# Oberlin High School

## Teacher: Mr. S. Edwards

## CAPE Physics- Unit One (1)

| Date | Module | Topics | Objectives |
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| October | **Atomic and Nuclear Physics** | Particulate Nature of Electromagnetic Radiation | • Describe the phenomenon of photoelectric emissions<br>• Use the relationship E=hf to solve problems<br>• Discuss the shortcomings of classical physics to explain aspects of the photoelectric effect<br>• Explain how the photon theory better suits the emission of a photon<br>• Define work function, threshold frequency, cut-off wavelength and stopping potential.<br>• Use the relationship $hf=\phi+1/2\ mv^2$ to solve problems<br>• Use the electron volt as a unit of energy<br>• Explain the production of X-rays by electron bombardment of a metal target<br>• Explain the origins of line ad continuous x-ray spectra<br>• Solve problems using the equation for the attenuation of x-rays in matter.<br>• Discuss the use of x-rays in radiotherapy and imaging in medicine.<br>• Explain the wave particle nature of matter<br>• Describe the evidence provided by electron diffraction for the wave nature of particles |

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| | **Atomic and Nuclear Physics** | | • Discuss interference and diffraction as evidence of the wave nature of e-m radiation<br>• Use the relation for the de Broglie wavelength to solve problems. |
| | | Atomic Structure | • Describe the alpha scattering experiment and evidences that support the model of the atom<br>• Describe the Millikan's oil drop experiment and evidence for the quantization of charge. |
| November – December | | Atomic Mass | • Define mass defect and binding energy<br>• Calculate mass defect and binding energy in eV or Joules<br>• Use $E=mc^2$ to solve problems<br>• Use the atomic mass unit (u) as a unit of energy<br>• Represent graphically he relationship between binding energy per nucleon and nucleon number<br>• Compare the values of binding energy per nucleon when undergoing nuclear fission or fusion<br>• Interpret nuclear reactions |
| | | Radioactivity | • Relate radioactivity to nuclear instability<br>• Discuss the spontaneous and random nature of nuclear decay<br>• Identify the origins and environmental hazards of background radiation.<br>• Describe experiments to distinguish between the three types of emissions from radioactive substances. |

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| | **Atomic and Nuclear Physics (Cont'd)** | | • Write equations for radioactive decay<br>• Interpret equations for radioactive decay<br>• Discuss the environmental hazards of radioactive emissions<br>• Discuss safety precautions for handling and disposal of radioactive material<br>• Explain radioactive decay, decay constant and half life<br>• Use the law of decay to solve problems<br>• Use the relation T1/2 =ln2/wavelength<br>• Describe an experiment to determine the half-life of a radioactive isotope with a short half life<br>• Discuss uses of radioisotopes as tracers for carbon dating and in radiotherapy<br>• Describe the operation of simple detectors |