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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Science

Quarter 2
Lesson
6

Lesson Exemplar for Science Grade 8
Quarter 2: Lesson 6 of 6 (Week 7)
SY 2025-2026

Development Team

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SCIENCE /QUARTER 2 / GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners learn that: 1. The use of timeline and charts can illustrate scientific knowledge of the structure of the atom has evolved over time. 2. The current structure of the atom includes subatomic particles, their symbol, mass, charge, and location. 3. Elements and compounds are identified as pure substances. **4. The periodic table is a useful tool to determine the chemical properties of elements.**
B. Performance Standards	By the end of the Quarter, learners demonstrate an understanding of the structure of the atom and how our understandings have changed over time. They draw models of the atom and use tables to represent the properties of subatomic particles. **They demonstrate their knowledge and understanding of the periodic table by identifying the elements, their symbols, their valence electrons, and their positions within the groups and periods**. They design and/or create timelines or documentaries as interesting learning tools.
C. Learning Competencies and Objectives	***Learning Competency*** 1. discuss the significant contributions of early scientists in the development of the periodic table using a timeline; 2. identify the names and symbols of the first 20 or several common elements of the periodic table; 3. explain that the arrangement of elements in the periodic table as 7 periods and 18 groups is based on their atomic structure and chemical properties, such as reactivity; **4. explain that the electron structure of an atom determines its position on the periodic table;** 5. calculate the number of protons, neutrons, and electrons in the atom of several elements, such as aluminum; and explain that the elements within a group in the periodic table have the same number of valence electrons. ***Learning Objectives:*** Students should be able to: 1. Form electron clouds containing the basic structure of an atom. 2. Understand how the electron structure of an atom determines an element's position on the periodic table. 3. Define valence electron and determine the number of valence electron of the first 18 elements 3. Connect electron structure to chemical behavior and properties.
D. Content	Topic: The Atom and the Periodic Table (Part 1) Sub-topics: Electron Clouds Energy Levels

	Valence Electrons
E. Integration	SDG 6: Clean water and sanitation SDG 12: Responsible Consumption and Production SDG 14: Life below water SDG 15: Life on land

II. LEARNING RESOURCES

Chang, R., & Goldsby, K. (2014). *General chemistry: the essential concepts*. Mcgraw-Hill.

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Dhruvitha. (n.d.). Periodic Classification of Elements - History, Periodic Table & Periodic Trends. BYJUS. https://byjus.com/chemistry/classification-of-elements-in-modern-periodic-table/

Ebbing, D. D. and Gammon, S. D. *General Chemistry (Ninth Edition*). (2009). Houghton Mifflin Company

Helmenstine, A. (2018, October 11). When Were the Elements Discovered? Timeline and Periodic Table. Science Notes and Projects. https://sciencenotes.org/when-were-the-elements-discovered-timeline-and-periodic-table/#:~:text=1%20Hydrogen%20%28Henry%20Cavendish%201766%29%202%20Nitrogen%20%28Rutherford

NagwaEd. (n.d.). History of the periodic table. Nagwa. https://www.nagwa.com/en/videos/248156969426/

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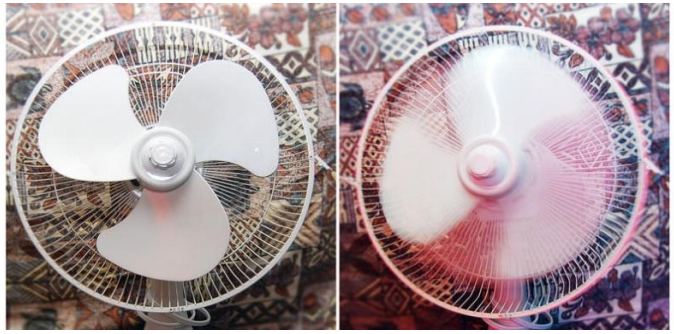
- https://openstax.org/books/chemistry/pages/1-introduction

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**Day 1** **1. Short Review (5 minutes per day)** Three Sphere: Using any spherical objects of different colors, assign one color to neutron, one color for electron, and one color for proton.	Discuss any misconceptions that arise from the short review.

