

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019
Topic: Atoms, molecules and ions

Stage 1 - Desired Results

Established Goal(s):

In the first part of this chapter, the students will understand how the closeness and motion of the particles influences the properties of the three states of matter students. Then further of the chapter, they will understand what the substances were made from in order to explain how chemical substances behave when brought to react. Students will understand the structure inside the atoms themselves, and the role of electrons, protons and neutrons. They will then be able to design and make materials and objects almost at the atomic level. Students will understand arrangement of the electrons within an atom and how they are organized in different energy levels and understand the effects of these arrangements. They will understand the concept of ionic and covalent bonding, predict which bonding an element will form and be able to draw diagrams to show it. In this chapter we shall focus on atoms, molecules and ions.

Understandings:

Students will understand ...

- that all matter is made up of small particles.
- the particle nature of, and motion in solids, liquids and gases.
- how the change in temperature affects the movement of the particles in each physical state
- the composition of elements and compounds.
- how to write the symbols of elements and some simple compounds with their formula.
- the structure of an atom.
- the difference between ionic and covalent compounds
- how ionic and covalent bonds are formed
- the arrangement of electrons in energy levels in relation to chemical bonding.
- importance of achieving the noble gas configuration for atoms.
- how to draw electron-dot for compounds.
- How ionic and covalent molecular substances differ in terms of properties.

Essential Questions:

- How does the motion of particles in solid, liquid and gas change as the temperature increases?
- What are the elements and compounds composed of?
- How were the symbols of elements derived?
- Name some simple compounds with their formulae.
- How are the electrons arranged in energy levels?
- Describe the structure of an atom.
- What information does the periodic table provide and how is it used?
- How does the electron dot structure relate to the chemical bonding?
- What is a molecule?
- What is the difference between ionic, covalent and metallic bonding?
- Can the physical properties of substances be predicted from the type of bonding present?
- How do ionic and molecular compounds differ in their properties?

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

<p>Knowledge: <i>Students will know ...</i></p> <ul style="list-style-type: none"> • That particles move and interact in different ways • What atoms are made of • That diagrams can show covalent bonding in different elements • What a molecule is • That some elements form bonds and others don't • Non-metal atoms form covalent bonds with each other • think critically based on scientific concepts and theories being taught the electron-dot structure and electron configuration • make observations from a scientific perspective • think scientifically and use scientific knowledge to make decisions on real world problems. • think analytically by evaluating evidence using relevant criteria ; develop appropriate conclusions as well as new questions • develop skills on how to be open-minded in communicating and sharing ideas towards peers • read, interpret & examine scientific claims • pose questions & form hypotheses based on personal observations, scientific articles, experiments & knowledge • develop teamwork in group activities • enhance creativity and resourcefulness upon doing the task 	<p>Skills: <i>Student will be able to...</i></p> <ul style="list-style-type: none"> • explain the differences of the movement and arrangement of particles of matter that influence their respective physical properties • identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses • deduce the numbers of protons, neutrons and electrons present in both atoms and ions given proton and nucleon numbers and charge • state the electronic configuration of atoms and ions given information. proton number and charge • describe the different types of bonding using dot structures • describe, interpret and predict the effect of different types of bonding on the physical properties of substances • infer the type of bonding present based on the • predict the physical properties of substances from the type of bonding present. • explain why group 0 elements do not form bonds while atoms of other elements do form bonds • explain what a molecule is • draw diagrams to show to show bonding in elements
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Stage 2 - Assessment Evidence

<p>Performance tasks:</p> <ul style="list-style-type: none"> • Class project: Make a 3D model of a specific molecule and give a presentation in class on its boiling point, melting point, state at room temperature and what it can be used for. • Design a poster / 3D model of chosen elements and discuss how their chemical symbols were derived • Exercises 1-7; 9-11 • Design a 3D model for chosen atoms and discuss its 	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Two individual assessments (Mid-Term/Final) accounting for the assigned percentage of the overall course grade. • Homework, participation, behavior and attendance • Grades based on presentation of knowledge and ideas
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The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

electron configurations, their bonding capabilities and how bonding takes place

- Explain the concept of achieving noble gas configuration, naming noble gases and explaining their respective properties through presentations
- Chemical bond worksheets
- Exercises 24-28; 29-30; 32; Test yourself 35-46
- Accomplishing post-lab questions

Stage 3 – Learning Plan

Learning Activities

- Lecture/Discussion/Overhead Presentation.
- Experiments/Small-group work/Cooperative Learning.
- Videos showing related to the subject.
- Students draw their current concept of atom, display in the class and discuss and list common concepts
- Finding the element activity. Students will be given the no of protons, neutrons and electrons then they identify the element in the periodic table or v.v.
- Electron configuration class activity (<http://www.bondwithjames.com/2015/10/electron-configuration.htm>)
- video showing to further explain ionic and covalent bonding
- Lewis dot structure activity (<https://study.com/academy/lesson/lewis-dot-structure-activities-games.html>)

Discuss in groups / Group Activity

- Understanding using models
- Writing chemical equations and formulas
- Identifying the common and chemical name to every given chemical formula
- Identifying atomic symbols and atomic mass of an element using the periodic table
- Constructing the orbital diagram and drawing the electron dot structure of an element
- Class project: Make a 3D model of a specific molecule and give a presentation in class its boiling point, melting point, state at room temperature and what it can be used for.

