AS Physics Pre-Course Material

Course Outline:

Unit 1 – PHYA1 Particles, Quantum Phenomena and Electricity

This Unit is assessed by a written examination out of 70 marks, equalling 120 UMS mark. It will consist of 6 or 7 structured questions and will assess the subject content, How Science Works and Quality of Written Communication. The examination is 1¼ hours long and makes up 40% of the total AS marks and 20% of the total A-level marks. Topics covered include:

- The structure of the atom
- Stable and unstable nuclei and isotopes
- Ionising radiation and radioactive decay
- Fundamental forces and particles
- Matter and antimatter
- Quantum Phenomena and the experiments that prove wave-particle duality
- Current Electricity
- Resistance and current / voltage characteristics
- Resistivity and the effects of temperature resistance
- Circuit theory and analysis
- AC and DC current
- Use of an oscilloscope

Unit 2 – PHYA2 Mechanics, Materials and Waves

This unit is assessed in the same way as Unit 1. It is worth the same number of marks, contains the same number of questions and is worth an equal amount of the total AS and A2 score. It will also assess the subject content, How Science Works and Quality of Written Communication. Topics covered include:

- Scalars and vectors
- Scale drawings and resolving vectors
- Moments and torque couples
- Motion in a straight line, including displacement, speed, velocity and acceleration
- Equations for uniform acceleration, terminal speed and projectile motion
- Newton's laws of motion
- Conservation of energy
- Properties of solids and density
- Hooke's law, elastic limit and experimental investigations.
- Tensile strain, stress and Young's modulus
- Progressive and Stationary Waves
- Wave properties, including polarisation, refraction, refractive index and total internal reflection
- Superposition of waves
- Interference and diffraction patterns

Unit 3 Investigative and Practical Skills in AS Physics

This Unit is assessed internally using Practical Skills Assignments (PSA's worth 9 raw marks) and the Investigative Skills Assignment (ISA worth 41 raw marks). This adds up to 50 marks and makes up the final 20% of the AS and 10% of the A2. The ISA will normally be sat at the end of the teaching so you have covered the course content but the PSA's will be completed as part of the normal practical work you complete during Unit 1 and Unit 2.

Pre-course tasks:

Provided with this document are two teacher resource booklets, designed to explain particle physics and key vocabulary in detail. Particle physics is a new topic for you. You had the briefest of introductions at GCSE when you studied radioactivity. By studying particle physics, we can now answer all the remaining questions you might have. It is also vital you understand the key

vocabulary as these will be used as the command words in exams and in the ISAs. Read both of the resource booklets, then answer the following questions:

1. Describe the differences between accuracy, precision, reliability and sensitivity.

2. What are the two types of error? Give examples of what causes each type.

3. What is uncertainty and how is it found?

4. Describe two ways to make an experiment more reliable.

5. What is a zero error? Give three examples of zero errors.

6. Construct a table showing the 6 quarks and 6 leptons in the Basic Standard Model.

7. State the quark composition of a proton and a neutron. Use the table on page 17 of the guide to prove the charge of a proton is +1 and a neutron is 0. Show your working out.

8. Go to http://www.richard-feynman.net/videos.htm and watch the first video by the BBC from May 2013 – The Fantastic Mr Feynman. The video is one hour long in total but, as well as looking at Feynman's life and the impact he had on 20th century science, it provides an introduction to quantum physics.