	Ask the class to arrange on the teacher's table or on the board (as an alternative) these three objects to represent the arrangement of the subatomic particles inside an atom. **2. Feedback** *Provide a feedback mechanism on how to check any homework indicated in LE Q2 Week 6.*	
B. Establishing Lesson Purpose	**1. Lesson Purpose (2-3 minutes)** *Inform the learners of the lesson focus and link to previous learning.* **2. Unlocking Content Area Vocabulary (3 minutes per day)** a. **electron clouds** - It's where electrons are most likely to be found. b. **probability** - how likely something is to happen. c. **energy level** - like different floors in an electron "building." d. **orbital** - a region around the nucleus where electrons are likely to be found. e. **electron configuration** - It describes how electrons are distributed in an atom's orbitals. f. **valence shell** - The outermost energy level of an atom is called the valence shell. g. **valence electrons** - the electrons in the outermost shell.	The teacher may unlock these terms separately per day. Ensure that the ideas of the students on these terms are gathered first, before the operational definition is shared with the class.
C. Developing and Deepening Understanding	**SUB-TOPIC 1: Electron Clouds** **1. Explicitation** • Use the analogy of an electric fan that is turned on. 	Image Source: flexbooks.ck12.org

- Discuss the differences between the two images of the fan.
- Connect the moving fan blades with electrons that move very quickly, and we can never tell exactly where they are. If that's the case, how can we represent electrons in models of the atom?
- *Ask students:*
  - How exactly do electrons move around the nucleus?
  - Can we pinpoint their exact location?
- Explain that the traditional picture of electrons in well-defined orbits is not entirely accurate. It's more like a cloud of probability.

2. Worked Example

The teacher may use the online Open the Build an Atom simulation (https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_all.html) and click on the Atom icon.

(a) Pick any one of the first 5 elements that you would like to build and state its symbol. Start with hydrogen (H).

(b) Drag protons, neutrons, and electrons onto the atom template to make an atom of the element.

(c) Then, discuss the cloud model of the element.

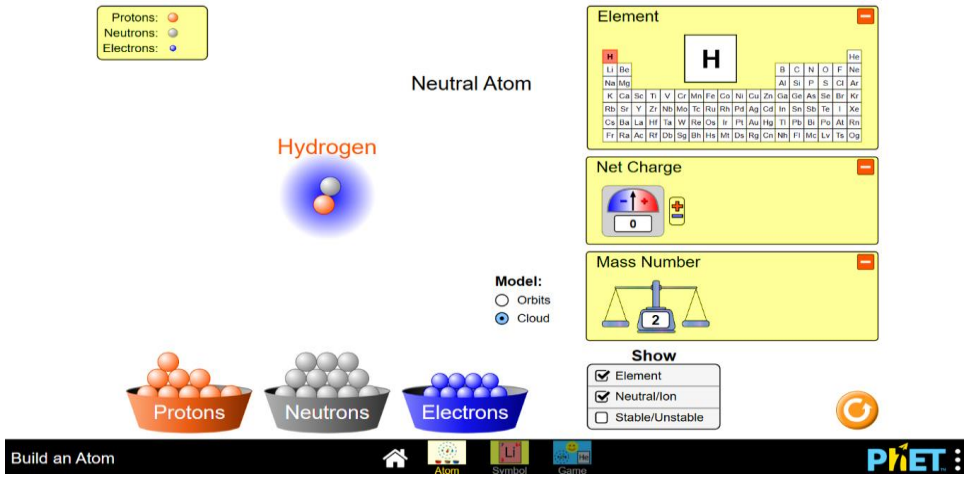


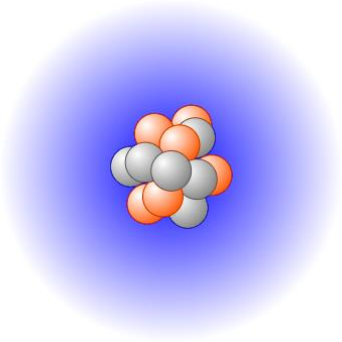
Image Source: youtube.com

Points for discussion:

- Introduce the concept of the electron cloud as a region of space where there is a high probability of finding an electron.
- The electrons are most likely to be inside the sphere closest to the nucleus where the cloud is darkest.
- Briefly mention Heisenberg's uncertainty principle, explaining that we cannot know both the exact position and momentum of an electron simultaneously.

3. Lesson Activity
Activity 1.

- Assign one element (from carbon to neon) per student. Ask them to draw the electron clouds for that element.
- Identify the element, symbol, number of protons, electrons, and neutrons given the electron cloud model.

Electron Cloud Model	Answers
	Element: Carbon Symbol: C Number of protons: 6 Number of neutrons: 6 Number of electrons: 6

Note: This is just an example. You may build other elements (up to Neon) using the simulation.

