Physics: Atomic Physics

Whole unit overview

Learning Outcomes		Suggested Teaching Activities	Resources
5.1 (a)	Show awareness of the existence of background radioactivity. Describe the detection of alpha-particles, beta-particles and gamma-rays.	Use a Geiger tube to detect background radiation and a, b and g radiations. Emphasise that the radiations are emitted from the nucleus.	This site has an interesting history of Marie Curie. http://www.aip.org/history/curie/contents.htm
5.1 (b)	State that radioactive emissions occur randomly over space and time. State, for radioactive emissions: (i) their nature (ii) their relative ionising effects (iii) their relative penetrating abilities.	Use a Geiger counter with suitable absorbers to show penetrating abilities. Use a diffusion type cloud chamber to show a particle tracks and lead to discussion of ionising effects. A spark counter could also be used.	
	Describe their deflection in electric fields and magnetic fields. Interpret their relative	Emphasise the links between the properties (penetration, ionisation, deflection by magnetic or electric fields) and the nature (charge, relative size, particles/e-m radiation).	

	ionising effects.		
5.1 (c)	State the meaning of radioactive decay, using equations (involving words or symbols) to represent changes in the composition of the nucleus when particles are emitted.	Use a radioactive decay simulation exercise and if possible an experiment with a Geiger counter and short half-life isotope to plot decay curves.	
5.1 (d)	Use the term half-life in simple calculations which might involve information in tables or decay curves.	Extend to work from data involving long half-lives.	This site has a good presentation to explain the meaning of the term 'half-life'. http://www.colorado.edu/physics/2000/index.pl On the left-hand side click on Table of Contents. Scroll down to the bottom of the page and click on 'Meaning of half-life'. There is also a useful half-life simulation – a graph is plotted as an isotope decays (a variety of isotopes can be chosen). Click on Half-life.
5.1 (e)	Describe how radioactive materials are handled, used and stored in a safe way.	This should arise naturally from the teacher demonstrations and is best integrated within the unit as a whole extending discussion to cover industrial and medical issues.	
5.2 (a)	Describe the structure of an atom in terms of a nucleus and electrons.	Extension students could discuss the limitations of the simple atomic model.	
	Describe how the scattering of alpha-particles by thin metal foils provides evidence	This important piece of understanding can be placed in its historical context and provide useful discussion on the nature of scientific research.	This site has interesting historical background covering Rutherford, Curie, Becquerel and Rontgen. http://www.accessexcellence.org/AE/AEC/CC/historical_background.html

	for the nuclear atom.		
5.2 (b)	Describe the composition of the nucleus in terms of protons and neutrons. Use the term proton number (= atomic number), *z,* use the term nucleon number **(**= mass number), *A*, use the term nuclide and nuclide notation $^{A}_{Z}X$	Nuclear reactions and decay series could be discussed to provide a focus for this section.	
5.2 (c)	Use the term isotope Give and explain examples of practical applications of isotopes	Use many examples, concentrating on those that students will know something about, e.g. medical treatment and diagnosis, smoke alarms etc.	This site has useful information on medical imaging, radioactive dating and detection of radioactivity. http://library.thinkquest.org/3471/medical_imaging.html