Physics > Big idea PMA: Matter > Topic PMA5: Nuclear physics

Key concept (age 14-16)
PMA5.2: Radioactive decay

Progression toolkit: Alpha decay

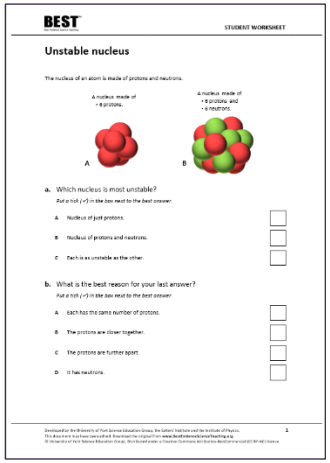
Learning focus	Some large nuclei, which are unstable because they contain too many protons, decay spontaneously by alpha radiation because of repulsive forces between protons.				
As students' conceptual understanding progresses they can:	CONCEPTUAL PROGRESSION →				
	Describe the effect of the electrostatic force within an atomic nucleus. **P**	Interpret nuclear equations to describe the alpha decay of radioactive nuclei.	Describe what happens to an atom and its nucleus during an alpha decay.	Explain why large nuclei with too many protons emit alpha particles rather than protons. **B**	Explain why a nucleus usually emits gamma radiation after an alpha decay.
Diagnostic questions	Unstable nucleus	Alpha decay	Alpha decay story	Why alpha?	After alpha
Response activities			Explaining alpha decay		Alpha and gamma

Key:

P Prior understanding from earlier stages of learning

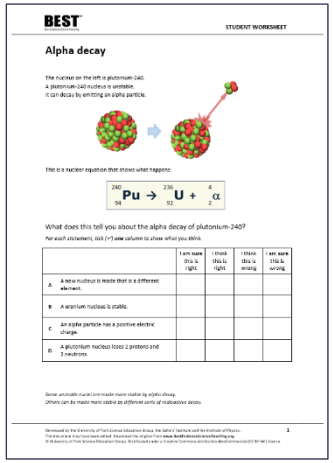
B Bridge to later stages of learning

Unstable nucleus



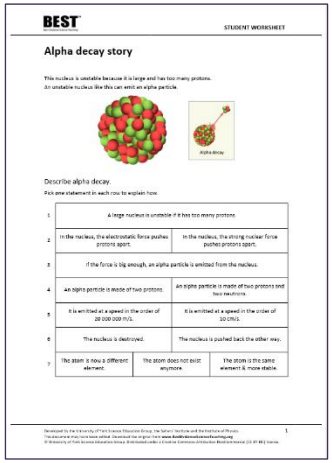
Two-tier multiple choice

Alpha decay



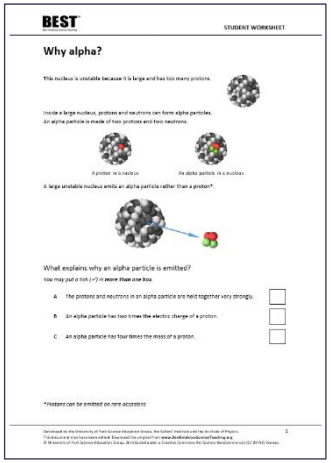
Confidence grid

Alpha decay story



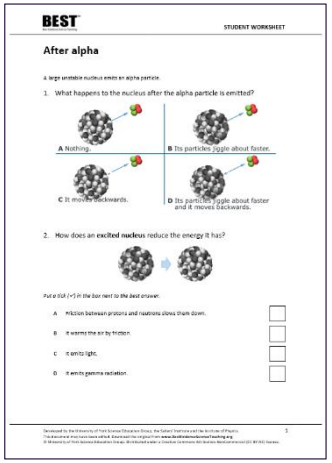
Explanation story

Why alpha?