See Learning Activity Sheet:
Activity #1: Electron Clouds

- Summary: Briefly summarize the key points: electrons exist in a cloud of probability around the nucleus, and this cloud can be divided into orbitals.
- Explain that although electrons don't have fixed paths, electron clouds can be divided into regions with different shapes and energy levels called orbitals.

SUB-TOPIC 2: Energy Levels

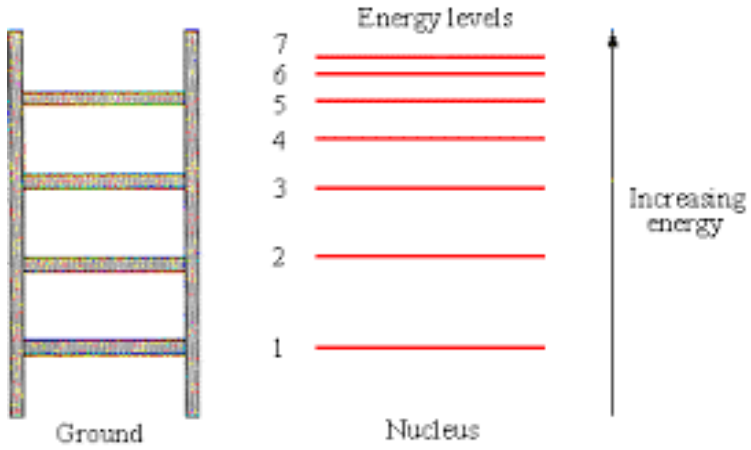
1. Explicitation

Elicit the learners' experiences about climbing stairs or ladders.

Possible Questions:
1. What do they require to climb up the stairs?
2. When going up the stairs, is it possible to reach the top instantly?

Imagine the atom as a staircase or ladder with the nucleus being on the ground (most stable location). The steps above represent different energy levels (n = 1, 2, 3, etc.) with the ground floor being closest to the nucleus (lowest energy). Each step, like an electron orbital, has a limited capacity for people (electrons).

Just like staircases, electrons prefer to occupy the most desirable location first – closer to the nucleus, which translates to lower energy levels. These lower levels, like the steps directly right above it, have a smaller capacity (can hold fewer electrons). Once those levels are filled, electrons must move to steps farther away (higher energy levels) which can accommodate more tenants.



Day 2

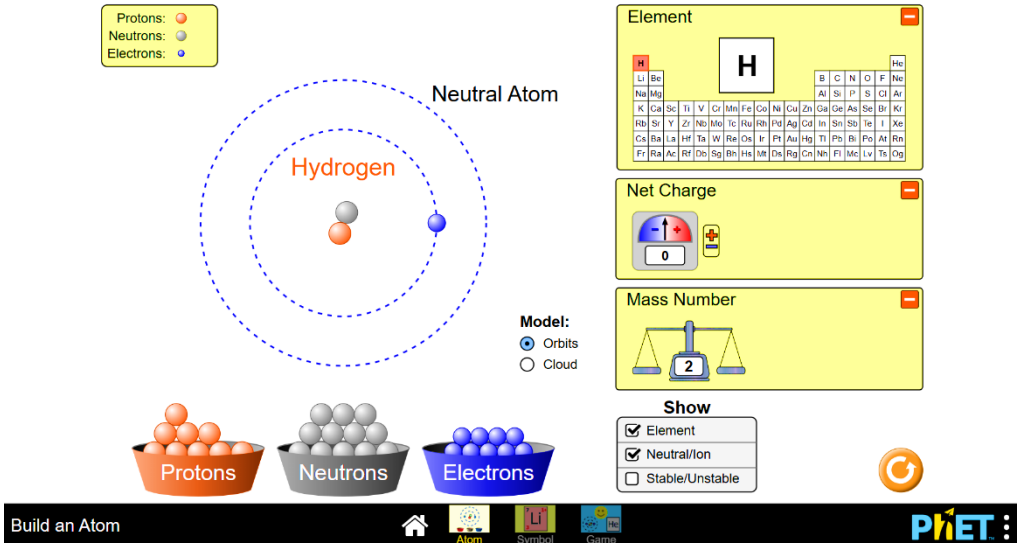
2. Worked Example

The teacher may use the online Open the Build an Atom simulation (https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_all.html) and click on the Atom icon.

