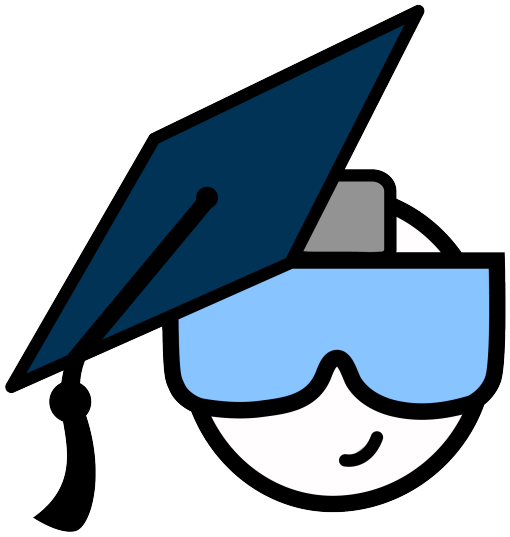


FUTUCLASS

LESSON PLAN:

Oxygen Escape Room

v. 01061

WELCOME TO FUTUCLASS!

The following lesson plan gives an overview of the Oxygen Escape Room study module. 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:

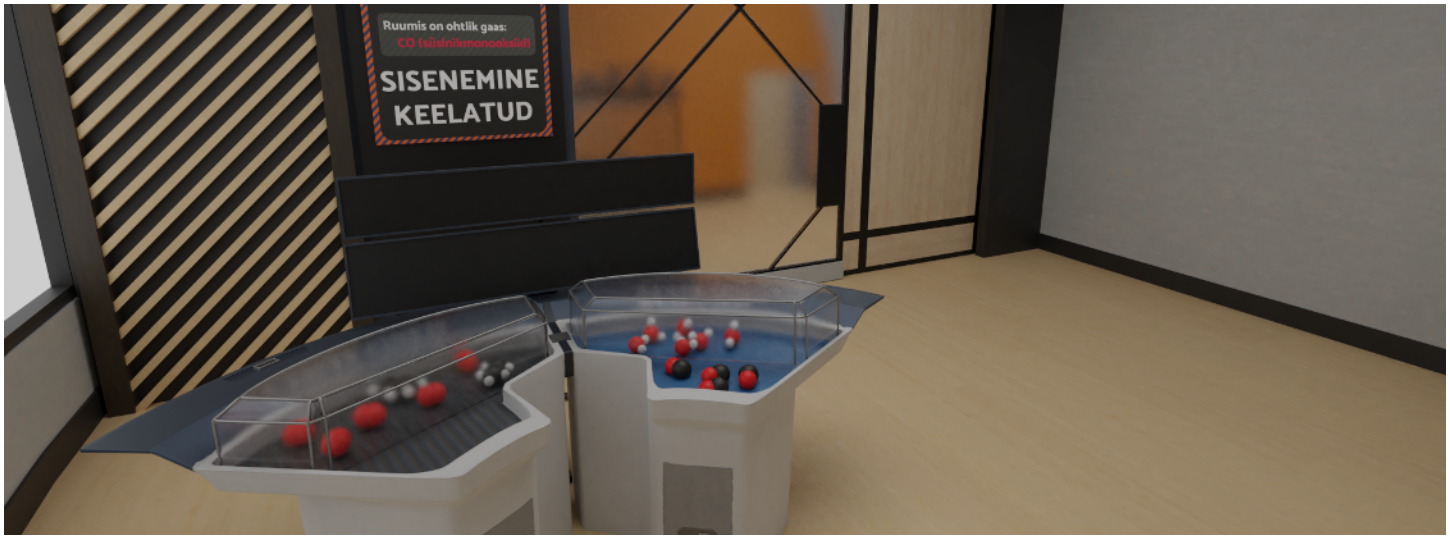
- Can gather information from a molecular formula.
- Can explain how reaction equation works.
- Can balance simpler reaction equations.
- Knows what is the "3D model" of a molecule.

Learning Goals:

- Can deduce which substances are required for the reaction to occur based on the chemical equation.
- Knows the required conditions for the incomplete and complete combustion to occur.
- Knows how to balance the reaction equation for the complete combustion of ethane.
- Differentiates between the parts that make up a 3D molecule.

