



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

## Pacing Guide for Teachers

# CHEMISTRY

GRADE IX

Theory

Numbers of weeks: 28

Number of periods per week: 5

Key Textbook: Chemistry for Grade 9, National book  
Foundation, Islamabad

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## Topic

## Total Periods

1. Fundamentals of Chemistry

32

Sub-Topic	Range of SLOs	Periods (40 mins)
1.1 Chemistry and its Branches	1.1.1-1.1.2	4
1.2 Basic Definitions and Comparison of Essential Terminologies	1.2.1-1.2.2	2
	1.2.3	2
	1.2.4	2
	1.2.5-1.2.6	2
	1.2.7	2
	1.2.8-1.2.11	3
1.3 Avogadro's Number and Mole	1.3.1-1.3.2	2
	1.3.3	2
1.4 Empirical and Molecular Formulae	1.4.1-1.4.3	2

1.5 Chemical Reactions and Calculations	1.5.1-1.5.2	1
	1.5.3	2
	1.5.4-1.5.5	3
	1.5.6	3

## Suggested Activities and/or Formative Assessment

### Activity 1:

Ask students to make a concept map of branches of chemistry.

### Activity 2:

Provide students with a blank diagram or template and ask them to draw and label the structures of atoms, ions, molecules, compounds, and mixtures.

### Activity 3:

Ask students to make a flow chart to recall the formulae and interconversion of moles, mass, and molecules for the numerical/ unitary method.

### Activity 4:

Worksheet for numerical of number of moles, mass, molecules, and Avogadro's number.

Links for worksheets and activities

<https://studylib.net/doc/8588062/avogadro-s-number-worksheet>

<https://www.chemistrylearner.com/worksheets/types-of-chemical-reactions-worksheets>

<https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical->

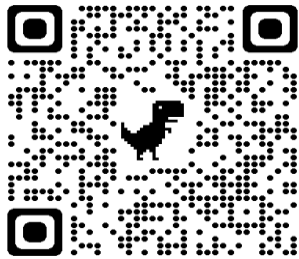
[equations\\_en.html](#)

[https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom\\_en.html](https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html)

## Further Resources

For additional resources related to teaching, learning and formative assessments, please refer to: **Learn Smart Classroom by Knowledge Platform:**

<https://akueb.knowledgeplatform.com/login>



FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

2. Atomic Structure

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
2.1 Features of an Atom	2.1.1-2.1.2	1
	2.1.3	1
2.2 Isotopes	2.2.1-2.2.3	2
2.3 Models to Understand the Structure of an Atom	2.3.1-2.3.3	3
2.4 Shells and Sub-shells	2.4.1	1
2.5 Electronic Configuration	2.5.1	2

## Suggested Activities and/or Formative Assessment

### Activity 1:

Atomic structure worksheet

<https://www.gpb.org/sites/default/files/2020-04/atomstructurewkst.pdf>

### Activity 2:

Electronic configuration- YouTube link

[https://youtu.be/hSkJzE2Vz\\_w](https://youtu.be/hSkJzE2Vz_w)

### Activity 3:

Electronic configuration – worksheet link

<https://studylib.net/doc/25800766/electronic-structure-worksheet>

### Activity 4:

Interactive worksheet on shells and sub-shells

<https://www.liveworksheets.com/qz2319995ke>

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## Topic

## Total Periods

3. Periodic Table and Periodicity

12

Sub-Topic	Range of SLOs	Periods (40 mins)
3.1 Periodic Table	3.1.1-3.1.5	3
	3.1.6	3
3.2 Periodic Properties	3.2.1-3.2.2	2
	3.2.2-3.2.3	4

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Family characteristics

Research and make a list of the common characteristics, properties, and trends associated with each family. Create a visual representation of each family by organizing index cards or pieces of paper with the name of the family, its common properties, and examples of elements belonging to that family.

