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

Key concept (age 14-16)
PMA5.3: Ionising radiation

Progression toolkit: Ionising radiation

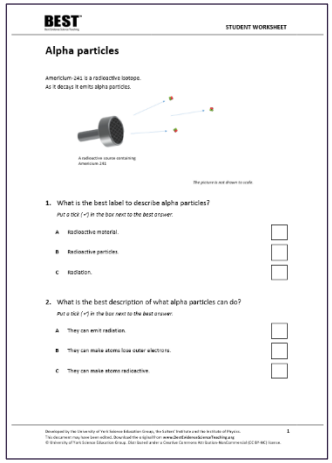
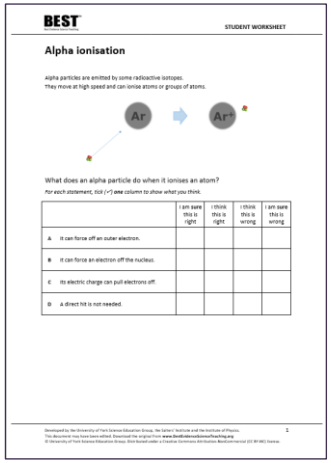
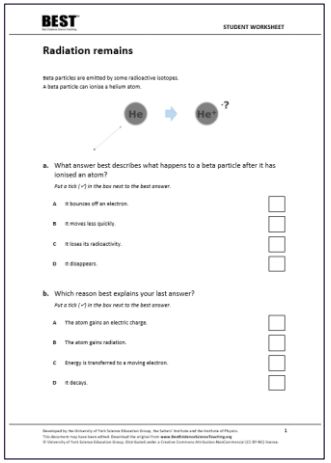
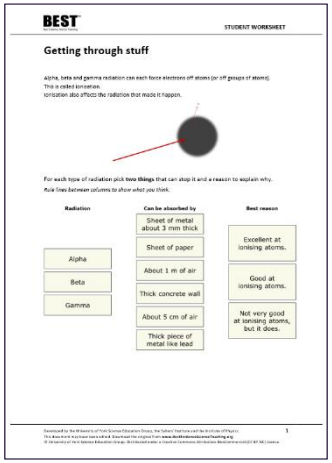
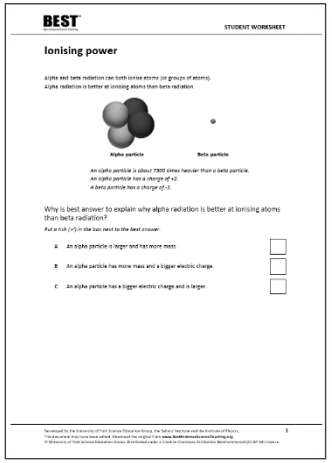
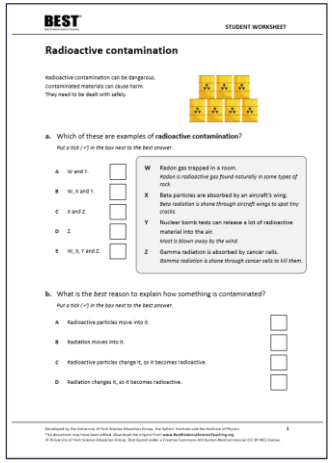
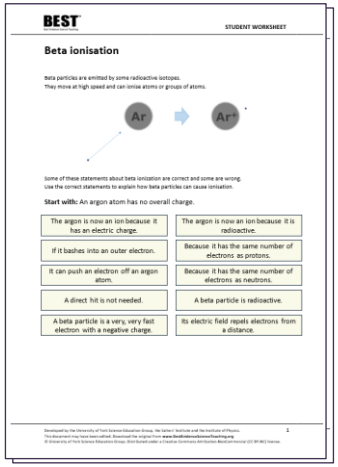
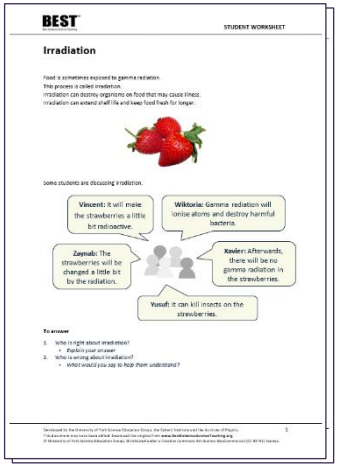
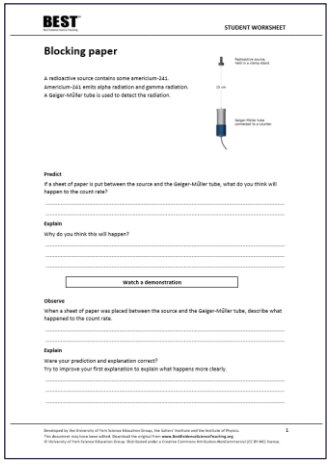
Learning focus	Some forms of radiation can ionise atoms or groups of atoms. Several properties of each form of ionising radiation are determined by its ionising power.				
As students' conceptual understanding progresses they can:	CONCEPTUAL PROGRESSION →				
	Describe the difference between radioactive particles and radiation. **P**	Describe what happens when radiation causes ionisation.	Explain why ionising radiation does not make objects radioactive*.	Explain how the ionising power of each ionising radiation affects its properties.	Explain radioactive contamination and how it differs from irradiation.
Diagnostic questions	Radioactive sources Alpha particles	Alpha ionisation	Radiation remains	Getting through stuff Ionising power	Radioactive contamination
Response activities		Beta ionisation	Irradiation	Blocking paper	Fukushima