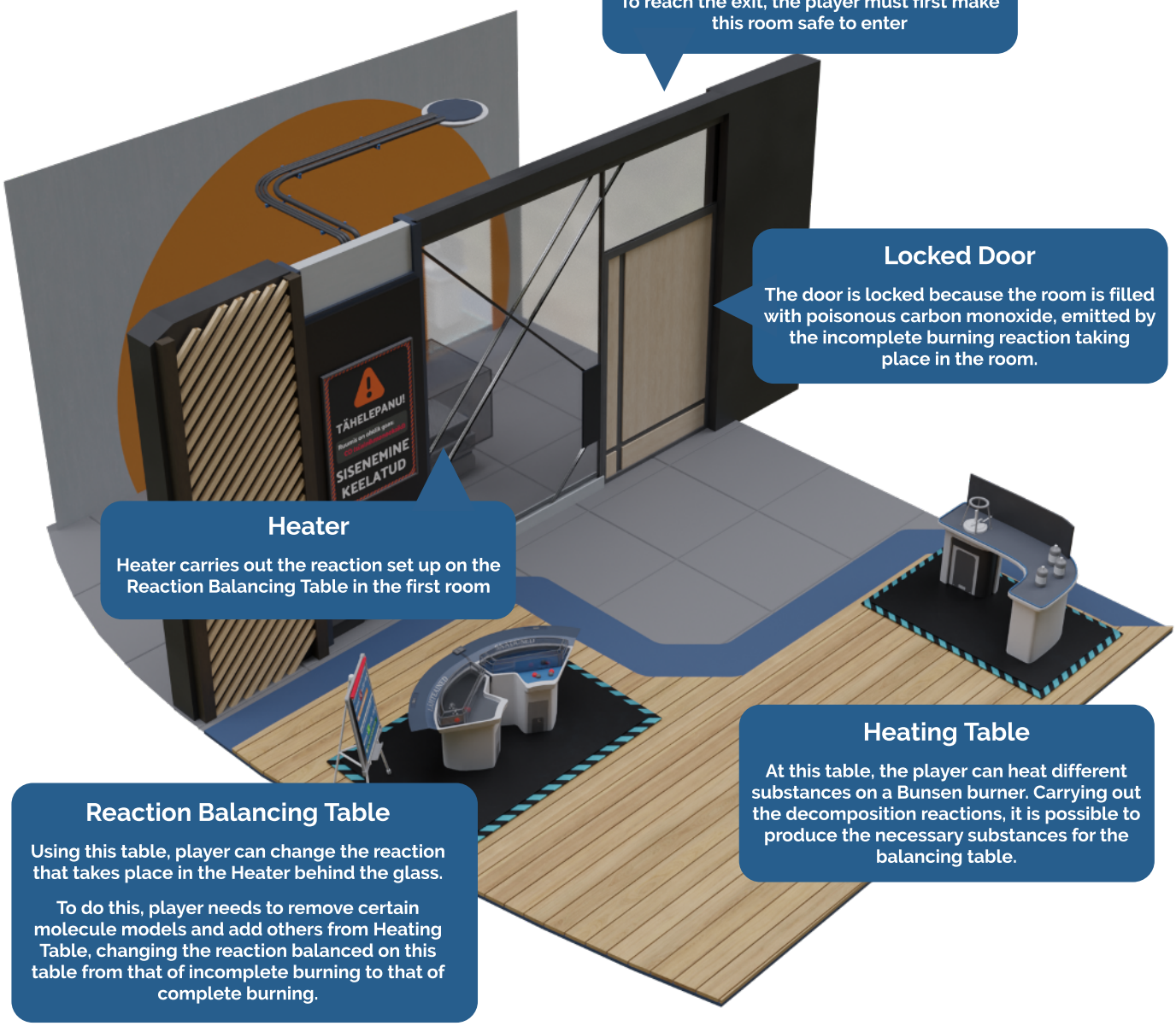
PREPARATION	PLAYFUL LEARNING	REFLECTION
Getting to know the game	Escape the room by mastering combustion.	See what you learned
5 minutes	25 minutes	10 minutes

WHAT DOES THE LESSON CONTAIN?