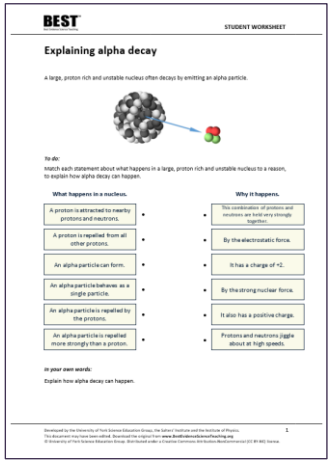
Multiple choice

After alpha



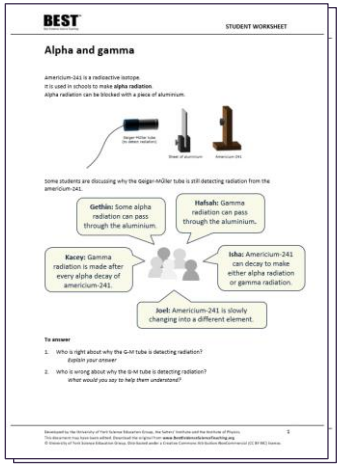
Simple multiple choice

Explaining alpha decay



Linking ideas

Alpha and gamma



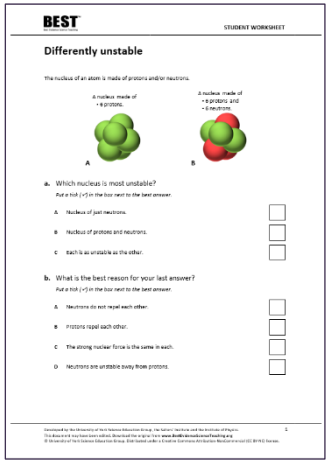
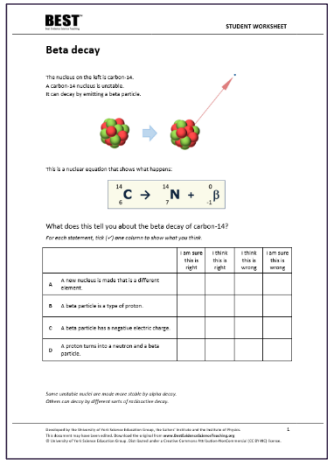
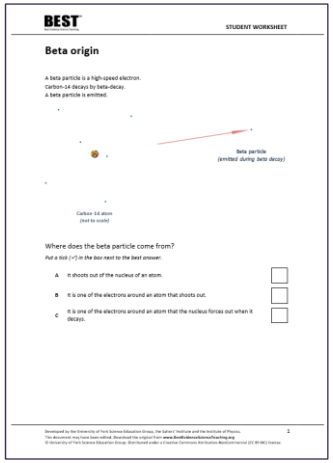
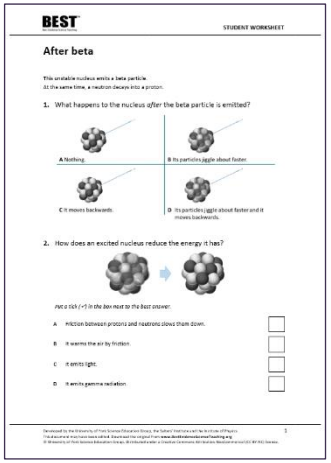
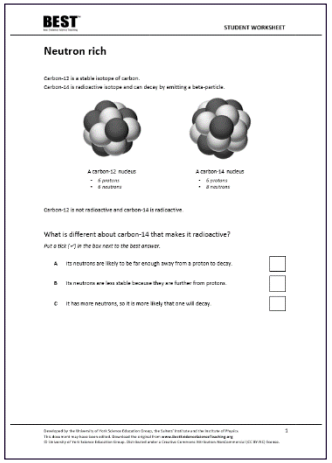
Talking heads

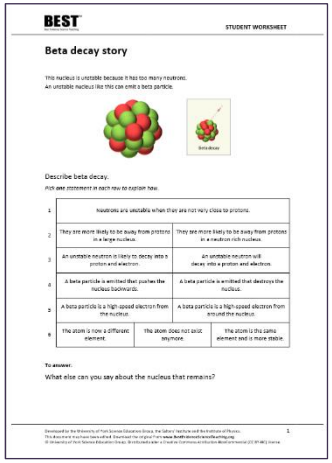
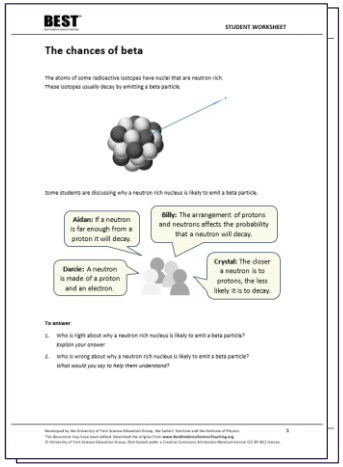
Progression toolkit: Beta decay

Learning focus	Some nuclei, which are unstable because they have too many neutrons, decay spontaneously by beta radiation because neutrons are unstable away from the close proximity of protons.				
As students' conceptual understanding progresses they can:	CONCEPTUAL PROGRESSION →				
	Restate, in own words, the reasons why a nucleus cannot be made of just neutrons.	Interpret nuclear equations to describe the beta decay of radioactive nuclei.	Describe what happens to an atom and its nucleus during a beta decay.	Explain why a nucleus can often emit gamma radiation after a beta decay.	Explain why the chances of beta decay increase with the proportion of neutrons to protons in a nucleus. **B**
Diagnostic questions	Differently unstable	Beta decay	Beta origin	After beta	Neutron rich
Response activities			Beta decay story		The chances of beta

Key:

B Bridge to later stages of learning

Differently unstable	Beta decay	Beta origin	After beta	Neutron rich
				
Two tier multiple choice	Confidence grid	Simple multiple choice	Simple multiple choice	Simple multiple choice

Beta decay story	The chances of beta
	
Explanation story	Talking heads