

Edexcel GCSE Physics

Topics 6.36P-6.46P - Nuclear Power

Flashcards

Describe the advantages of nuclear power for generating electricity.

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- Nuclear fuels do not produce carbon dioxide
- The fuel is readily available, so would reduce strain on the fossil fuel supplies
- Less nuclear fuel has to be used to produce the same amount of energy as burning fossil fuel
 - Does not contribute to global warming

Explain some disadvantages of using nuclear power to generate electricity.

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- Unpopular - the public perceive nuclear power as very dangerous
- Security risks as the radioactive substances can be useful for terrorists
- Expensive to commission and decommission the stations - which may be bad for a country's economy
- The radioactive waste can be difficult to dispose of and will remain radioactive for many years - which can be dangerous to humans and the environment
- Risk of nuclear accidents

What is nuclear fission?

What is nuclear fission?

The splitting of large, unstable nuclei to form smaller more stable nuclei (+ the emission of spare neutrons).

What usually needs to happen to induce fission?

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- The unstable nuclei must absorb a neutron
- Spontaneous fission (where no neutron absorption occurs) is rare

Alongside two smaller nuclei, what else is emitted in a fission reaction?

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- Two or three neutrons
- Gamma rays
- Energy

Name a common fissile nuclei.

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Uranium-235

What are the three main components of the core a nuclear reactor?

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1. Fuel rods
2. Control rods
3. Moderator

What takes place during a chain reaction
in a nuclear reactor?

What takes place during a chain reaction in a nuclear reactor?

- An unstable nucleus absorbs a neutron
- The nucleus undergoes fission and releases 2 or 3 further neutrons
- These induce more fission, which results in a chain reaction

What is the consequence of an uncontrolled chain reaction?

What is the consequence of an uncontrolled chain reaction?

- The rate of fission events becomes too high and results in the production of too much energy
- This can lead to a nuclear explosion

How is the chain reaction in a fission reactor kept under control?

How is the chain reaction in a fission reactor kept under control?

- Control rods are positioned in between the fuel rods
- The rate of fission is controlled by moving these rods up and down
- The lower the rods are inserted, the slower the rate of fission

What is the role of the moderator in a nuclear reactor?

What is the role of the moderator in a nuclear reactor?

To slow down the neutrons so they are travelling at speeds which allow them to be absorbed by fissile nuclei and cause fission.

How is electricity produced in a nuclear power station?

How is electricity is produced in a nuclear power station?

- The reactions release thermal energy
- The thermal energy is used to boil water and then produce steam.
- This steam is then used to turn a turbine which starts the generator.

What is nuclear fusion?

What is nuclear fusion?

When two light nuclei join to produce a heavier nucleus and release energy.

Name two isotopes of hydrogen which are commonly used in nuclear fusion.

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Deuterium and Tritium

Which releases more energy, nuclear fission or nuclear fusion?

Which releases more energy, nuclear fission or nuclear fusion?

Nuclear fusion.

Explain the difficulty of generating energy through nuclear fusion.

Explain the difficulty of generating energy through nuclear fusion.

Fusion requires very high temperatures which in itself requires large quantities of energy. Currently, the production of fusion results in a net loss of energy.

Give an example of where fusion occurs?

Give an example of where fusion occurs?

In the sun - stars use fusion as their energy source.

Why does nuclear fusion require so much energy?

Why does nuclear fusion require so much energy?

This is because both nuclei are positive therefore a lot of energy is required to overcome the electrostatic repulsion between the two nuclei.