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A UNIT FOR SEVEN LESSON PLANS FOR TEACHING  
CHEMISTRY IN FOURTH SECONDARY CLASSES

A PROJECT

PRESENTED TO THE FACULTY OF THE BEIRUT COLLEGE  
FOR WOMEN IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR  
THE DEGREE OF BACHELOR OF ARTS

BY

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The Writer

### BIOGRAPHICAL SKETCH

The writer was born in 1936 in Annha, Iraq. She got her elementary education in Annha. Annha had no high-schools, so she moved to Baghdad and attended a boarding school where she got her high school diploma in 1952, from the Rashid Secondary School for Girls. In the summer of 1952 she came to Beirut where she entered the Beirut College for Women, majoring in General Sciences - mathematics. She plans to teach Chemistry and mathematics in a government high school in Iraq after graduation.

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## INTRODUCTION

What is Chemistry? Chemistry is "The science that is concerned with the composition of bodies and with the changes of composition they undergo. Analytical Chemistry deals with the methods of separation of pure substances from mixtures of elements and compounds."<sup>(1)</sup>

Chemistry is the study of matter and its main aim is to find the truth.

Teaching and learning are impossible if we do not have a purpose, our purposes in teaching Chemistry are:

1. To acquaint the pupil with the nature of his environment. This should be done by simple experimental teaching and observation of natural phenomena which take place in our daily life.

2. To show the student the part that Chemistry plays in the improvement and control of his environment. That is to acquaint the student with the industries, medicines and atomic energy which are the results of chemical analysis and chemical research.

3. To help the student acquire a habit of keeping up to date with the general scientific news that happens around the world.

4. To arise in the student an attitude of curiosity and inquiring about his environment.

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(1). Encyclopedia Britannica, London, New York, Encyclopedia Britannica Company LTD. p. 355.

5. To develop in the student the ability to think and reason the problems which he faces in life in a scientific way.

The main aim of this unit is to acquaint the students with the smallest element of matter which is the basic principle of all the universe and to have a thorough understanding of the structure of the atom.

I am trying to make this unit as helpful as possible by using all audio-visual aids that I can get to make the atom real and vivid to the students.

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First Lesson:INTRODUCTION

- I. Objectives: Without an interest there can be no learning and teaching is meaningless if the students are not interested in the thing being taught. But the atom today is the interest of the whole world, the world's peace is dependent on the atom. Fourth secondary students would be curious to know and learn about the atom if they are told that it is the smallest particle of matter and it is the source of the greatest power man had ever discovered.

Therefore to help the students satisfy their desire and interest for knowledge about the atom, they should be first acquainted with the history of the atom. The history of the atom should be shown and presented in such a way as to show the relation of all substances and elements in nature to our life.

- II. Introduction of the Teacher:

Teacher and students should not be foreign to each other for there will be always a strain on both sides; the processes of learning and teaching will not be as fruitful as it should be. Therefore the first thing the teacher should do is to introduce herself and then know something about the history of the class as a whole and of each individual separately. As to the class history and the material, they have taken she should have an idea about it from outside the class. Then in the class the teacher will find out what difficulties they have specially in Chemistry. Then she will give them suggestions on how to study Chemistry.

### III. Subtopics:

#### A. Introduction of the atom and its history:

After the students and teacher have been acquainted, the class will be told about the material to be covered in that period - the smallest thing which is the principle of the universe, the thing of which all matter is made.

#### B. The History of the atom:

What is an atom? How did the first idea of atom start?  
Who was the first one to start it?

#### C. Facts about atoms and molecules and their importance in life.

#### D. Dalton's Atomic Theory:

1. All substances are composed of small, solid, indestructible particles called atoms.
2. The atoms of a given substance are identical as regards weight, size and shape.
3. The atom is the smallest part of an element which enters into a chemical change.
4. The molecules of a compound are produced by the union of the atoms of two or more elements.
5. The most stable compounds are formed when one atom of each of two elements combine.<sup>(1)</sup>

### IV. Method:

The teacher will be explaining the subtopics and conducting a discussion on the subject matter.

### V. Material used:

Charts, black-board, pictures, and diagrams will be used as

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(1). Paul R. Frey, College Chemistry, New York, Prentice.

teaching aids.

VI. Questions:

1. What is an atom?
2. What are examples of elements and atoms you know which you use daily?
3. What is Dalton's Theory about the atom?
4. Why is the atom important in life?

VII. Assignment:

1. Each student draws an atom with two protons, two electrons, and two neutrons.
2. Study the atom: definition, occurrence and composition.

