

Summary

Topic 8 - Energy Production

Subject	Year	Start date	Duration
Physics	IB1, IB2	Week 1, June	3 weeks 8 hours

Course Part
Core

Curriculum

Aims

- Appreciate scientific study and creativity within a global context through stimulating and challenging opportunities
- Acquire a body of knowledge, methods and techniques that characterize science and technology
- Apply and use a body of knowledge, methods and techniques that characterize science and technology
- Develop an ability to analyse, evaluate and synthesize scientific information
- Develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- Develop experimental and investigative scientific skills including the use of current technologies
- Develop and apply 21st century communication skills in the study of science
- Become critically aware, as global citizens, of the ethical implications of using science and technology
- Develop an appreciation of the possibilities and limitations of science and technology
- Develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

Objectives

Demonstrate knowledge and understanding of

- facts, concepts and terminology
- methodologies and techniques
- communicating scientific information

Apply

- facts, concepts and terminology
- methodologies and techniques
- methods of communicating scientific information

Syllabus Content

Core

8. Energy production

8.1 – Energy sources

Nature of science:

Risks and problem-solving: Since early times mankind understood the vital role of harnessing energy and large-scale production of electricity has impacted all levels of society. Processes where energy is transformed require holistic approaches that involve many areas of knowledge. Research and development of alternative energy sources has lacked support in some countries for economic and political reasons. Scientists, however, have continued to collaborate and share new technologies that can reduce our dependence on non-renewable energy sources.

Understandings:

Specific energy and energy density of fuel sources

Sankey diagrams

Primary energy sources

Electricity as a secondary and versatile form of energy

Renewable and non-renewable energy sources

Applications and skills:

Solving specific energy and energy density problems

Sketching and interpreting Sankey diagrams

Describing the basic features of fossil fuel power stations, nuclear power stations, wind generators, pumped storage hydroelectric systems and solar power cells

Solving problems relevant to energy transformations in the context of these generating systems

Discussing safety issues and risks associated with the production of nuclear power

Describing the differences between photovoltaic cells and solar heating panels

8.2 – Thermal energy transfer

Nature of science:

Simple and complex modelling: The kinetic theory of gases is a simple mathematical model that produces a good approximation of the behaviour of real gases. Scientists are also attempting to model the Earth's climate, which is a far more complex system. Advances in data availability and the ability to include more processes in the models together with continued testing and scientific debate on the various models will improve the ability to predict climate change more accurately.

Understandings:

Conduction, convection and thermal radiation

Black-body radiation

Albedo and emissivity

The solar constant

The greenhouse effect

Energy balance in the Earth surface–atmosphere system

Applications and skills:

Sketching and interpreting graphs showing the variation of intensity with wavelength for bodies emitting thermal radiation at different temperatures

Solving problems involving the Stefan–Boltzmann law and Wien’s displacement law

Describing the effects of the Earth’s atmosphere on the mean surface temperature

Solving problems involving albedo, emissivity, solar constant and the Earth’s average temperature

ATL Skills

Approaches to Learning

Thinking

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK



Social

- In this unit, we will

have students work in small groups

allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

have students peer assess their group performance or process

support students in resolving a conflict in a team

give a group assessment task

give students feedback on how they worked as a group

have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

provide an opportunity for students to analyse the impact of their behaviour on the class or on a group performance

encourage students to consider alternative points of view or to take the perspective of others

provide opportunities for students to make decisions



Communication

- In this unit, we will

ask students to explain their understanding of a text or idea to each other

construct a task around the use of different vocabulary and examples when speaking to different audiences

have students give an oral presentation without reading from their notes

ask students to monitor and check the quality of their writing

construct a task so that students practise their listening skills

assess or give feedback on speaking or writing concisely

provide opportunities for students to read and understand different types of texts

encourage or require students to plan a response before they begin

ask students to formulate arguments clearly and coherently

encourage all students to contribute to discussions



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable

IB DP 12 PHY 6 HL (IB1)



Thinkers



Reflective