- Laboratory: Gumdrop Atom Activity

- Lab Experiment: Atoms and Molecules

- Lab Experiment: Ionic and Covalent Bonds

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019
Topic: Chemical reactions, names and formulae

Stage 1 - Desired Results

Established Goal(s):

In this chapter, We looked at the range of substances available to us from the Earth and saw how to separate out desired ones. After these lessons students shall be able to observe and conclude chemical reactions when obtaining desired substances. They will be able to name simple compounds when given the names of elements that form them and work out their formula. They will be able to write equations either in symbols or in word for chemical reactions and balance symbol equations. They will also be able to name ionic and compound molecular substances.

Understandings:

Students will understand ...

- the differences between physical and chemical change.
- how pure substances can be decomposed into two or more other pure substances.
- the different processes of decomposition.
- how to write the equations for chemical reactions.
- how to write formulae and names the different rules apply for ionic and covalent compounds.

Essential Questions:

- What are the distinguishing properties of physical and chemical changes?
- What are the different decomposition reactions?
- What is Electrolysis and how is it done for water and molten lead bromide?
- How to write equations for chemical reactions?
- How to write formulae and derive names for compounds?
- What are the different rules for writing formulae and names for ionic and covalent compounds?

Knowledge:

Students will know ...

- the different properties of Physical and Chemical Changes.
- the different decomposition processes.
- the ways to write equations for chemical reactions
- ways to write the formulae and names of compounds
- the rules for writing formulae and naming for ionic and covalent compounds.
- think critically based on scientific concepts and theories being thought
- make observations from a scientific perspective
- to think scientifically and use scientific knowledge to make decisions real world problems.

Skills:

Student will be able to...

- identify manifestations of any chemical reaction when it occurs
- present the different decomposition processes
- effectively write chemical equations for particular reactions
- easily name compounds and effectively come up with their formulae

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

- think analytically by evaluating evidence using relevant criteria ; develop appropriate conclusions as well as new questions
- develop skills on how to be open-minded in communicating and sharing ideas towards peers
- read, interpret & examine scientific claims
- pose questions & form hypotheses based on personal observations, scientific articles, experiments & knowledge
- develop teamwork in group activities
- enhance creativity and resourcefulness upon doing the task

Stage 2 - Assessment Evidence

Performance tasks:

- Experiment: Chemical Change (Baking soda and vinegar reaction)
- Exercises: 5-6
- Club presentations
- Students to create practical activities happening in real life that showcase physical and chemical changes through designed experiments, poster making, presentations

<https://www.teacherspayteachers.com/FreeDownload/Physical-vs-Chemical-Change-FREE-cut-paste-activity-932183>

- Exercises 1-3; 5-10; 11-19
- Test yourself 1-20
- Revision for chapter 3 test, Revision for final exam

Other Evidence:

- Two individual assessments (Mid-Term/Final) accounting for the assigned percentage of the overall course grade.
- Homework, participation, behavior and attendance.
- Grades based on presentation of knowledge and ideas.

Stage 3 – Learning Plan

Learning Activities

- Lecture/Discussion/Overhead Presentation.
- Small-group work/Cooperative Learning.
- Videos related to the subject.
- Explanation about properties of Physical and chemical changes and do the experimentation, activities and group discussion.

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

- Experiment: Chemical Change (Baking soda and vinegar reaction)
- Experiment: Forming & Naming Ionic Bond
- Chemical reactions activities
 - Go React!
 - Jeopardy

<https://study.com/academy/lesson/chemical-reaction-games-activities.html>
- Naming Ionic Compound activities
 - A compound by any other name
 - Naming mnemonics/rhymes

<https://study.com/academy/lesson/naming-ionic-compounds-games-activities.html>

What are the distinguishing properties of Physical and chemical changes?

- Experimentations
- Exercises: what are the distinguishing properties of physical and chemical changes

How to write formulae and names for compounds?