(a) Pick any one of the first 5 elements that you would like to build and state its symbol. Start with hydrogen (H).

(b) Drag protons, neutrons, and electrons onto the atom template to make an atom of the element.

(c) Then, discuss the Bohr model of the element.



Points for discussion:

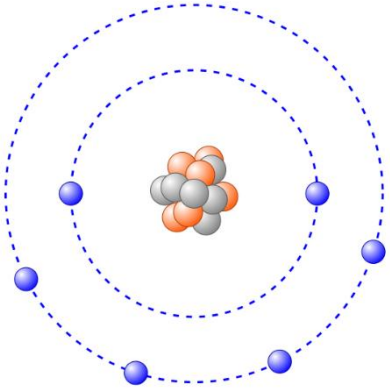
- Briefly introduce the Aufbau principle, which states that electrons fill orbitals of lower energy levels first. Explain that electrons occupy orbitals within specific energy levels based on their energy. Lower levels are closer to the nucleus and have lower energy.

3. Lesson Activity

Activity 2.

- Draw the Bohr model for elements 6-10.
- Identify the element, symbol, number of subatomic particles, group and period number given the Bohr model.

See Learning Activity Sheet: *Activity #2: Energy Levels*

Bohr Model	Answers
	Element: Carbon Symbol: C Number of protons: 6 Number of neutrons: 6 Number of electrons: 6 Group number: 4 Period number: 2

Note: This is just an example. You may build other elements (up to Neon) using the simulation.

SUB-TOPIC 3: Electron Configurations

1. Explicitation

Points for discussion:

- Energy levels can be represented by numbers. The innermost energy level is 1, the second is 2, the third is 3, and so on.
- Discuss what electron configuration is.
- Inform the students that there are a limited number of electrons that can be placed at each energy level.

Energy Levels	Maximum number of electrons
1	2
2	8

3	18
4	32

- Each energy level has different sublevels (s, p, d, f).

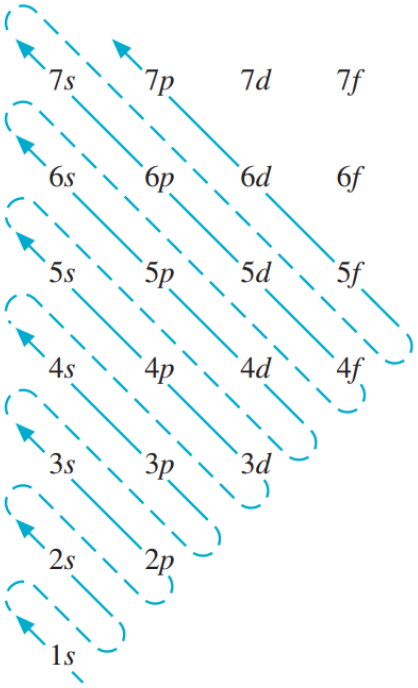
Energy Levels	Sublevels
1	s
2	s, p
3	s, p, d
4	s, p, d, f

- Each sublevel can have a maximum of a specific number of electrons.

Sublevel	Maximum number of electrons
s	2
p	6
d	10
f	14

2. Worked Example

- Example 1: Recall the Bohr model of hydrogen, use the diagram and come up with its electron configuration.
  Electron configuration of hydrogen: $1s^1$
  - The 1 stands for the energy level

	• The s represents the only sublevel present in the first energy level • Superscript 1 refers to the only electron of hydrogen. • Refer to the rules and tables in writing the electron configuration.  • Recall the Aufbau principle. The teacher may use the mnemonic or the diagram to help them remember the order of successive filling of subshells when writing electron configuration of heavier elements. • Example 2: Recall the Bohr model of boron, use the diagram and come up with its electron configuration. Electron configuration of boron: $1s^2\ 2s^2\ 2p^1$	Mnemonic: "Si Sally pumasok sa pinto. Si daddy pumasok sa door. Paano si Francis daddy paano si francis daddy paano?" The teacher may use other mnemonic devices but should not encourage the students to memorize it because this can easily be figured out in the periodic table.

