Do I Understand The Syllabus?

Unit 5

Redruth School Physics Department **Assess your understanding of the points set out below**

Key to completing:

Red	I do not understand any of this and need to revise it thoroughly (e.g. Read CGP Revision Guide, learn Summary Sheets, make notes, ask questions, ask for help, do many worksheets/lesson questions and complete all practice paper questions and self-mark).
Amber	I understand some of this and need to revise it (e.g. Learn Summary Sheets, reading and writing some notes, review in CGP Revision Guide, complete all practice paper questions and self-mark).
Green	I understand this and only need the slightest revision (e.g. Check Summary Sheets, complete some practice questions and self-mark).

Some points are divided into separate sections to help identify problem areas.

Nuclear Physics

You will be assessed on your ability to:	**Understanding**	
	End of lesson	*End of topic*
Show an awareness of the existence and origin of background radiation, past and present.		
Investigate and recognise nuclear radiations (alpha, beta and gamma) from their penetrating power and ionising ability.		
Describe the spontaneous and random nature of nuclear decay.		
Determine the half lives of radioactive isotopes graphically and recognise..., and use the expressions for radioactive decay: $dN/dt = -\lambda N$, $\lambda = \ln 2/t_{½}$ and $N = N_0 e^{-\lambda t}$		
Discuss the applications of radioactive materials, including ethical and environmental issues.		

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Thermal Physics

You will be assessed on your ability to:	**Understanding**		
	Red	*Amber*	*Green*
Investigate, recognise and use the expression $\Delta E = mc\Delta\theta$.			
Explain the concept of internal energy as the random distribution of potential and kinetic energy amongst molecules.			
Explain the concept of absolute zero and how the average kinetic energy of molecules is related to the absolute temperature.			
Recognise and use the expression $\frac{1}{2} m\langle c^2\rangle = 3/2\ kT$.			
Use the expression $pV = NkT$ as the equation of state for an ideal gas.			

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Oscillations

You will be assessed on your ability to:	**Understanding**		
	Red	*Amber*	*Green*
Recall that the condition for simple harmonic motion is $F = -kx$..., and hence identify situations in which simple harmonic motion will occur.			
Recognise and use the expressions $a = -\omega^2 x$, $a = -A\omega^2 \cos \omega t$, $v = A\omega \sin \omega t$, $x = A\cos \omega t$ and $T = 1/f = 2\pi/\omega$ as applied to a simple harmonic oscillator.			
Obtain a displacement – time graph for an oscillating object and recognise that the gradient at a point gives the velocity at that point.			
Recall that the total energy of an undamped simple harmonic system remains constant and recognise and use expressions for total energy of an oscillator.			
Distinguish between free, damped and forced oscillations.			
Investigate and recall how the amplitude of a forced oscillation changes at and around the natural frequency of a system and describe, qualitatively, how damping affects resonance.			
Explain how damping and the plastic deformation of ductile materials reduce the amplitude of oscillation.			

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Astrophysics

You will be assessed on your ability to:	**Understanding**		
	Red	*Amber*	*Green*
Use the expression $F = Gm_1m_2/r^2$			
Derive and use the expression $g = -Gm/r^2$ for the gravitational field due to a point mass.			
Recall similarities and differences between electric and gravitational fields.			
Recognise and use the expression relating flux, luminosity and distance $F = L/4\pi d^2$ application to standard candles.			
Explain how distances can be determined using trigonometric parallax and by measurements on radiation flux received from objects of known luminosity (standard candles).			
Recognise and use a simple Hertzsprung-Russell diagram to relate luminosity and temperature. Use this diagram to explain the life cycle of stars.			
Recognise and use the expression $L = \sigma T^4$ x surface area, (for a sphere $L = 4\pi r^2\sigma T^4$) (Stefan-Boltzmann law) for black body radiators.			
Recognise and use the expression: $\lambda_{max}T = 2.898 \times 10^{-3}$ m K (Wien's law) for black body radiators.			
Recognise and use the expressions $z = \Delta\lambda/\lambda \approx \Delta f/f \approx v/c$ for a source of electromagnetic radiation moving relative to an observer and $v = H_o d$ for objects at cosmological distances.			
Be aware of the controversy over the age and ultimate fate of the universe associated with the value of the Hubble Constant and the possible existence of dark matter.			
Explain the concept of nuclear binding energy, and recognise and use the expression $\Delta E = c^2\Delta m$ and use the non SI atomic mass unit (u) in calculations of nuclear mass (including mass deficit) and energy.			
Describe the processes of nuclear fusion and fission.			
Explain the mechanism of nuclear fusion and the need for high densities of matter and high temperatures to bring it about and maintain it.			