

# **FUTUCLASS**

**LESSON PLAN:**

## Atom Structure

# WELCOME TO FUTUCLASS!

*The following lesson plan gives an overview of the Atom Structure VR Lesson. The lesson plan provides an overview of what prior knowledge is expected of the student, what the study module contains and how to instruct the student during the study module play.*

## Requirements for the student:

- Knows that substance is made of molecules.
- Knows that a molecule is made of atoms.
- Knows that an atom is made of smaller particles.

## Learning goals:

- The player will be able to describe the atomic structure.
- The player will be able to draw parallels between the position of an element in the periodic table and the atomic structure of that element.
- The player will construct the electron configuration of an element based on the atomic number.
- The player will be able to describe an atom as an electrically neutral particle.

### PREPARATION

Set up the game

5 minutes

### PLAYFUL LEARNING

Assemble atoms by yourself using protons, neutrons and electrons!

25 minutes

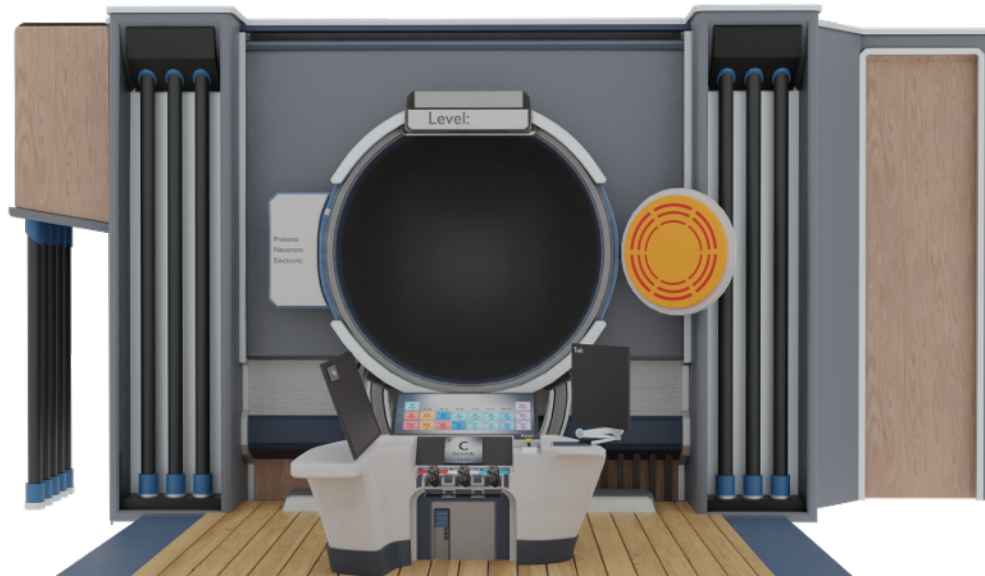
### REFLECTION

See what you learned

10 minutes

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# WHAT DOES THE LESSON CONTAIN?



- The goal of the game is to teach and practice the conceptualizing of the atom structure and the periodic table.
- Player's task is to create planetary models of different atoms using the emitters of protons, neutrons and electrons.
- In case the player is not familiar with any term (such as proton, electron layer, period, group etc.) they can learn about it from a touch screen inside the game.
- During the course of the game, the student will learn what an atom is made of, what are the organizing principles of the periodic table, and how to find the number of protons, neutrons, electrons and the atomic mass of an element.
- The student will learn to conceptualize why an atom does not have a charge.
- Mastering the VR lesson requires the player to experiment, to observe the changes in an element's charge and mass number, and to refer to the in-game periodic table.
- In the VR lesson, the student is given different tasks. The goal of each task is to create an atomic model using different input parameters which may include: the atomic mass, proton count, neutron count, period, group, etc.
- Feedback to student's successes and mistakes is given on the in-game screen.
- The student can at any moment in the game learn more about new concepts.

# LESSON OVERVIEW

The following overview will give an insight into what environment the player will be in and what the student will be able to experience.

The large dark target in front of the player is the area where the atoms will be created.

At the top is the current level indicator.

To the right is the confirmation target - shooting any particle at it will check if the atom the player created is the correct one.

