Higher Physics Unit 2- Particles and Waves LOs

Name_____ Teacher_____

✓	**I am confident that I understand this and I can apply this to problems**
?	**I have some understanding but I need to revise this some more**
✘	**I don't know this or I need help because I don't understand it**

Orders of Magnitude	Covered (✓)	How well can you do this?
To be able to discuss the range of orders of magnitude of length from the very small (sub-nuclear) to the very large (distance to furthest known celestial objects).		✘ ? ✓
The Standard Model	Covered (✓)	How well can you do this?
To be able to discuss the evidence for the sub-nuclear particles and the existence of antimatter.		✘ ? ✓
State that Fermions, the matter particles, consist of Quarks (6 types) and the 6 Leptons (Electron, Muon and Tau, together with their neutrinos).		✘ ? ✓
State that Hadrons are composite particles made of Quarks		✘ ? ✓
State that Baryons are made of three Quarks and Mesons are made of two Quarks.		✘ ? ✓
To be able to describe beta decay as the first evidence for the neutrino		✘ ? ✓
State that the force mediating particles are bosons (Photons, W and Z Bosons and Gluons)		✘ ? ✓
Describe how a PET scanner works		✘ ? ✓
Electric Fields	Covered (✓)	How well can you do this?
State that, in an electric field, an electric charge experiences a force		✘ ? ✓
State that an electric field applied to a conductor causes the free electric charges in it to move		✘ ? ✓

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Movement of Charge	Covered (✓)	How well can you do this?
State that work, W, is done when a charge, Q, is moved in an electric field.		✗ ? ✓
State that the potential difference (V) between two points is a measure of the work done in moving one coulomb of charge between the two points		✗ ? ✓
State that if one joule of work is done moving one coulomb of charge between two points, the potential difference between the points is one volt.		✗ ? ✓
State the relationship V = W/Q.		✗ ? ✓
Carry out calculations involving the relationship V = W/Q		✗ ? ✓
Calculate the speed of a charged particle accelerated in an electric field using the relationship $QV = ½ mv^2$.		✗ ? ✓
Charged Particles in a Magnetic Field	Covered (✓)	How well can you do this?
State that a moving charge produces a magnetic field		✗ ? ✓
Describe the force acting on a charged particle in a magnetic field.		✗ ? ✓
Particle Accelerators	Covered (✓)	How well can you do this?
State the three types of particle accelerator		✗ ? ✓
Describe the basic operation of particle accelerators in terms of acceleration, deflection and collision of charged particles		✗ ? ✓

Fission and Fusion	Covered (✓)	How well can you do this?
Explain what is meant by alpha, beta and gamma decay of radionuclides		✗ ? ✓
Identify the processes occurring in nuclear reactions written in symbolic form		✗ ? ✓

State that in fission a nucleus of large mass number splits into two nuclei of smaller mass numbers, usually along with several neutrons		✗ ? ✓
State that fission may be spontaneous or induced by neutron bombardment		✗ ? ✓
State that in fusion two nuclei combine to form a nucleus of larger mass number		✗ ? ✓
Explain, using $E = mc^2$, how the products of fission and fusion acquire large amounts of kinetic energy		✗ ? ✓
Carry out calculations using $E = mc^2$ for fission and fusion reactions.		✗ ? ✓
Describe the principles of the operation of a nuclear fission reactor in terms of fuel rods, moderator, control rods, coolant and containment vessel		✗ ? ✓
Describe the coolant and containment issues in nuclear fusion reactors.		✗ ? ✓
The Photoelectric Effect and Wave Particle Duality	Covered (✓)	How well can you do this?
State that photoelectric emission from a surface occurs only if the frequency of the incident radiation is greater than some threshold frequency, *fo*, which depends on the nature of the surface		✗ ? ✓
State that a beam of radiation can be regarded as a stream of individual energy bundles called photons, each having an energy $E = hf$, where h is Planck's constant and f is the frequency of the radiation.		✗ ? ✓
Carry out calculations involving the relationship $E = hf$		✗ ? ✓
State that photoelectrons are ejected with a maximum kinetic energy, *Ek*, which is given by the difference between the energy of the incident photon *hf* and the work function *hfo* of the surface: $Ek = hf - hfo$.		✗ ? ✓

