Sequence 6: Nuclear energy

Sommaire des activités ETLV :

Layout of the sequence

1. Activity 1: Introduction (5 min). Watching a video and finding vocabulary (20 min).
2. Activity 2: Questions and answers (10 min).

ACTIVITY 1: History of nuclear energy (level 1)

Objective: Acquiring information on nuclear energy and its history

DOCUMENT 1: Geo history : History of nuclear power - Summary on a Map

https://www.youtube.com/watch?v=gGTEDH0SIdA

Source: Geo history
Let's retrace on a map a summary of the history of civilian and military nuclear power since the discovery of radioactivity.

Gathering information:

Watch the first 5min of the video carefully. Write down the keywords/expressions/definitions you heard on a piece of paper.

_____
_____
_____
_____
_____
_____

Acquiring vocabulary:

Fill in the blanks:

English	French
to revolve	
nucleus	
research	
a chain reaction	
to break out	

to flee	
the latter	
fissile	
enriched uranium	
tremendous	

Going into details:

Watch the video and find the missing words (numbered from 1 to 25):

We begin in (1).

In Paris, physicist Henri Becquerel accidentally discovers during an experiment that uranium leaves a trace -- or darkens -- a photographic plate without any other (2) source.
He concludes that uranium naturally emits a ray he calls “uranique” in French.
In the following years, physicists Pierre and Marie (3) discover other elements that also naturally emit radiation.
They call the phenomenon radioactivity. Later, Ernest Rutherford, a British physicist born in New Zealand, suggests that radioactivity is radiation that accompanies the (4) of atoms, which were previously considered to be indestructible. Other findings are then used to better understand the structure of the atom, with electrons revolving around a nucleus composed of protons and (5). In 1938, two German chemists, Hahn and Strassmann discover nuclear fission. Bombarding an atom of uranium with a neutron, it is divided into two, releasing (6).
The following year in Paris, Frédéric Joliot-Curie discovers that during the nuclear fission of uranium, (7) neutrons are ejected which in turn could cause further fission of atoms.
He discovers the ability to initiate a (8) reaction and thus produce a large amount of energy.

The Manhattan Project

In Europe, World War II breaks out. While Germany continues to conduct (9) on uranium, Albert Einstein is convinced by Hungarian physicists to sign a letter addressed to (10), the President of the United States informing him of recent nuclear discoveries and the possibility of creating a very powerful (11) using uranium. The United States benefits from the influx of European scientists (12) war and invests in research.
At the University of California, Glenn Seaborg discovers that irradiated uranium produces a tiny amount of plutonium, a new metal that is radioactive and (13), i.e. it can trigger a chain reaction.
In Chicago, Enrico Fermi creates the first atomic pile and - for the first time - manages to (14) the first chain reaction of the fission of uranium atoms. Research is accelerated and substantial resources are invested.
The United States secretly launches the (15) in collaboration with Canada and the United Kingdom.
Top scientists gather in about 30 secret locations, with the best laboratories at the time made available to them. Their goal is to create the atomic bomb.

The atomic bomb

The goal is to create a bomb from uranium and another from (16).
In nature, uranium is composed of more than 99% of uranium 238, i.e. with a nucleus of 92 protons and 146 neutrons, and 0.7% of uranium (17), with three neutrons less. Only the latter is fissile and therefore useful in the project. The challenge is isolating and concentrating it to obtain so-called (18) uranium.
The United States manages to produce 64 tons of highly enriched uranium to be used in the manufacture of the first bomb. By propelling a highly enriched uranium block onto another, the material becomes (19).
Fission begins and in a split second, a chain reaction ensues, releasing tremendous amounts of energy.
For a (20) bomb, a maximum of uranium piles are created in order to collect the plutonium produced.

A few pounds are concentrated in the centre of the bomb. By simultaneously causing (21) all around, the material is compressed, becomes supercritical and explodes.

First uses

On 16 July 1945, the first successful nuclear test takes place in the desert of New Mexico.
By this point, Germany had already (22). Only the Empire of Japan is still at war against the United States. After Japan refuses to surrender unconditionally, the United States drops two atomic bombs on the country a uranium bomb on Hirashima and a plutonium one on (23). The two bombs cause about 200,000 civilian casualties. Days later, Japan surrenders. With the United States demonstrating its power to the world, the (24) accelerates its own nuclear program to try and (25).

- **Write your answers in a Google Form or below:**

1. _____	**2.** _____
3. _____	**4.** _____
5. _____	**6.** _____
7. _____	**8.** _____
9. _____	**10.** _____
11. _____	**12.** _____
13. _____	**14.** _____
15. _____	**16.** _____
17. _____	**18.** _____
19. _____	**20.** _____
21. _____	**22.** _____
23. _____	**24.** _____
25. _____	

ACTIVITY 2: Nuclear energy history (level 2)

Objective: Reinvesting vocabulary to increase your knowledge on nuclear energy history

Answer the following questions. At the end of the lesson, the results will be presented to the rest of the class.

a) What do you notice about the map of France in 1896?
What is the cause of that?

_____

b) How many Nobel prizes did Marie Curie win?

_____

c) What does radioactivity mean?

_____

d) Give the name of the Hungarian physicist who wrote the letter with Einstein to President Roosevelt.

_____

e) What did Frédéric Joliot-Curie find during the nuclear fission that Hahn and Strassman didn't?
What is the consequence of this discovery?

_____

f) Why is the experiment of Enrico Fermi so important?

_____

g) What was the purpose of the Manhattan Project?

_____

h) What was the name of the first bomb tested in New Mexico on July 16, 1945?

_____

Activities summary

What you must remember:

- **nuclear energy**
- **uranium**
- **fissile**

Skills linked to the curriculum**:**

Compétences	Capacités à maîtriser	Où dans cette séquence ?
APP	Utiliser du vocabulaire spécifique	Activités 1 à 6
	Lire et comprendre des documents scientifiques	Activités 1 à 6
COM	S'exprimer à l'écrit et à l'oral en utilisant le vocabulaire adapté	Activités 1 à 6

Objectifs de la séance :

- *Compétences linguistiques* : Améliorer la capacité des élèves à parler en anglais sur un sujet technique.
- *Compétences techniques* : Renforcer les connaissances sur l'énergie nucléaire.
- *Compétences de présentation* : Développer les compétences en communication et présentation en anglais.

Durée de la séance : 1 heure

Matériel nécessaire :

- Support visuel (vidéo courte).
- Accès à internet (pour recherches rapides si nécessaire notamment un Google form)