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Lesson " 2 "

The Atom

In learning about the atom or anything else, the teacher provides for the students all the aids and circumstances which make the lesson or the thing being taught as real as possible. The teacher can make simple materials or cheap visual aids that will help the students see reality in things. We should not learn abstract ideas which do not mean anything to us and which we will forget after closing the book. But we should start with simple observations and experimentations in our environment so that we can develop and build ideas. Then from these simple observations we learn the conclusions.

Objectives:

1. To broaden the imagination of the students by using



drawings, cartoons, and showing films about the atom.

2. To acquaint the students with the parts of the atom and their positions.

Pupil Activities:

The class will be divided into two groups: one will present in front of the class their drawings of the atom on card-board or papers and at the same time explain their drawings. The other group will draw on the black-board atoms with different atomic numbers.

Materials used:

1. Samples of atoms with electrons around the nucleus made up of beads arranged on wire.
2. Cartoons showing how two atoms are joined together.
3. Flannel board and parts of an atom to present on it.

Subject Matter to be covered:

1. The atom: definition, nature, occurrence and composition.
2. Different parts of the atom: nucleus, protons, neutrons, electrons, shells and atomic number.
3. Properties of the atom, its reaction, the charge of electrons and their movement.
4. How atoms combine: Sharing or giving: exchanging of electrons, molecules.
5. The resemblance of the structure of the atom to the  
(2)  
Solar System.
6. The difference between an element and a compound.

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(2). John Charence, Hogg and others, Chemistry A Course for High School, New York, Nastand 1948.

Method:

The two groups of the class will first present and explain their drawings. The teacher will bring out the flannel board and put atom and its parts on it. On the flannel board teacher will show the class that two atoms may share an electron and combine together to form a molecule. Then show them the beads atom and how electrons move around the nucleus in shells. The teacher will explain all the subtopics using the available material for illustration.

Questions:

1. Define: an element, an atom, a molecule, a compound and give an example on each. (3)
2. Indicate the component parts of the atoms and their properties.
3. How many electrons may there be in each shell of an atom?
4. How are atoms combined?
5. To what do the nucleus and electrons of an atom correspond if an atom is compared with the Solar System?

Assignment:

1. Draw diagrams of atoms of Hydrogen and Oxygen.
2. Draw diagrams of atoms with 2, 4, and 8 atomic numbers.
3. List the importance of the atom to our life.
4. Announce a film about the atom for next time.

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(3). Ibid., p. 19.

Lesson " 3 "    A Film 'Introducing the Atom'    (4)

The more we see and hear of the thing the more we learn about. The vague may become clear to us. In this film the class is going to see how is this everyy used for industry.

Objectives:

1. To make the atom more real to the students by seeing it at work.
2. To develop a continuity of thought and technical vocabulary in the students.
3. To develop a high degree of interest in the students and make learning more permanent.
4. To stimulate self activity in the students.

Method:

The teacher first will introduce the film, say what it is about, what it will show them. Give the class points to look for in the film. Then the film will be shown and the teacher will explain points that need illustration and show again the parts they could not see well. After the film is shown the class will have a review on the film to help them remember it well. Then ask questions. A discussion of the film will follow.

Subject Matter:

1. The film will show us different shapes of the atom, and atoms moving.
2. Importance of the atom, how different elements are changed from one to another, e.g., Nitrogen - Carbon - Oxygen.

3. Atomic energy and its use for industry, planting, manufacturing, and curing diseases.

Materials used: The film.

Assignment:

1. Prepare questions about the film and the atom.
2. List the industries you know for which atomic energy may be used in the future.
3. Prepare for molecules and reactions. Write an equation showing the reaction of oxygen with hydrogen.

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Lesson " 4 "    Molecules and Reactions

Chemistry has its own shorthand language and it is formed of: symbols, formulas and equations. Without cooperation learning would be a crippled process. We want to have cooperation so that we will learn best. The students must participate in the class activities.

Objectives:

To enable the students <sup>to</sup> think and work in terms of chemical symbols so that they understand the language of Chemistry and relate it to natural events.

Method:

This period is to be given mostly to the students to take care of it. They will play the role of the teacher by explaining the lesson, asking questions and answering, drawing and writing equations. The teacher will first give the class examples of

molecules: NaCl, H<sub>2</sub>O, N<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>S, and explain what is a reaction, how to write equations.