- Class discussion on the rules of writing formulae and naming for ionic and covalent compounds.
- Exercises on writing and naming ionic and covalent compounds

Discuss in groups -

- What are the different properties of physical and chemical changes
- The different decomposition reactions.
- What Electrolysis means and its examples?
- Writing formulae and names for compounds?
- The rules of writing formulae and names for ionic and covalent compounds.
- Real-life examples and applications of physical and chemical changes

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019
Topic: The Periodic Table

Stage 1 - Desired Results

Established Goal(s):

In this chapter, the students will understand the historical development of the periodic table and understand how the elements were organized. They will then be able to survey some properties of the elements and see how they vary with position in the periodic table. They will be able to explain the trends in the periodic variation of some physical properties like ionization energy, atomic radius based on the elements' position in the periodic table.

Understandings:

Students will understand ...

- how elements are organized and arranged in the periodic table.
- the trends in periodic variations in physical properties of the elements.
- the difference between a period and a group.
- the factors influencing the ionization energies and atomic radii and other properties of the elements

Essential Questions:

- How are elements arranged on the periodic table?
- How does the structure of the periodic table allow us to predict the chemical and physical properties of an element?
- What characteristic of the atom is used to organize the periodic table?
- How does an element's position on the periodic table affect the trend in the following properties:-
 - Number of Valence electrons
 - Ionization energy
 - Atomic radii
 - electronegativity
 - reactivity

Knowledge:

Students will know ...

- Know the significance of the periodic table
- How to make observations from a scientific perspective
- How to be knowledgeable about scientific concepts and theories
- How to be able to think scientifically and use scientific knowledge to make decisions real world problems.
- How to Think analytically by evaluating evidence using relevant criteria ; develop appropriate conclusions as well as new questions
- How to communicate ideas clearly, both written and verbal

Skills:

Student will be able to...

- explain and use ionization energy and atomic radii data to explain the trends across the period and down the group of a periodic table.
- interpret successive ionisation energy data of an element in terms of the position of that element within the Periodic Table.
- investigate the development of the periodic table as a method of organizing elements.
- identify the characteristic properties of metals, non-metals, and metalloids and classify elements according to these properties. Examples: ductility, conductivity of heat and electricity, lustre, reactivity.

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

- How to read, interpret & examine scientific claims
- How to pose questions & form hypotheses based on personal observations, scientific articles, experiments & knowledge

- relate the reactivity and stability of different families of elements to their atomic structure including alkali metals, alkaline earths metals, halogens, and noble gases.
- identify properties of common families of elements
- explain how elements differ in terms of structural parts and electrical charges of atoms.
- gather and synthesize information about the Periodic Table.
- show how knowledge of chemistry is used in everyday life.

Stage 2 - Assessment Evidence

Performance tasks:

- Looking at relationships/ similarities and differences in the properties of elements in the same group.
- Homework : Using the PT, deduce the electron configuration of elements
- Present a graph on the ionization energy against atomic number for the first twenty elements,
- Present a graph on the atomic radius against atomic number for the first twenty elements
- Presentation on Further Trends
- Experiment: Identifying elements and properties
- Exercises from book

Other Evidence:

- Two individual assessments (Mid-Term/Final) accounting for the assigned percentage of the overall course grade.
- Homework, participation, behavior and attendance.
- Grades based on presentation of knowledge and ideas.

Stage 3 – Learning Plan

Learning Activities

- Lecture/Discussion/Overhead Presentation.
- White board.
- Small-group work/Cooperative Learning.
- Videos related to the subject.
- Graph making and analysis on the trends in the periodic table

How are elements arranged on the periodic table?

- Group report -Periodic table Trend report
- Make a poster
- Quiz on arrangements of elements on the periodic table.
- Experiment: Identifying elements and properties

How does an element's position on the periodic table affect periodic properties?

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

- Class discussion on how an element's position on the periodic table affect its properties.
- quiz on the trends in the Periodic Table

Discuss in groups

1. How does the organization of the periodic/reference table assist us in our study of chemistry?
2. How is the arrangement of the periodic table related to atomic structure?
3. How is the periodic table used to identify characteristics of any given element?
4. What trends are evident when using the periodic table?
5. How has the periodic table evolved over time?

Composition of matters

- Lecture/Discussion/Overhead Presentation
- Small-group work/Cooperative Learning
- Videos related to the subject
- Interpreting an illustration/ lab skills
- Choosing elements for real life purposes based on their properties

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019
Topic: Chemical Earth

Stage 1 - Desired Results

Established Goal(s):

In this chapter, we will be looking at various mixtures, elements and compounds that make up planet Earth. After these lessons students will be able to name different mixtures and separate them through different methods according to their properties. They will have an understanding on the existence of elements and compounds. They will be able to effectively choose which elements to use for a particular purpose.

Understandings:

Students will understand ...