Key:

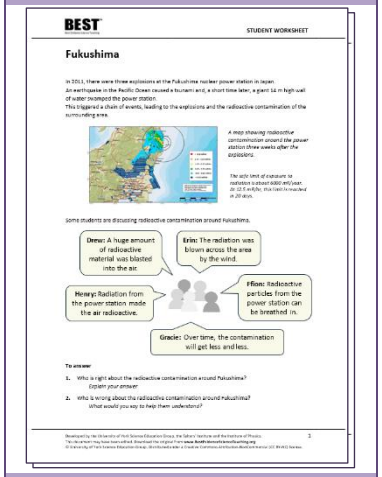
P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

**An exception to this rule is the example of high-energy gamma photons that may excite atomic nuclei.*

Radioactive sources	Alpha particles	Alpha ionisation	Radiation remains	Getting through stuff
				
Focused cloze	Simple multiple choice	Confidence grid	Two-tier multiple choice	Linking ideas
Ionising power	**Radioactive contamination**	**Beta ionisation**	**Irradiation**	**Blocking paper**
				
Simple multiple choice	Two tier multiple choice	Explanation story	Talking heads	PEOE

Fukushima


BEST

STUDENT WORKSHEET

Fukushima

In 2011, there were three explosions at the Fukushima nuclear power station in Japan.
An earthquake in the Pacific Ocean caused a tsunami and, a short time later, a giant 14 m high wall of water swamped the power station.
This triggered a chain of events, leading to the explosions and the radioactive contamination of the surrounding area.

A map showing radioactive contamination around the power station three weeks after the explosions.

The safe limit of exposure to radiation is about 6000 mSv/year. In 13.5 mSv/hr, this limit is reached in 29 days.

Some students are discussing radioactive contamination around Fukushima.

Dena: A huge amount of radioactive material was blasted into the air.

Erin: The radiation was blown across the area by the wind.

Henry: Radiation from the power station made the air radioactive.

Pilou: Radioactive particles from the power station can be breathed in.

Gracie: Over time, the contamination will get less and less.

To answer

1. Who is right about the radioactive contamination around Fukushima?
   Explain your answer
2. Who is wrong about the radioactive contamination around Fukushima?
   What would you say to help them understand?

Developed by the University of York Science Education Group, the Salters' Institute and the Institute of Physics. 3

Talking heads