S4 Physics – Demo Class Overview

Duration: 30 Minutes

Topic: Introduction to Physics – The Science of the Physical World

CURRICULUM REFERENCE

Based on National 4 / National 5 SQA Syllabus
Official link: https://www.sqa.org.uk/sqa/47425.html

SQA UNITS AND TOPICS OVERVIEW

Unit 1: Dynamics and Space

- Speed, Distance, and Time
- Velocity and Acceleration
- Scalars and Vectors
- Newton's Laws of Motion
- Forces (Friction, Tension, Weight)
- Energy, Work, and Power
- Projectile Motion (basic level)
- Satellites and Space Exploration
- The Expanding Universe and Cosmology

Unit 2: Waves and Radiation

- Wave Properties: Wavelength, Frequency, Amplitude
- Transverse and Longitudinal Waves
- Sound and Ultrasound Applications
- Electromagnetic Spectrum and Refraction
- Nuclear Radiation: Alpha, Beta, Gamma
- Half-life and Radioactive Decay
- Radiation Safety Measures

Unit 3: Electricity and Energy

- Electrical Charge, Current, and Voltage
- Ohm's Law and Resistance: $V = IR$

- Series and Parallel Circuits
- Electrical Power and Energy Calculations
- AC/DC Supply, Electricity Generation
- Renewable vs Non-renewable Energy Sources
- Gas Laws and the Kinetic Theory
- Heat Transfer: Conduction, Convection, Radiation

DEMO CLASS OBJECTIVES

- Introduce Physics as a subject and its real-life relevance.
- Identify basic physical quantities: Mass, Length, Time.
- Differentiate between scalar and vector quantities.
- Engage students with questions and examples.

CLASS PLAN

1. What is Physics?

- Definition: *"Physics is the study of the natural world — how things move, how forces work, and how energy behaves."*
- Brief overview of branches:
  - Mechanics (motion and forces)
  - Heat (energy, temperature)
  - Electricity (circuits and power)
  - Waves (sound and light)
- Daily life examples: gravity, cycling, mobile phones

2. Basic Physical Quantities

- **Length** (meter), **Mass** (kilogram), **Time** (second)
- Role of measuring instruments and units
- Verbal quiz: "Which instrument measures time?"

3. Scalars and Vectors

- **Scalar:** Only magnitude (e.g., speed, temperature)
- **Vector:** Magnitude + direction (e.g., velocity, force)
- Chalkboard arrow activity: 5 km east vs. 5 km anywhere

4. Q&A and Concept Check

- What is a vector?
- Name one scalar quantity.
- Why do we study physics?

5. Closing Motivation

> "Physics helps us understand how the world works — from the smallest atom to galaxies. It's not about memorizing — it's about curiosity!"

This demo aims to spark interest in Physics while showcasing teaching clarity, energy, and relevance to daily life.