SUBJECT AS Physics — Year 12 LP 5

This half term: Skills, Knowledge and Understanding to be developed:

- **Skills (students will be able to by the end of the Learning Programme):** carry out calculations using the equation associated with the photoelectric effect and lasers.
- **Knowledge (students will know by the end of the Learning Programme**): the historical importance of Rutherford gold leaf experiment and the photoelectric effect.
- **Understanding (students will demonstrate their understanding):** by answering a range of AS level exam questions relating to the Nature and Properties of Waves and Stationary Waves.

Key Terms/Words: Nucleus, Atom, Electrons, Frequency, Wavelength, Photon, Planck Constant, Work function, Stopping Voltage, Joules, Laser, Stimulated Emission, Absorption Spectrum, Emission Spectrum

LP 5 – Week 1 & 2 Learning Outcomes: **Unit 2.7: Photons** 1. Students will be able to explain the structure of the atom by using Rutherford gold leaf experiment 2. Students will be able to explain how there are different energy levels in an atom. Students will be able to calculate the photon energy released in terms of joules and electron volts 3. Students will be able to explain the energy levels of Hydrogen. Students will be able to explain the use of emission and absorption spectrum to explain the changes in positions of electron in an atom 4. Students will be able to explain the photoelectric effect		**Success criteria:** 1. Be able to recognise how energy levels changes in an atom 2. Be able to calculate the change in energy of electrons when being promoted from one level to another in terms of eV and Joules.	**Homework: LP 5**
LP 5 – Week 3 & 4 Learning Outcomes: 1. Students will be able to calculate the work function of different materials 2. Students will be able to explain the specified practical to calculate stopping voltage 3. Students will be able to explain what is wave-particle duality 4. Students will be able to describe the practical to show evidence of wave-particle duality **Students will apply and demonstrate new knowledge and skills in a CDG ASSESSMENT.**	Assessment CDG 1 Grade:	**Success criteria:** 1. To calculate the work function of different materials in terms of frequency and wavelength 2. Explain the practical used to calculate stopping voltage of different materials	**Homework: LP 5**
LP 5 – Week 5 & 6 Learning Outcomes: **Unit 2.8: Lasers** 1. Students will be able to explain the process of stimulated emission and how this process leads to light emission that is coherent 2. Students will be able to use the idea that a population inversion (N2 > N1) is necessary for a laser to operate 3. Students will be able to use the idea that a population inversion is not (usually) possible with a 2-level energy system 4. **Students will apply and demonstrate new knowledge and skills in a CDG ASSESSMENT.**	Assessment CDG 2 Grade:	**Success criteria:** 1. Explain how a stimulated emission works and explain the properties of the light emitted 2. Explain the condition needed for a laser to operate	**Homework: LP 5**
LP 5 – Week 7 Learning Outcomes: **1.** Students will know how a population inversion is attained in 3 and 4-level energy systems and explain the process of pumping and its purpose **2.** Students will be able to describe the structure of a typical laser i.e. an amplifying medium between two mirrors, one of which partially transmits light		**Success criteria:** 1. Students will be able to explain how a 4-level energy system is attained and the purpose of pumping	**Homework: LP 5**