State that for frequencies smaller than the threshold value, an increase in the irradiance of the radiation at the surface will not cause photoelectric emission.		✗ ? ✓
State that for frequencies greater than the threshold value, the photoelectric current produced by monochromatic radiation is directly proportional to the irradiance of the radiation at the surface.		✗ ? ✓
Explain that if *N* photons per second are incident per unit area on a surface, the irradiance at the surface *I = Nhf.*		✗ ? ✓
Conditions for Constructive and Destructive Interference	Covered (✓)	How well can you do this?
Use correctly in context the terms: 'in phase', 'out of phase' and 'coherent', when applied to waves		✗ ? ✓
Explain the meaning of: 'constructive interference' and 'destructive interference' in terms of superposition of waves.		✗ ? ✓
State that interference is the test for a wave		✗ ? ✓
Interference of Waves using two Coherent Sources	Covered (✓)	How well can you do this?
State the conditions for maxima and minima in an interference pattern formed by two coherent sources in the form: Path difference = nl for maxima and Path difference = (n + ½) l for minima, where *n* is an integer		✗ ? ✓
Carry out calculations using the above relationships		✗ ? ✓

Gratings	Covered (✓)	How well can you do this?
Describe the effect of a grating on a monochromatic light beam		✗ ? ✓
Carry out calculations using the grating equation ; $d\sin\theta = n\lambda$		
Describe the principles of a method for measuring the wavelength of a monochromatic light source, using a grating		✗ ? ✓

State approximate values for the wavelengths of red, green and blue light.		× ? ✓
Describe and compare the white light spectra produced by a grating and a prism		× ? ✓
Refraction	Covered (✓)	How well can you do this?
State that the ratio sinθ1 /sinθ2 is a constant when light passes obliquely from medium 1 to medium 2		× ? ✓
State the absolute refractive index, n, of a medium is the ratio sinθ1 /sinθ2, where θ1 is in a vacuum (or air as an approximation) and θ2 is in the medium		× ? ✓
Describe the principles of a method for measuring the absolute refractive index of glass for monochromatic light		× ? ✓
Carry out calculations using the relationship for refractive index		× ? ✓
State that the refractive index depends on the frequency of the incident light.		× ? ✓

State that the frequency of a wave is unaltered by a change in medium		× ? ✓
State the relationships for refraction of a wave from medium 1 to medium 2 $$\frac{\sin\theta_1}{\sin\theta_2} = \frac{\lambda_1}{\lambda_2} = \frac{v_1}{v_2}$$		× ? ✓
Carry out calculations using the above relationships		× ? ✓
Critical Angle and Total Internal Reflection	Covered (✓)	How well can you do this?
Explain what is meant by total internal reflection		× ? ✓
Explain what is meant by critical angle θc		× ? ✓
Describe the principles of a method for measuring a critical angle		× ? ✓

Derive the relationship $\sin\theta c = 1/n$, where θc is the critical angle for a medium of absolute refractive index, n.		✗ ? ✓
Carry out calculations using the above relationship		✗ ? ✓
Irradiance and the Inverse Square Law	Covered (✓)	How well can you do this?
State that the irradiance I at a surface on which radiation is incident is the power per unit area.		✗ ? ✓
Describe the principles of a method for showing that the irradiance is inversely proportional to the square of the distance from a point source.		✗ ? ✓
Carry out calculations involving the relationship $I = k/d^2$		✗ ? ✓
Explain why a beam of laser light having a power even as low as 0.1 mW may cause eye damage		✗ ? ✓
Spectra	Covered (✓)	How well can you do this?
State that electrons in a free atom occupy discrete energy levels		✗ ? ✓
Draw a diagram which represents qualitatively the energy levels of a hydrogen atom		✗ ? ✓
Use the following terms correctly in context: ground state, excited state, ionisation level		✗ ? ✓
State that an emission line in a spectrum occurs when an electron makes a transition between an excited energy level W2 and a lower level W1, where $W2 - W1 = hf$		✗ ? ✓
State that an absorption line in a spectrum occurs when an electron in energy level W1 absorbs radiation of energy hf and is excited to energy level W2, where $W2 = W1 + hf$.		✗ ? ✓
Explain the occurrence of absorption lines in the spectrum of sunlight.		✗ ? ✓