

Summary

Topic 1 - Measurements and Uncertainties

Subject	Year	Start date	Duration
Physics	IB1, IB2	Week 1, September	2 weeks 5 hours

Course Part

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

1. Measurements and uncertainties

1.1 – Measurements in physics

Nature of science:

Common terminology: Since the 18th century, scientists have sought to establish common systems of measurements to facilitate international collaboration across science disciplines and ensure replication and comparability of experimental findings. Improvement in instrumentation: An improvement in apparatus and instrumentation, such as using the transition of cesium-133 atoms for atomic clocks, has led to more refined definitions of standard units. Certainty: Although scientists are perceived as working towards finding “exact” answers, the unavoidable uncertainty in any measurement always exists.

Understandings:

Fundamental and derived SI units

Scientific notation and metric multipliers

Significant figures

Orders of magnitude

Estimation

Applications and skills:

Using SI units in the correct format for all required measurements, final answers to calculations and presentation of raw and processed data

Using scientific notation and metric multipliers

Quoting and comparing ratios, values and approximations to the nearest order of magnitude

Estimating quantities to an appropriate number of significant figures

1.2 – Uncertainties and errors

Nature of science:

Uncertainties: “All scientific knowledge is uncertain... if you have made up your mind already, you might not solve it. When the scientist tells you he does not know the answer, he is an ignorant man. When he tells you he has a hunch about how it is going to work, he is uncertain about it. When he is pretty sure of how it is going to work, and he tells you, ‘This is the way it’s going to work, I’ll bet,’ he still is in some doubt. And it is of paramount importance, in order to make progress, that we recognize this ignorance and this doubt. Because we have the doubt, we then propose looking in new directions for new ideas.” Feynman, Richard P. 1998. *The Meaning of It All: Thoughts of a Citizen-Scientist*. Reading, Massachusetts, USA. Perseus. P 13.

Understandings:

Random and systematic errors

Absolute, fractional and percentage uncertainties

Error bars

Uncertainty of gradient and intercepts

Applications and skills:

Explaining how random and systematic errors can be identified and reduced

Collecting data that include absolute and/or fractional uncertainties and stating these as an uncertainty range (expressed as: best estimate \pm uncertainty range)

Propagating uncertainties through calculations involving addition, subtraction, multiplication, division and raising to a power

Determining the uncertainty in gradients and intercepts

1.3 – Vectors and scalars

Nature of science:

Models: First mentioned explicitly in a scientific paper in 1846, scalars and vectors reflected the work of scientists and mathematicians across the globe for over 300 years on representing measurements in three-dimensional space.

Understandings:

Vector and scalar quantities

Combination and resolution of vectors

Applications and skills:

Solving vector problems graphically and algebraically

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

IB DP 12 PHY 6 HL (IB1)



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable



Thinkers



Reflective



Stream & Resources

☰ Resources



Humayan Moyhuddin

Posted **3 files** on Sep 13, 2020 at 8:56 PM

Unit 1 - Measurements and Uncertainties



Topic_1.1_-_Measurements_in_physics.pptx

2 MB PowerPoint Presentation



Topic_1.2_-_Uncertainties_and_errors.pptx

1 MB PowerPoint Presentation



Topic_1.3_-_Vectors_and_scalars.pptx

700 KB PowerPoint Presentation