- The goals of the game are: Balance the chemical reaction of complete combustion. Obtain molecules of substances required for the reactions. Understand that carbon monoxide and carbon dioxide are substances with different properties.
- The player's task is to get acquainted with and to understand the differences between complete and partial combustion reactions, and then to balance the complete combustion reaction equation of the alkane using "3D" molecular models. To do this, the molecules of the substances needed must be produced by decomposition reactions (game-based boards and instructions are available to help with this). During the game, player moves around in the space that contains the interconnected tasks.
- During the game, students see the "3D" molecules being made up of different atoms. They understand that decomposition reactions produce various different products, and balance a complete combustion reaction equation using "3D" molecular models.
- Understanding the content of the game presupposes that the student is able to interpret the written reaction equations, understands the representations of “3D” molecular models and dares to experiment with the construction of the reaction equation using the molecular models.
- Student is also guided in the game through voice instructions.

LESSON OVERVIEW



SOLUTION KEY

1. Player is looking for a way to exit the room.
    A. How can one exit the room?
2. Player tries to exit the room.
    A. Try to exit the room.
3. Room cannot be exited, because the door leading to the room with exit door is closed. The screen/sign next to the door warns of dangerously high level of carbon monoxide inside the room.
    A. What prevents you from leaving the room?
4. Player is investigating what the warning screen is connected to / why the door is closed.
    A. What can tell you if there air in the room is toxic? Is it in any way related to the screen?
5. Player investigates what causes the high level of CO.
    A. Do you see anything happening in this room that explains the high level of CO? Remember that CO is produced by incomplete combustion.
6. Player examines whether anything can influence what is happening in the room.
    A. See if you can find anything that controls or feeds the reaction in the room? How could you influence that?
7. Player makes the connection between the Balancing Table in the first room and the combustion process in the second room.
8. Player examines the reaction on the Balancing Table. She detects that this is an incomplete combustion reaction.
    A. What chemical reaction takes place in the second oom?
    B. What is usually the product of the combustion reaction? How is it different?
9. The player understands that the reaction on the balancing table determines what happens in the room.
    A. How is the balancing table related to what is happening in the room?
10. The player begins to change the reaction equation. It is necessary to replace CO with CO_2 and change the ratio of methane to oxygen.
    A. What do you need to do for complete combustion to take place?
    B. What must change in the reaction equation for the combustion to be complete?
11. The player understands that there are not enough compounds. There is no carbon dioxide.
    A. Is something missing?
12. The player looks for more compounds in the environment..
    A. Is it possible to get it anywhere?
13. There are no compounds needed in the environment, but there is another table where different liquids can be heated. (H_2O_2, H_2CO_3, H_2O)
14. The player heats the liquids and receives the required compounds as a result.
    A. What happens when these liquids are heated?
15. Player takes the new compounds to the Reaction Balancing Table.
16. Player balances the equation of the complete burning reaction.
17. The moment the equation has been balanced, the reaction in the next room changes, and the door opens.
    A. What changed? Why now are you allowed to enter the room?
18. Player exits the room.
19. Lesson complete.

REFLECTION

1. Based on the reaction equations, decide which reaction can be used to produce oxygen carbon dioxide. Write the answer (can produce oxygen / can produce carbon dioxide) onto the line behind each equation.

$2H_2O_2 \rightarrow 2H_2O + O_2$_____

$H_2O(v) \rightarrow H_2O(g)$_____

$H_2CO_3 \rightarrow H_2O + CO_2$_____

2. Write for each molecule which substance this molecule characterizes (choose from: carbon dioxide, carbon monoxide, oxygen, water, ethane)

_____

3. Decide if the statement is true or false - correct the false statement:

a) When there is insufficient oxygen, incomplete combustion occurs, producing toxic carbon dioxide. _____

b) When there is sufficient oxygen, complete combustion occurs, producing non-toxic CO_2. _____

4. Balance the combustion reaction

____C_3H_8+ ___$O_2 \rightarrow$ ___CO_2+ ___H_2O

Does this reaction characterize the complete or the partial combustion of the substance??

_____

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