- the differences between mixtures, elements and compounds.
- that mixtures can be separated by different methods.
- that there are elements that occur on earth as uncombined elements
- the reasons why compounds exist
- the importance of the elements in our daily lives
- the two classification / group of elements

Essential Questions:

- What does pure substance means?
- How do we obtain purity in a substance? How are pure substances separated from mixtures?
- Is purity important? How can you tell if the substance is pure?
- How do we separate mixtures?
- What is the basis for choosing the type of separation method to use in a particular mixture?
- What is the importance of knowing the physical properties of the elements in the periodic table?
- What apparatus is used to obtain pure water from salt water?
- What are the two classifications of elements?

Knowledge:

Students will know ...

- the solubility of solids in relation to the temperature of the solvent.
- the differences between pure substances and impurity.
- the effects of the presence of impurity to some of the properties of the elements.
- how to make observations from a scientific perspective.
- that there are methods that we can use to separate mixtures.
- that there are elements that exists on earth as free and uncombined.
- the different properties and uses of elements.
- the classification of elements and their general properties

Skills:

Student will be able to...

- define terms such as mixture, solution, solute, solvent, aqueous solution and give examples
- identify the characteristics of a pure substance from the mixture by separation
- explain the terms pure substance and impurity and give examples where purity is very important.
- explain how melting and boiling points change when an impurity is present
- decide whether a substance is pure from melting and point data
- describe the different methods of separating mixtures, give examples of mixtures and explain which method to use
- name elements that exist as uncombined and explain why most elements exist as compounds.
- effectively choose which elements to use for a

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

<ul style="list-style-type: none"> • how to be knowledgeable about scientific concepts and theories • how to be able to think scientifically a use scientific knowledge to make decisions real world problems. • how to Think analytically by evaluating evidence using relevant criteria ; develop appropriate conclusions as well as new questions. • how to communicate ideas clearly, both written and verbal. • how to read, interpret and examine scientific claims. • how to pose questions & form hypotheses based on personal observations, scientific articles, experiments & knowledge. 	<p>particular purpose</p> <ul style="list-style-type: none"> • discuss the difference between metal and non-metal in relation to their chemical and physical properties.
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Stage 2 - Assessment Evidence

<p>Performance tasks:</p> <ul style="list-style-type: none"> • Identification using properties of substances • <u>Homework:</u> Creation of a poster including different separating techniques and their examples. • Inserting information into a table, classification of matter. • Experiments: Separation Methods • Experiment: Melting and boiling points • Exercises 1-7, 18-13; 15-18 • Posters / chart making of classification of matter: students to choose their own samples of elements and compounds / mixtures and pure substances then explain to the class • poster making of the different separation method • Metal/Non-metal ppt presentations on their history, background, uses etc 	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Two individual assessments (Mid-Term/Final) accounting for the assigned percentage of the overall course grade. • Homework, participation, behavior and attendance. • Grades based on presentation of knowledge and ideas.
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Stage 3 – Learning Plan

<p>Learning Activities</p> <ul style="list-style-type: none"> • Lecture/Discussion/Overhead Presentation. • Small-group work/Cooperative Learning. • Videos related to the subject. • Explanation about separation techniques, elements and compounds.

The Asian International School
Unit Backward Design
Chemistry, Upper-Intermediate, 2018-2019

- group research work on the application of distillation in real life situation (such as water distillation, beverage or wine distillation, perfume from steam distillation and petroleum fractional distillation)
- Class project: Make a 3D model of a specific molecule and give a presentation in class on its boiling point, melting point, state at room temperature and what it can be used for.
- Applying and examining rules for naming of compounds and practice writing them.
- Using rules for naming compounds/ determination from chemical formula
- Experiments: Separation Methods
- Experiment: Melting and boiling points
- Research: students will research on different gas mixtures and ways on how they can be separated
- Choosing / discussion on elements for real life purposes based on their properties

What are the different separation techniques?

- Make a poster
- Quiz on uses of separation techniques.

What is the difference between elements, mixtures and compounds?

- Class discussion on the differences between elements, mixtures and compounds.
- table showing contrasting patterns of aluminum, aluminum oxide and bauxite

When is purity important?

- Site examples of applications in daily life

Discuss in groups

- What are the differences between elements, compounds and mixtures?
- What are the similarities between compounds and mixtures?
- Which separation technique is the best for separating two insoluble solids?
- Which separation technique is the best for separating two liquids?
- Which separation technique is the best for separating a solid dissolved in a liquid?

Composition of matters

- Lecture/Discussion/Overhead Presentation
- Small-group work/Cooperative Learning
- Videos related to the subject
- Interpreting an illustration/ lab skills
- Choosing elements for real life purposes based on their properties