of the elements in Question #4?

6. What do you notice about the number of valence electrons as you move from left to right across a period (or row) in the periodic table? (Example: Na → Ar)

7. What do you notice about the number of valence electrons as you move down a group or column in the periodic table? (Example: H → Li → Na)

8. What do you notice about the number of energy levels or shells as you move down a group or column in the periodic table? (Example: H → Li → Na)

9. What do you notice about the melting points as you move from left to right across a period (or row) in the periodic table? (Example: Li → Ne)

10. What do you notice about the boiling points as you move from left to right across a period (or row) in the periodic table? (Example: Li → Ne)

11. Each column or group in the periodic table is called a family. Elements are organized into families according to their physical and chemical properties. Identify the elements that belong to each family based on the number of valence electrons. Give the name and symbol for each element.

HINT: You will only use the elements you colored in Step 8!

Alkali Metals - 1 valence electron _____ _____

Alkaline Earth Metals - 2 valence electrons _____ _____

Boron Family - 3 valence electrons _____ _____

Carbon Family - 4 valence electrons _____ _____

Nitrogen Family - 5 valence electrons _____ _____

Oxygen Family - 6 valence electrons _____ _____

Halides - 7 valence electrons _____ _____

Noble Gases - Complete outermost shell

_____ _____ _____ _____ _____ _____

12. What do you notice about the location of the elements in each family?

13. How would you classify hydrogen? Give at least one reason.

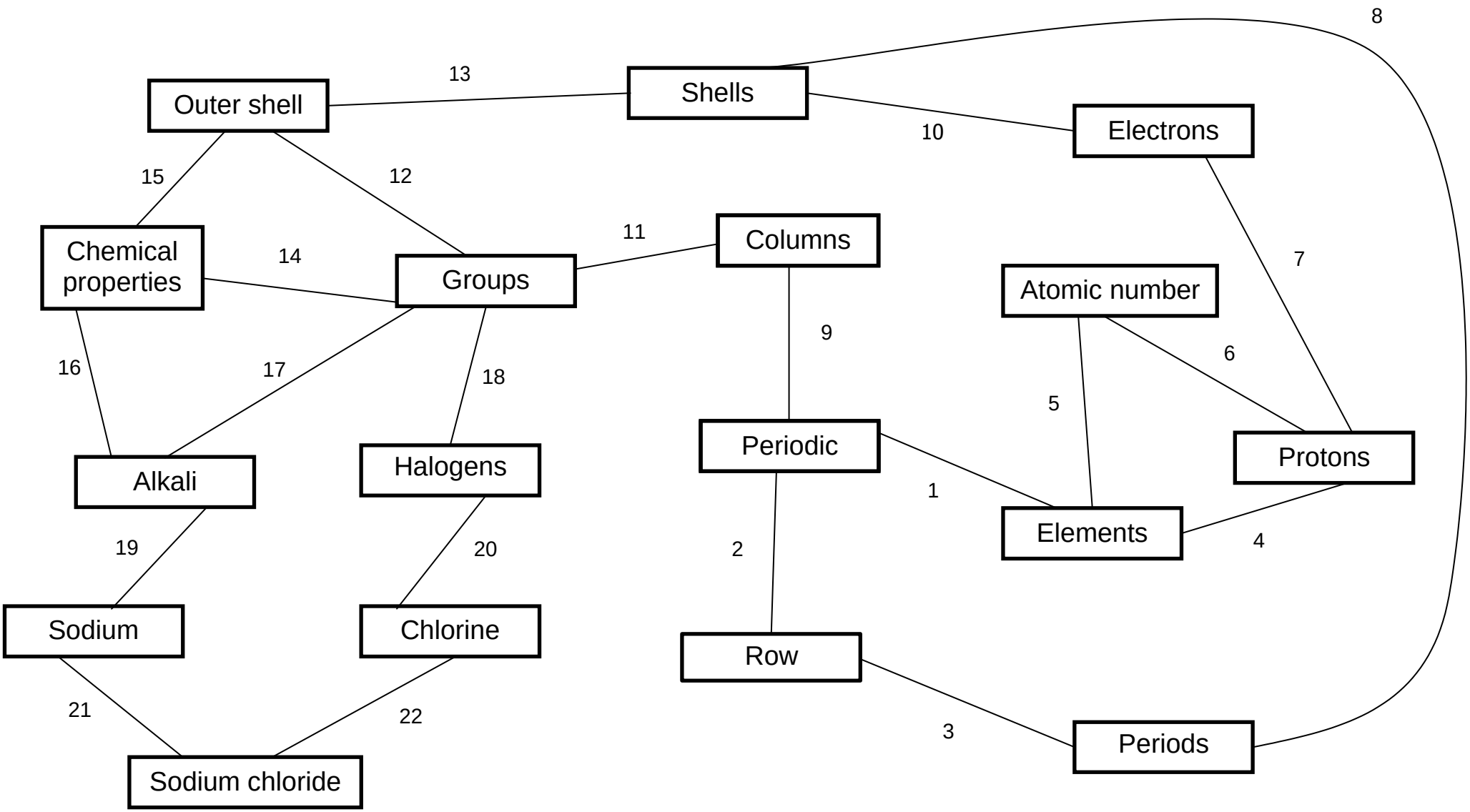
14. Do any of the elements have similar properties? If yes, list the names of the elements and the properties they have in common.

15. Do any of the elements have similar uses? If yes, list the names of the elements and the uses they have in common.

Challenge: Predict the number of valence electrons for each element based on its location in the Periodic Table of Elements. You will need to use the periodic table in your textbook.

Barium = _____ Lead = _____ Xenon = _____ Potassium = _____

The Periodic Table
Revision Map



Revising the periodic table
Worksheet

The Revision map for the Periodic Table is made up of boxes.
In the boxes are words we use about the Periodic Table.
The boxes are connected by numbered lines.

- Connect the words in the boxes together, with a sentence.
- Write down your sentence for each of the numbered lines.
- Use the same number in the table as the line you are writing about.

One of the sentences has been done, to get you started.

Name ……

1	
2	
3	
4	The atoms of different elements contain different numbers of protons.
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	

15	
16	
17	
18	
19	
20	
21	
22	

At my first attempt I completed sentences numbered

After talking with other students I also completed sentences numbered