### Activity 2:

#### Element showcase

Choose a specific family/group from the periodic table that you find interesting or want to learn more about. Research and select a few representative elements from that family. Create a mini-exhibit or showcase for each element, including information about its atomic number, symbol, atomic mass, electron configuration, common uses, and any notable properties or characteristics.

## Activity 3:

### Family scavenger hunt

Create a scavenger hunt activity focused on specific families/groups of the periodic table. Develop a list of clues or questions related to the properties or characteristics of elements within those families. Hide the clues around a room or outdoor space and invite participants to find and answer the clues using the periodic table.

<https://sciencenotes.org/periodic-table-worksheet-2/>

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## Topic

## Total Periods

4. Structure of Molecules

20

Sub-Topic	Range of SLOs	Periods (40 mins)
4.1 Formation of Chemical Bond	4.1.1-4.1.4	1
	4.1.5	2
4.2 Ionic Bond	4.2.1-4.2.2	2
	4.2.3	4
	4.2.4	1
4.3 Covalent Bond	4.3.1-4.3.3	2
	4.3.4	1
	4.3.5-4.3.7	1
4.4 Coordinate Covalent Bond	4.4.1	1
	4.4.2-4.4.3	1

4.5 Metallic Bond	4.5.1-4.5.2	2
4.6 Intermolecular Forces	4.6.1	2

## Web Resource

[https://youtu.be/IP\\_EsVY4CVg](https://youtu.be/IP_EsVY4CVg)

## Suggested Activities and/or Formative Assessment

### Activity 1:

Ask students to create concept maps that illustrate the various types of chemical bonds (ionic, covalent, and metallic) and their characteristics.

### Activity 2:

Present students with a set of molecular models or diagrams and ask them to identify the type of bond (ionic, covalent, or metallic) present in each model.

### Activity 3:

Organise a group activity where students discuss and debate different aspects of chemical bonding. Assign roles to each student, such as advocate for ionic bonding, covalent bonding, or metallic bonding.

One hands-on activity on chemical bonding is to demonstrate ionic bonding using simple materials. Here's a step-by-step guide:

#### Materials needed:

- Small squares of aluminum foil
- Small squares of plastic wrap
- Salt (table salt or sodium chloride)
- Water
- Small cups or containers

#### Instructions:

- Fill two small cups or containers with water.
- Place a small square of aluminum foil in one cup and a small square of plastic wrap in the other.

- Sprinkle a small amount of salt onto each of the squares.
- Observe the behavior of the salt on the aluminum foil and the plastic wrap.
- Stir the contents of each cup gently with a stirring rod or a toothpick.
- Observe the changes in the water and the behavior of the salt particles.
- Explain the observations based on the concepts of ionic bonding.

Explanation: The aluminum foil represents metal, while the plastic wrap represents a non-metal. When salt (sodium chloride) is added to water, it dissociates into positive sodium ions ( $\text{Na}^+$ ) and negative chloride ions ( $\text{Cl}^-$ ). In the cup with aluminum foil, the aluminum atoms lose electrons and form positive ions ( $\text{Al}^{3+}$ ), which are attracted to the negative chloride ions. This attraction results in the formation of a thin layer of white solid on the aluminum foil, representing the formation of an ionic compound (aluminum chloride).

In the cup with plastic wrap, the plastic is non-conductive and does not allow the flow of electrons, preventing the formation of ions. Therefore, no visible reaction occurs on the plastic wrap.

This hands-on activity provides a visual representation of ionic bonding by demonstrating the attraction between positive and negative ions, highlighting the basic principles of chemical bonding.