Pupil Activities:

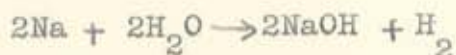
As has been mentioned above this period is a class activity. The class will explain and write on the black-board reactions of molecules and atoms. Other students will draw how a reaction takes place. Others will show their drawings of atoms, molecules and their reactions.

Materials used:

A box representing a gram molecular volume, cartoons, card-board, metallic Na and a beaker of water.

Subject Matter:

1. Definitions: molecules, equations and reactions.
2. Writing equations of reactions and drawing molecules on the black-board.
3. Atomic weight and molecular weight.
4. The volume of a molecule.
5. Sodium reacting with water.



Questions:

1. What is the difference between an atom and a molecule?
2. Write the equation for the reaction of Na with water.
3. How do molecules react?
4. What is the atomic number? and what is the molecular weight?
5. If chlorine has an atomic number of 17 and atomic

weight of 35, draw its atomic structure.

Assignment:

1. Read hydrogen from the book and write down in your own words what do you understand by an isotope.
2. Write three equations for hydrogen reactions and hand in next time.

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Lesson " 5 "

Hydrogen

Objectives:

1. To develop a skill of writing and balancing equations.
2. To acquaint the students with an important element for life.
3. To develop the ability of associating Chemistry to life and vice versa.

Method:

1. Questions about hydrogen to see how much they studied and understood; to see how many know that hydrogen is an important element of water molecule.
2. Present and explain the hydrogen atom, molecule and preparation.
3. Students write the equations for the reactions of  $H_2$  of the black-board.
4. The teacher explains the isotopes of hydrogen.

Materials used:

Cartoons of  $H_2$  atom and of  $H_2O$ , card boards, flannel board, black board and chalk.

Subject Matter:

1. Occurrence and history of  $H_2$ .
2. Structure of  $H_2$  atom and molecule.
3. Preparation of  $H_2$ .
4. Reactions of  $H_2$ .
5. Uses of  $H_2$  and its importance.
6. Isotopes.

Pupil Activities:

1. Write equations on the black-board.
2. Draw the hydrogen atom on the black-board.

Questions:

1. Of what importance to Chemistry was the discovery of Hydrogen?
2. Explain the statement: hydrogen, like oxygen is essential to life.
3. What uses of hydrogen make it a very important gas in industry.
4. Define: isotope, atomic hydrogen and reduction.

Assignment:

1. You have a laboratory the next period, read preparation of the experiment for the laboratory.
  2. Review hydrogen well.
  3. Prepare for a test the period after the laboratory.
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Lesson " 6 " Laboratory Period: Preparing HydrogenObjectives:

1. To bring hydrogen into reality by seeing it, smelling it, and observing its reactions.
2. To develop skill for laboratory work and experiments.

Method:

1. Class work in four groups.
2. Teacher instructs the class on laboratory work.
3. Pupils observe and report their observations.

Materials used:

Bunsen burner, beakers, test tubes, Erlenmeyer flask, pneumatic trough, chemicals:  $\text{HCl}$ ,  $\text{Zn}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{Na}$ ,  $\text{H}_2\text{O}$ , bottles, cover glasses, rubber stoppers, glass tubing.

Subject Matter:

1. Review hydrogen properties and preparation before doing the experiment, emphasizing the fact that hydrogen is a very light gas.
2. Explain the experiment, say what we are going to do.
3. The experiment: prepare  $\text{H}_2$  by: 1. displacement from water by  $\text{Na}$ . 2. from  $\text{H}_2\text{SO}_4$  and  $\text{Zn}$ .
4. Testing for  $\text{H}_2$  and its properties: burning  $\text{H}_2$  in air, and smelling.

Questions:

1. What is the color and smell of  $\text{H}_2$ ?
2. Does hydrogen burn in air?
3. Describe the method of collecting  $\text{H}_2$ .



4. Explain why hydrogen does not occur free in the air.
5. Which is more active Na or Zn?
6. Why does hydrogen diffuse more rapidly than other gases?
7. What are some of the industrial uses of hydrogen?

Assignment:

1. Write a report on all your observations in the laboratory.
2. Prepare for a test.

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Lesson " 7 "

Hour Test

Objectives:

1. To find out how much they have learned in this period.
2. To find out if the material they have taken needs to be given in a better way.
3. To test their ability in laboratory work.

Questions:

1. Name and define the different parts of an atom.
  2. Describe the preparation of hydrogen as you did it in the laboratory, write and balance the equation for it.
  3. What part of the atom makes it active and why? draw a diagram showing different parts of the atom and label them.
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