To the left is the particle counter, counting all of the protons, neutrons and electrons.

To advance to the next level the player has to create the correct atoms according to the given instructions.

On the left the player will see a large touchscreen displaying headings for various concepts.

Whenever the player needs more info, they can tap on a heading and the concept will be explained to them.

The buttons will blink if they are most relevant in the current level.

The station in front of the player has a lot of necessary info and tools.

In the front is the periodic table. Below it an indicator showing the element the player currently has created.

At the lowermost part are the particle guns with mode buttons (add/remove).

To the right the player will see a screen showing the current task and feedback.

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# SOLUTION KEY

*The following table will describe what the player has to understand and to do in order to complete each levels in the VR lesson.*

Level	Learning goal and required task
1	Understanding that the number of protons defines the element. <i>Add protons to create the required element.</i> (neutrons and electrons are auto-added)
2	Understanding that neutrons change the mass but don't change the element. <i>Add neutrons to create the required element</i> (protons and electrons have been preset).
3	Understanding that both protons and neutrons contribute to the mass of the atom. <i>Add protons and neutrons to create the required element. Observe the atomic mass.</i>
4	Understanding that the number of protons and electrons has to be the same. <i>Create an element based on how many protons, neutrons and electrons it has.</i>
5	The number of electron layers corresponds to a row in the periodic table. <i>Create an element from a specific period.</i>
6	Number of electrons on the last layer (for group A elements) corresponds to a column in the periodic table. <i>Create an element from a specific group.</i>
7	Combine your knowledge - atomic mass and number of electron shells) <i>Create an element of a specific period given the constraint on the atomic mass.</i>
8	Combine your knowledge - atomic mass and electrons on the outer shell <i>Create an element of a specific group given the constraint on the atomic mass.</i>

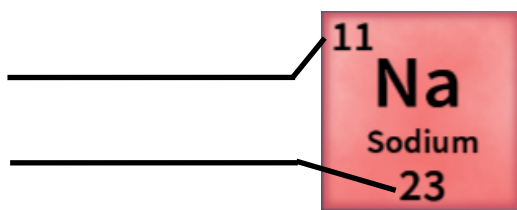
# REFLECTION

1. Write the correct term after each explanation. The correct terms are listed below.

- A positively charged subatomic particle, the count of which is indicated by the atomic number, is called \_\_\_\_\_
- A negatively charged subatomic particle, the count of which is indicated by the atomic number, is called \_\_\_\_\_
- A subatomic particle with no electric charge, the count of which is found by subtracting the atomic number from the element's atomic mass, is called \_\_\_\_\_
- A row in the periodic table is called \_\_\_\_\_
- A column in the periodic table is called \_\_\_\_\_

Choice of terms (two of them are redundant): electron, atomic number, group, neutron, period, proton, molecule.

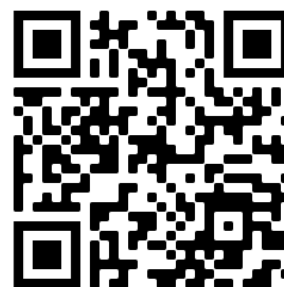
2. Write on the lines what the numbers in the box represent (use the terms: number of protons, number of electrons, number of electrons in the outer layer, atomic mass, number of nuclei, number of electron layers).



I A								VIII A	
1.	1 H Hydrogen 1							2 He Helium 4	
2.	3 Li Lithium 7	4 Be Beryllium 9	5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20	
3.	11 Na Sodium 23	12 Mg Magnesium 24	13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulfur 32	17 Cl Chlorine 36	18 Ar Argon 40	

3. Use the periodic table to decide which element is being described. Answer by writing the symbol of the correct element.

- 1) Which element has 4 protons? \_\_\_\_\_
- 2) Which element has a mass number of 24? \_\_\_\_\_
- 3) Which element has three electron layers and a mass number less than 24?  
\_\_\_\_\_
- 4) Which element has three electrons in the outer layer and a mass greater than 15?  
\_\_\_\_\_



Take this test online!

<https://forms.gle/iMZaVQLZrgNn8Pwp7>

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