## Further Resources

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## Topic

5. States of Matter

## Total Periods

14

Sub-Topic	Range of SLOs	Periods (40 mins)
5.1 Physical States of Matter	5.1.1	1
5.2 Gaseous State	5.2.1	1
5.3 Laws Related to Gases	5.3.1-5.3.2	3
5.4 Liquid State	5.4.1-5.4.2	4
5.5 Solid State	5.5.1-5.5.2	3
5.6 Types of Solid	5.6.1-5.6.2	2

## Web Resource

[https://phet.colorado.edu/sims/html/states-of-matter-basics/latest/states-of-matter-basics\\_en.html](https://phet.colorado.edu/sims/html/states-of-matter-basics/latest/states-of-matter-basics_en.html)

# Suggested Activities and/or Formative Assessment

## Activity 1:

Use graphic organizers like Venn diagrams, T-charts, or flowcharts to compare the properties of solids, liquids, and gases. Have students fill in the organiser with relevant information and provide feedback on their work.

## Activity 2:

Phase diagram can be given to identify and interconvert states of matter.

## Activity 3:

Links for activities

<https://phet.colorado.edu/en/simulations/diffusion>

<https://phet.colorado.edu/en/simulations/gases-intro>

<https://phet.colorado.edu/en/simulations/gas-properties>

<https://phet.colorado.edu/en/simulations/states-of-matter>

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## Topic

6. Solutions

## Total Periods

20

Sub-Topic	Range of SLOs	Periods (40 mins)
6.1 Introduction to Solutions	6.1.1-6.2.1	2
6.2 Types of Solution According to Phases	6.2.2-6.2.3	2
6.3 Types of Solution According to Concentration	6.3.1-6.3.2	1
6.4 Concentration Units and Dilution of Solutions	6.4.1-6.4.3	3
	6.4.4-6.4.6	3
6.5 Factors Affecting Solubility	6.5.1-6.5.2	2
	6.5.3-6.5.4	2
6.6 Methods for Separating Mixtures	6.6.1-6.6.3	2
	6.6.4-6.6.5	2
6.7 Comparison of Solution, Suspension and Colloid	6.7.1	1

# Suggested Activities and/or Formative Assessment

## Activity 1:

Present students with real-life scenarios involving solubility issues, such as dissolving a particular substance in each solvent under specific conditions. Ask them to analyse the situation, identify the relevant factors affecting solubility, and propose solutions or explanations.

## Activity 2:

One practical activity related to the composition of a solution is a "Dissolving Race." This activity allows students to explore the factors that affect the rate at which a solute dissolve in a solvent.

## Activity 3:

Prepare solutions of different concentrations to find the molarity and present its report including appropriate units, observations, and errors.

## Activity 4:

Give students a word bank to sort out solutions, suspensions, and colloids in their respective columns.

## Activity 5:

Use Venn diagrams to compare the properties of solutions, suspensions, and colloids. Have students fill in it with relevant information and provide feedback on their work.

## Activity 6:

Links for activities and worksheets

Chromatography can be performed in school using tissue paper.

<https://www.liveworksheets.com/gf2791720nj>

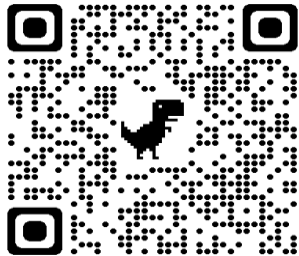
<https://phet.colorado.edu/en/simulations/concentration>

[https://www.labxchange.org/library/items/lb:LabXchange:be52b2cf:lx\\_simulation:1](https://www.labxchange.org/library/items/lb:LabXchange:be52b2cf:lx_simulation:1)

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS



## Topic

## Total Periods

7. Electrochemistry

23

Sub-Topic	Range of SLOs	Periods (40 mins)
7.1 Oxidation and Reduction Reactions	7.1.1	1
7.2 Oxidation States and Rules for Assigning Oxidation States	7.2.1-7.2.3	3
7.3 Oxidising and Reducing Agents	7.3.1-7.3.2	2
7.4 Electrochemical Cells	7.4.1-7.4.3	2
	7.4.4-7.4.5	2
	7.4.6	1
	7.4.7-7.4.10	4
	7.4.11-7.4.13	2
7.5 Electrochemical Industries	7.5.1-7.5.2	2
7.6 Corrosion and its Prevention	7.6.1-7.6.3	2

