

Molecular Interactions with Bond Breaker Classroom Edition– VEGA Teaching Scenario

Topic: Atoms form molecules that range in size and motion

Subject(s): Chemistry, Physics, Biology, Science

Age / Grade: 12+ years/ grade 6+

Short description of the game [Bond Breaker Classroom edition:](#)

This is a puzzle game based on real nano-scale science. You'll have to manipulate protons, molecules, laser light, and more to solve the challenges that await you. You start this game in the smallest way possible - as a single proton. You don't even have an atom to call your own. Learn what it takes to be a proton, experience subatomic forces, and with luck and determination, grow into an atom of your own. Collide atoms together into molecules, or break them apart again using lasers, tunneling microscopes, and heat. A fun and exciting way to learn as a team of scientists at the CaSTL Center help you navigate your way through the joys of physics and chemistry.

Learning outcomes for this scenario:

- comprehend that everything is made up of atoms
- gaining an understanding of the atomic world.
- get acquainted with how atoms are formed
- get familiar with nitrogen, helium and the oxygen atom
- get acquainted with protons, electrons and neutrons
- get acquainted with the basic principles according to how these move in relation to each other
- practice these goals in Bond breaker Classroom edition
- develop cooperation skills during the game
- develop self evaluation skills

A selection of learning outcomes from the Finnish Curriculum associated with the learning outcomes for this scenario

- awaken and maintain the student's interest in the environment and the teaching of environmental science and help the student to realize that all subject areas in environmental science are important to him. (M1)
- encourage the student to phrase questions about different subject areas and to use them as a starting point for research and other activities (M4)
- offer the student opportunities to practice working in a group by participating in different roles and social situations, inspire the student to express themselves and listen to others and support the student's ability to identify, express and regulate their emotions (M10)
- guide the student to observe the environment, human activities and phenomena related to them with the help of concepts in environmental science and to develop their concept constructions from consisting of different preconceptions so that they better correspond to the exact use of the concepts (M12)
- guide the student to investigate, describe and explain chemical phenomena, the properties and transformations of substances and lay the foundation for the understanding of the principle of the preservation of matter (M18)

[Formative assessment](#)

Number of students: Duration (estimated time/number of lessons):

- 20 students, 4 lessons á 45 min

Prerequisites (necessary materials and online resources):

- 10 computers with the game [Bond breaker Classroom edition](#)

ny uppgift: Atomer

Mål:

- förstå att allt är uppbyggt av atomer
- bekanta dig med hur atomer är uppbyggda
- bekanta dig med kväve, helium och syreatomen
- bekanta mig med protoner, elektroner och neutroner
- bekanta dig med grundprinciperna enligt hur dessa rör sig i förhållande till varandra
- öva dessa mål i Bond breaker Classroom edition

Inlämnad Tilldelade 18

	Voting - Mentimeter https://www.menti.com/wf7j1...		Vocaroo Online voice rec... https://voca.ro/1m5d0uu8mULr
	What's Inside an Atom? Pr... YouTube-video 4 minuter		Klassvideomöte http://meet.google.com/ksv-sr...
	Bond Breaker - Classroom... https://testtubegames.com/bo...		Bond Breaker ordlista Google Dokument

- splitted headphones
- information about the topic to mediate to the students (videos, books, pictures etc.)
- check that the internet is working

Before the program begins (preparatory work for teacher):

- check that the web-based program is working on all computers
- get familiar with the game
- search and collect information and material about the topic
- prepare and collect all things needed for the scenario
- the game is in English, make a [glossary](#) with words needed
- use for example [Vocaroo.com an online voice recorder](#) and record a summary of the knowledge you want the students to comprehend after part 1 in the scenario
- create a task in Google Classroom or Teams where all links are included
- create an online meeting link in Meet, Teams or Zoom with which the student's later can join and share screen
- schedule the task
- Divide the students into pairs

Introduction to the scenario *(incl. possible applications, alternatives, risks, and possible challenges)*:

- Check the internet and Wifi
- Check the graphic card and if the computers have enough battery, if not connected with a cord.
- Are the pairs well divided
- Are there students with special needs in the class? Be sure to provide them with what they need (assisting teachers, a space of their own etc.)
- Do the students have access to all links

The main part of the scenario (number of lessons):

Part one (two lessons 2 x 45 min)

Goal: Catch the students' interest for the topic by introducing the game

Lesson one:

Preparations:

- divide the pairs, **set norms for working in pairs:** • Take turns • Everyone shares • Look at the speaker - Don't interrupt!
- Ask the students to **login on their account** (Instructions included in the task in Google Classroom/Teams).
- Start with having the students fill in a [Mentimeter](https://www.menti.com) to get a perception of the students prior knowledge of the topic.

