WJEC England A-Level Physics

3D Energy and the Environment

Flashcards

What is renewable and non-renewable energy?

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Energy is renewable if it is able to be replenished in a lifetime, for example, 50 years.

Non-renewable energy is unable to be replenished within this lifetime.

What is a main sequence star?

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One that generates most of its energy from hydrogen to helium fusion within its core.

What is the Greenhouse Effect?

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Gases in the Earth's atmosphere acts like a greenhouse. The name comes from the idea that the glass of a greenhouse transmits visible radiation, some UV, and some infrared, but does not transmit the longer infrared given out by the cooler contents of the greenhouse. Instead the greenhouse absorbs it and re-radiates it back into the greenhouse. The more of these gases, the hotter the surface and temperature of the earth.

What is Wien's Law?

What is Wien's Law?

Peak wavelength x Temperature = 2.898x10 ³

$$\lambda_{max} T = 2.898 \times 10^{3}$$

Peak wavelength is the wavelength at which the emitted radiation is most intense.

What is the stefan-boltzmann law equation?

What is the stefan-boltzmann law equation?

$$L = \sigma A T^4$$

L is power output (W), σ is the stefan-boltzmann constant, A is the surface area of the black body (m^2) and T is the temperature (K)

What is Archimedes principle?

What is Archimedes principle?

Any object that is either somewhat or fully immersed in a fluid will experience a force that is equal to the weight of the fluid that is displaced by the object.

What is the solar constant?

What is the solar constant?

The solar energy that is radiated at a right angle of the line between the earth and the sun, just outside the atmosphere, per second per unit area. The mean value is 1.35 kW m^{-2}.

What are photovoltaic cells?

What are photovoltaic cells?

This is where the p-n junction diode is forward-biased. This mode is used in solar cells.

What is the equation for the intensity of the sun?

What is the equation for the intensity of the sun?

$$I = P/A$$

What does a pumped storage power station do?

What does a pumped storage power station do?

Electricity can't be stored and batteries aren't yet developed to be used as a backup so when there is low demand, power is provided to pump water from the lower to the upper reservoir.

What do tidal barrages do?

What do tidal barrages do?

Tidal barrages are a form of hydroelectric energy. They have inbuilt turbines so when there is a high tide the water level is higher outside than inside, so the sluice gates open to allow water to flow to use its potential energy. The gates close when the water level is equal and then they are opened so the water flow means that electricity is generated.

What is nuclear fission?

What is nuclear fission?

Where an unstable nucleus with a large mass number e.g. U235 splits into 2 smaller nuclei. Usually 2+ beta radioactive neutrons are produced with large amounts of kinetic energy.

The binding energy per nucleon increases when fission occurs therefore the overall process releases more energy.

What is fusion?

What is fusion?

When two small nuclei fuse together to create a larger nuclei. The new nucleus has a larger binding energy per nucleon than the old nuclei therefore energy is released in the process.

Which process (fission or fusion) releases the most energy?

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Fusion releases a lot more energy per reaction.

This is because the change in binding energy is more significant.

Why is it difficult to make fusion occur on earth?

Why is it difficult to make fusion occur on earth?

There is a large repulsion between the two positively charged nuclei, therefore a lot of energy is required to overcome the repulsion and fuse them together.

It is hard to get a material that can withstand the heat whilst still being cost effective.

How is fission used in nuclear reactors?

How is fission used in nuclear reactors?

Rods of uranium-235 absorb neutrons and become unstable and then split into two daughter nuclei. It also releases 2 or 3 more neutrons. These then go on to be reabsorbed by another uranium-235.

What is the process of the enrichment of uranium?

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Enrichment is where the proportion of the fissile uranium-235 to the non-fissile uranium-238 is increased, for a given sample of uranium.

How can nuclear fuel be ‘bred’ from U-238?

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When U-238 is bombarded with lots of quick and high energy neutrons, the resulting U-239 will decay via beta decay, first to form Pu-239 (plutonium-239). This will then undergo fission with slower thermal neutrons. Therefore, nuclear fuel can be ‘bred’ from U-238.

What is a fuel cell?

What is a fuel cell?

A fuel cell is a device that uses chemical energy from fuel in order to provide electrical energy directly. For example a hydrogen fuel cell.

In a hydrogen fuel cell hydrogen combines with oxygen producing electrical energy – the electrolysis of water in reverse.

What is a U value?

What is a U value?

The U value describes how well a building is able to conduct heat. It is the rate of transfer of heat for a square metre of the material/temperature difference in the material.

A high U value means low levels of insulation.