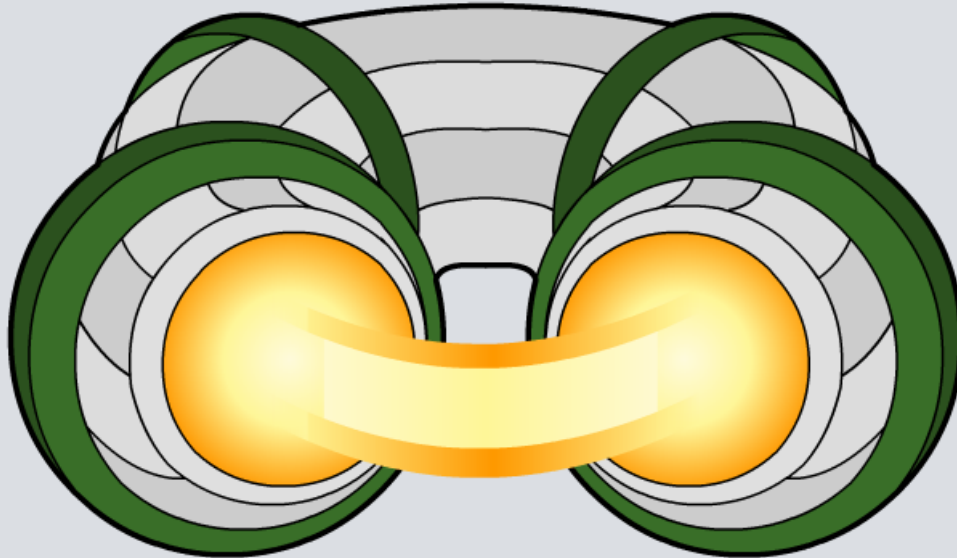


## Nuclear Fusion



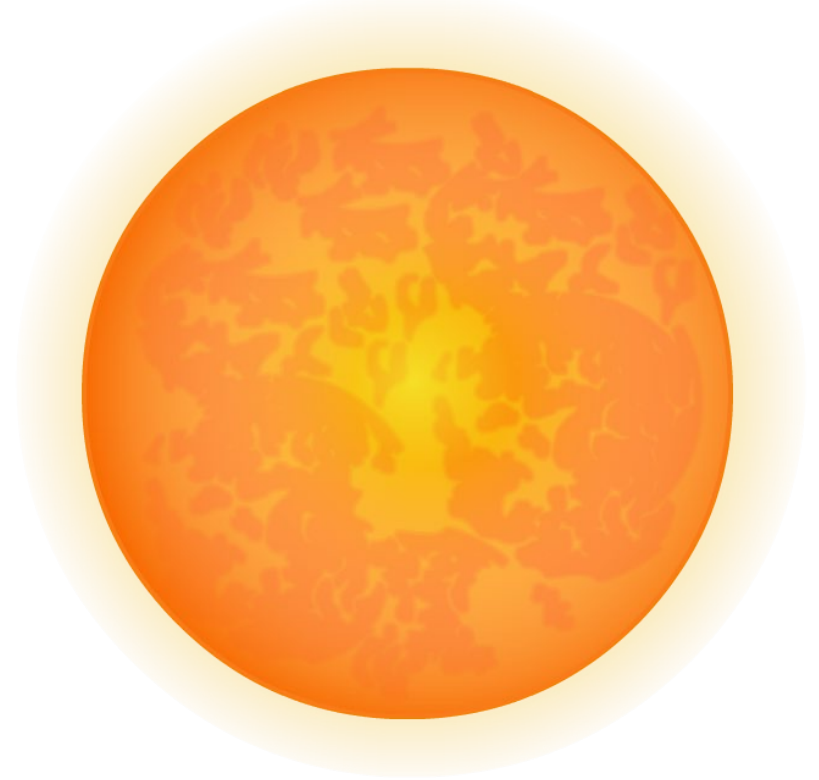
# What is nuclear fusion?

**Nuclear fusion** is the process which powers the Sun and other stars.

In this process, small nuclei join together to form larger nuclei and energy is released.

In the Sun's core, at temperatures of 15 million °C, hydrogen nuclei fuse to form helium nuclei and release vast amounts of energy.

A worldwide research program is being carried out to find ways in which nuclear fusion could be harnessed on Earth as a clean and plentiful source of energy.