For example: What do you know about atoms and their structure and motion? Look at the student's answers and discuss the answers.

Go to www.menti.com and use the code 2383 1516

Vad vet du om atomer och deras uppbyggnad och rörelse?

Mentimeter



- listen together at a **sound clip** repeating topics learned earlier in school. According to the sound clip, draw conclusions about what the headlights are and **summarize the content in a mindmap on the whiteboard.**
- Awaken the students' interest for the game by letting them **try the game** with only a few instructions such as explaining that they can either use the arrows on the keyboard or the mouse to play and how to turn off the background music.
- encourage the students to **use the glossary** when they encounter difficult words in English
- Let the students play the rest of the lesson approximately 15 minutes.
- walk around in the classroom and **supervise the students.**

Short break

Debrief, how is it going? Discussion with the whole group.

- What is the game about?
- Is there anything you do not understand?
- Have you encountered any challenges? How did you solve it? Do you need more help? In what way?

Ask the students to open the **glossary**. Read through the glossary in pairs and get familiar with the vocabulary.

After reading through the list let the students **continue playing**, for the next 20 minutes.

- **Encourage the students** to share the screen and ask for help from the rest of the group when they need advice.
- Solve the problems together.
- Encourage the students who have reached higher levels to become co-teachers and helping their classmates
- During the students' play the **teacher's role** is to continue walking around in the classroom **guiding and asking questions to consolidate the learning outcomes/goals**

When there are 10 minutes left, it is time to **share experiences** and to discuss. Discuss within the whole group.

- How far along did you get? In what way did you cooperate?
- What differences did you notice between protons and electrons?
- What do repel and attract mean regarding molecules?
- Did you have trouble with anything while playing? What? Where? Why?

Until the next lesson ask the students to

- watch [This animated video](#) and be prepared for the Kahoot coming up next time
- practice the Glossary words

Part two (two lessons 2 x 45 min.)

Preparations:

- prepare a Kahoot with questions from both the animated video and the Glossary
- prepare an evaluation survey for the students
- create an online meeting link
- create a task in Google Classroom or Teams
- schedule the task
- create an online meeting link
- book the computers

Lesson goal: Complete the game at least up to level 20? Repeat the topic in a Kahoot and summarize the learning Outcomes

Lesson 1

- Place the students in the same pairs as in the last lessons.
- Ask the students to login to their account (Instructions included in the task in Google Classroom/Teams).
- The teacher starts the Kahoot and the pairs play.
- Summarize the conclusions from the last lesson.
- Prepare the students for playing one last time, now with the knowledge they have earned.
- During the students' play the teacher continues to guide and ask questions.
- prepare the students for the Debriefing time coming up the last 10 minutes
- Debrief: Have you encountered any challenges? How did you solve it?
- Explain about the students' task for the next lesson

Task: While playing the game take screenshots of three tricky situations in the game. Be prepared to share the screen and show the situations and explain how you overcame the challenge

Short break

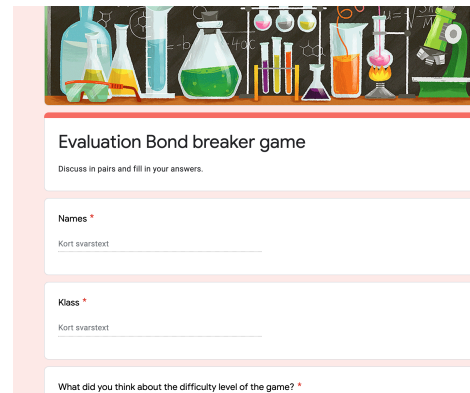
Lesson 2

Continue playing for 20 minutes. Encourage the students to take turns and to cooperate! The teacher continues to take the guiding part. Evaluate briefly together in the whole group before evaluating in the survey.

The pairs evaluate in the [shared survey](#).

Evaluation of the scenario with pupils:

In the end of part two.



Evaluation Bond breaker game
Discuss in pairs and fill in your answers.

Names *
Kort svarstext

Klass *
Kort svarstext

What did you think about the difficulty level of the game? *