	● The 1 and 2 stands for the energy levels present in the atom of the boron ● The s and p represent the sublevels present in the energy levels ● The superscript refers to the number of electrons per sublevel of boron. ● Refer to the rules and tables in writing the electron configuration. **3. Lesson Activity** **Activity 3.** ● Ask the students to put out the corrected Bohr model assigned to them and write the electron configuration of that element. **Day 3** **SUB-TOPIC 3: Valence Electrons** **1. Explicitation** ● Ask the students to bring out the Bohr model and electron configuration of their element. ● Ask them if they see the connection between these two. ● Introduce the concept of valence electrons once they have observed that the number of electrons in the outermost energy level in the Bohr model is the same as the sum of the electrons in the highest energy level in the electron configuration. **2. Worked Example** ● Example 1: Recall the Bohr model of hydrogen, use the diagram and determine the number of valence electrons. Electron configuration of hydrogen: $1s^1$ ● The superscript 1 refers to the only electron of hydrogen. ● Therefore, hydrogen has 1 valence electron.	See Learning Activity Sheet: *Activity #4: Electron Dot Diagrams*

	• Example 2: Recall the Bohr model of boron, use the diagram and determine the number of valence electrons. Electron configuration of boron: $1s^2\ 2s^2\ 2p^1$ • Recall that 2 is its highest energy level present in the atom of the boron. • The s and p represent the sublevels present in the second energy level. • Superscripts 2 and 1 refer to the number of electrons per sublevel of boron, respectively. • Add these to get the valence electrons: 2 + 1 = 3. • Therefore, boron has 3 valence electrons. **3. Lesson Activity** **Activity 4.** • Ask the students to identify the number of valence electrons for elements carbon to neon. • Provide the worksheet showing a periodic table chart and colored pencils/markers (optional). Instruct students to color-code different sections of the periodic table based on the highest occupied energy level of elements in that group (e.g., Group 1 - elements with 1 valence electron in the outermost level could be colored blue). • *Questions for discussion:* 1. How does the number of valence electrons change across a period (left to right)? 2. How does it change down a group (top to bottom)? 3. Do they see a relationship between the number of valence electrons and the position in the periodic table? Points for discussions: • Electrons occupy specific energy levels based on their energy, and the configuration of these levels influences an element's position on the periodic table.	See Learning Activity Sheet: *Activity #3: Periodic Table Color Coding* Key to correction: C: $1s^2\ 2s^2\ 2p^2$ N: $1s^2\ 2s^2\ 2p^3$ O: $1s^2\ 2s^2\ 2p^4$ F: $1s^2\ 2s^2\ 2p^5$ Ne: $1s^2\ 2s^2\ 2p^6$ Key to correction: C: 4 N: 5 O: 6 F: 7 Ne: 8

	• Elements in the same group have the same number of electrons hence they have comparable reactivity. • Valence electrons can be represented with Lewis Dot Diagrams (which will be discussed in Week 8).	
D. Making Generalizations	**Day 4** **1. Learners' Takeaways** Exit Ticket for Subtopic 1: o What is an electron cloud? o Why can't we pinpoint the exact location of an electron? Exit Ticket for Subtopic 2: o How does the energy level of an electron relate to its distance from the nucleus? o Explain why elements in the same group of the periodic table tend to have similar chemical properties. **2. Reflection on Learning** In their notebook, the students will write a journal entry consisting of 3-4 sentences, answering ANY of the following questions. *a. How did I learn the easy concepts?* *b. What should I do to learn challenging concepts?*	The teacher may propose other activities for the learners to describe their understanding of a concept, idea, and skill covered in the previous topic. The teacher should allow the learners to document their ways on how they think about their learning (metacognition).

V. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Draw the Bohr model, write the electron configuration, and identify the number of valence electrons of any of the following elements (The student may choose 1 only): a. Al b. Si c. P	The teacher may form other assessment items or strategies for this section.

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2. Homework (Optional)
Draw the Bohr model, write the electron configuration, and identify the number of valence electrons of argon.</td><td></td></tr>
<tr><td rowspan="5">A. Teacher's Remarks</td><td>Note observations on any of the following areas:</td><td>Effective Practices</td><td>Problems Encountered</td><td rowspan="5">The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement and other related stuff.

Teachers may also suggest ways to improve the different activities explored in the lesson exemplar.</td></tr>
<tr><td>strategies explored</td><td></td><td></td></tr>
<tr><td>materials used</td><td></td><td></td></tr>
<tr><td>learner engagement/ interaction</td><td></td><td></td></tr>
<tr><td>Others</td><td></td><td></td></tr>
</table>

B. Teacher's Reflection	*Reflection guide or prompt can be on:* ▪ *principles behind the teaching* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* ▪ *students* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* ▪ *ways forward* *What could I have done differently?* *What can I explore in the next lesson?*	Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.