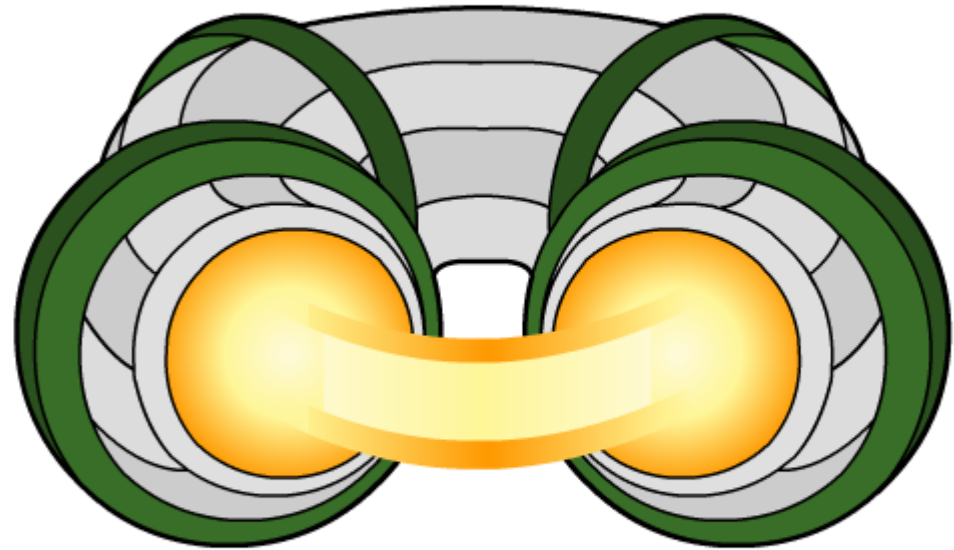


## What is nuclear fusion?

**Nuclear fusion** could be used as a source of energy on Earth in a fusion reactor.

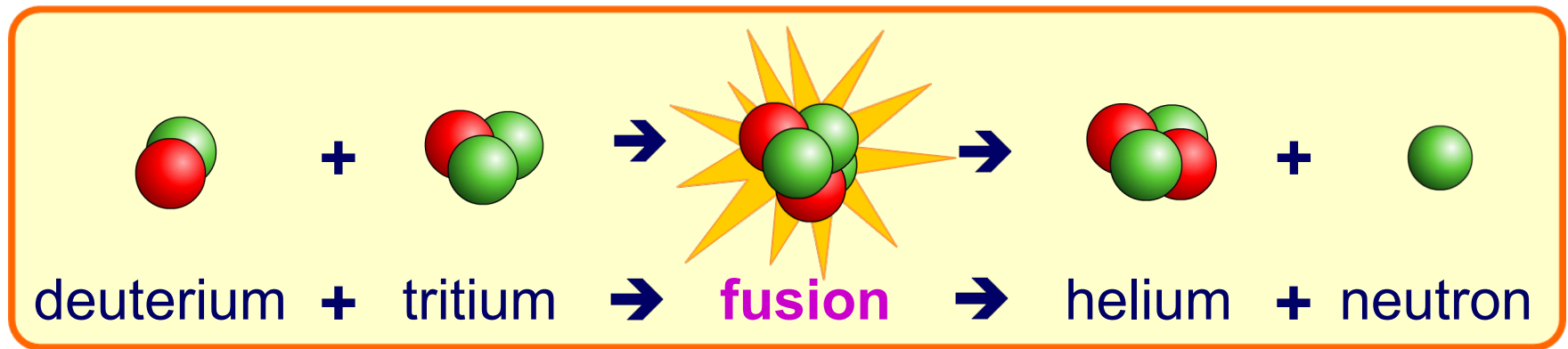
This process would involve two isotopes of hydrogen being joined together.

Click "**play**" to find out more.



# What are the conditions for nuclear fusion?

In nuclear fusion, small nuclei fuse together to form larger nuclei and energy is released.



Nuclear fusion happens all the time in stars at **very high pressures and temperatures**. These conditions overcome repulsive forces between the nuclei and force them together.

Scientists have found it difficult to create the extreme conditions needed to carry out nuclear fusion on Earth.

Various fusion reactors are being tested around the world.