	7.6.4	2
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## Web Resources

<https://www.labxchange.org/library/items/lb:LabXchange:DEL5DErJ:html:1>

<https://www.labxchange.org/library/items/lb:LabXchange:8b3f4dc3:video:1>

## Suggested Activities and/or Formative Assessment

### Activity 1:

Provide students with unbalanced redox equations and ask them to balance them to understand the process of assigning the oxidation numbers and balance half-cell reactions.

### Activity 2:

Provide students with real-life scenarios where oxidation or reduction reactions occur, such as corrosion of metals, combustion reactions, or biological redox reactions. Ask them to analyse the situation, identify the oxidising and reducing agents, and explain the overall process.

### Activity 3:

Ask students to compare galvanic cells and electrolytic cells. They can also discuss their similarities, differences in operation and the purpose of each type of cell.

### Activity 4:

Students can be analysed with a diagram of an electrochemical cell and ask to label the anode, cathode, direction of electron flow, direction of ion flow, and the overall cell reaction.

### Activity 5:

Set up corrosion experiments to demonstrate how metals react with oxygen in the presence of moisture.

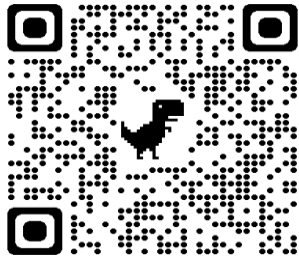
Worksheet for assigning the oxidation numbers.

<https://www.liveworksheets.com/az2007154ce>

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

8. Chemical Reactivity

## Total Periods

9

Sub-Topic	Range of SLOs	Periods (40 mins)
8.1 Differences Between Metals and Non-Metals	8.1.1	1
8.2 Metals	8.2.1-8.2.2	1
	8.2.3	1
	8.2.4-8.2.5	1
	8.2.6	1
	8.2.7-8.2.8	2
8.3 Non-Metals	8.3.1-8.3.2	2

## Suggested Activities and/or Formative Assessment

### Activity 1:

Classifying metals and non-metals based on their properties.

<https://studylib.net/doc/25401537/metals-and-no-metals--worksheet>

## Activity 2:

Ask open-ended questions that require students to explain their reasoning for ionisation energies of alkali and alkaline earth metals.

## Activity 3:

Activities related to metals:

### Conductivity Experiment

Test the conductivity of different metals by creating a circuit using a battery, wires, and a bulb. Observe which metals allow the bulb to light up, indicating their conductivity.

### Corrosion Investigation

Set up an experiment to study the corrosion process of metals by exposing them to different environmental conditions, such as water, saltwater, or acidic solutions.

## Activity 4:

Activities related to non-metals:

### Combustion Experiment

Investigate the flammability of various non-metals by testing their reactions with a flame. Observe which substances burn and which do not.

### Acid-Base Reactions

Perform experiments to study the reactions of non-metal oxides with water to form acids. Explore the properties and characteristics of different non-metallic acids.

## Further Resources

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**Note:** This teacher-led pacing guide has been developed for AKU-EB affiliated schools to facilitate them by

- ensuring smooth transition of a school's academic year.
- ensuring curricular continuity in schools.
- predicting the time and pace of syllabi implementation.

This document also contains **suggested activities and/or formative assessments** that may enhance the learning experience. Please note that these activities are meant to serve as suggestions. As educators, you have the flexibility and autonomy to adapt and modify them to best suit the needs of your students and the dynamics of your classroom.

You are advised to use an ad-blocker while accessing the websites and web resources. In case any website is not functional for any reason, you may inform us at [examination.board@aku.edu](mailto:examination.board@aku.edu) for an alternative or search material via any search engine.

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