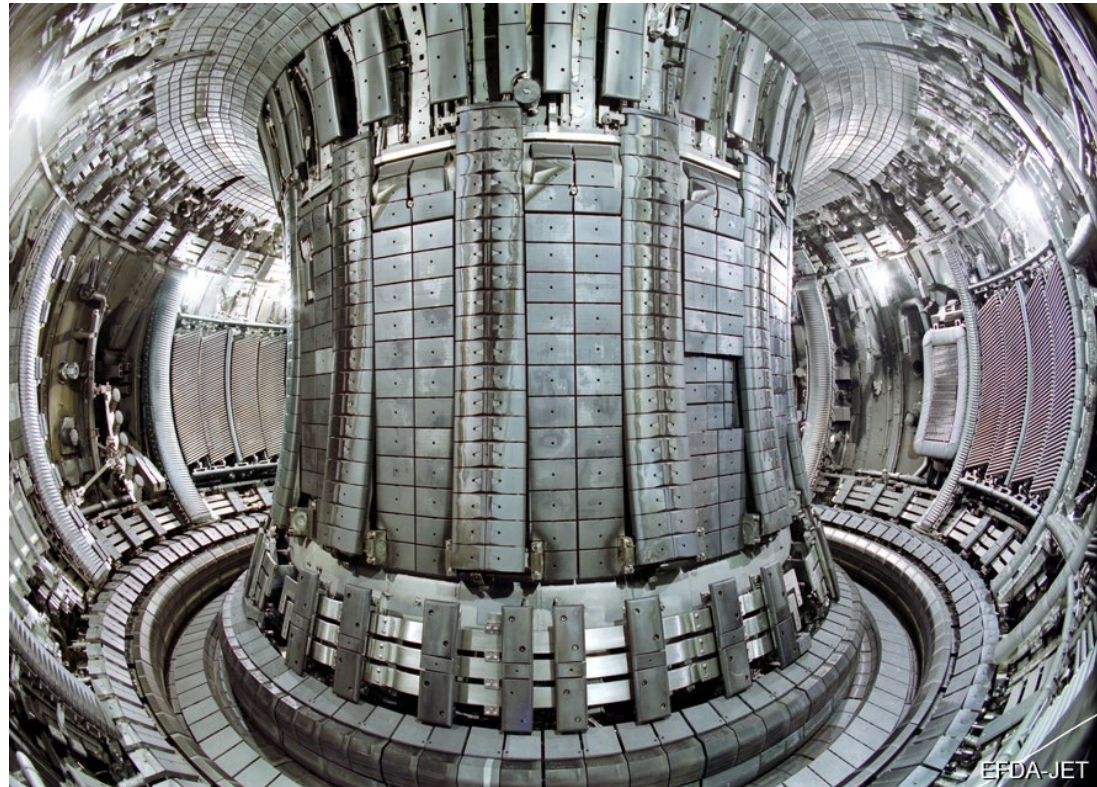


# What does a fusion reactor look like?

The largest nuclear fusion experimental reactor is **JET** (Joint European Torus) in Oxfordshire, England.

Fusion on Earth requires temperatures about six times hotter than the Sun's core.

This vessel uses a magnetic field to trap super-hot hydrogen, which has changed from a gas into a high-energy plasma.



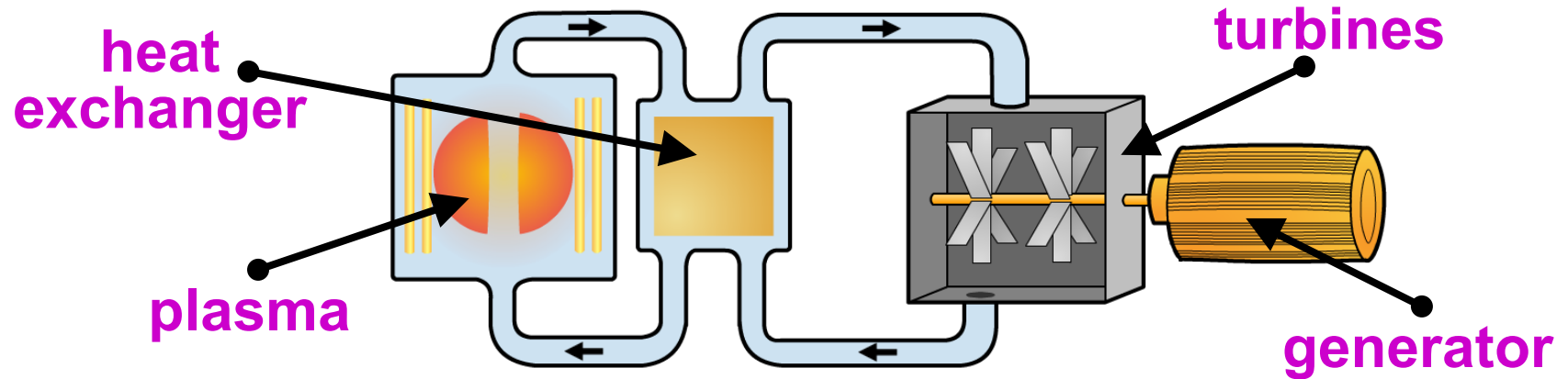
The reactor is most efficient as a **doughnut** shape.



# How will a fusion power station work?

In a fusion power station, the hydrogen plasma will be 'squeezed' to produce helium and high energy neutrons.

The energy of the neutrons will then be transferred by a water cooling loop to a heat exchanger to make steam.



Then, like fossil fuel and fission power stations, the steam will drive turbines to produce electricity.

It is hoped that the first fusion power station will be ready and working in about 30 years time.

# Why use nuclear fusion?

There are many advantages of using fusion energy:

**Abundant fuels** – Deuterium is extracted from water and tritium is made from lithium, which is readily available.

**Small amounts of fuel** – 10g of deuterium and 15g of tritium could produce enough energy for the lifetime of an average person in an industrialized country.

**Clean** – No greenhouse or polluting gases are made.

**Safe** – No need to keep chain reactions under control.

**Less radioactive waste** – The products of nuclear fusion are not radioactive, although the reactor walls will absorb neutrons and become radioactive.

**No weapons material produced** – The products are not suitable for making nuclear weapons.



Is each statement for or against nuclear fusion?

For nuclear fusion

Against nuclear fusion

still many years of  
development needed



solve

