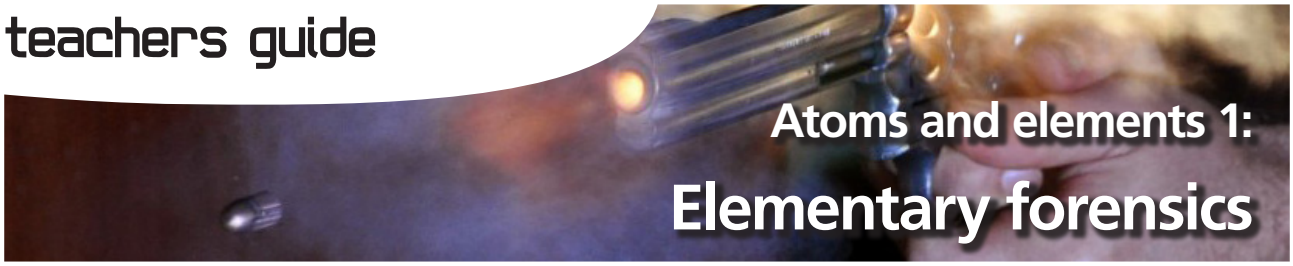
teachers guide



Atoms and elements 1: Elementary forensics

Components

	NAME	DESCRIPTION	AUDIENCE
	Elementary forensics teachers guide	This guide explains how to use a video to engage student interest in atoms and elements, through the context of ballistics.	teachers
	Fingerprinting bullets video	This video introduces concepts of atoms and elements by exploring ballistics research at The University of Western Australia that uses trace metal analysis, based on element mass.	students
	What is ICP-MS? background sheet	This background sheet explains how inductively coupled plasma mass spectrometry works. This is the process used in the video to analyse bullets.	teachers

Purpose

To **Engage** student interest in atoms and elements, by recognising how knowledge of elements can help solve crimes.

Outcomes

Students:

- understand that everything is made up of different elements;
- understand that atoms of different elements have different masses;
- see how scientists separate different elements based on their mass; and
- understand that scientists use scientific knowledge as a basis for research.

Activity summary

ACTIVITY	POSSIBLE STRATEGY
Students watch the video, *Fingerprinting bullets*.	whole class
Discuss the video. See **Teacher notes** below for key questions.	whole class

Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from www.adobe.com.

QuickTime version 7 or later is required to view the video. This is a free download from www.apple.com/quicktime. A high quality MP4 version of the video with subtitles is available on CD-ROM or download from the SPICE website.

Teacher notes

Information about the analytical technique Anna uses to fingerprint bullets (inductively coupled plasma – mass spectrometry) is included in the background sheet, *What is ICP-MS?*

Questions below may be used to promote class discussion after watching the video, *Fingerprinting bullets*.

DISCUSSION POINT	SUGGESTED RESPONSE
What physical characteristics can be used to distinguish bullets?	size, shape, colour, rifling marks
Why can't bullets always be distinguished using physical characteristics?	Some bullets are fragmented when they hit an object. Rifling marks can only be used when scientists have the gun. Shotgun pellets don't have rifling marks. Bullets are often very similar in size, shape and colour.
Why do different bullets contain different trace elements?	Bullets are often made from scrap metal and scraps used vary between batches.
What is the advantage of using a laser in Anna's research?	Only a tiny sample of bullet is needed for testing.
What property of elements in bullets allows them to be sorted?	Different elements have different masses.
Why do you think that particles of different elements have different masses?	This question is for student reflection. They will learn the answer as they follow the sequence, so it is best to leave it open for now. The answer is: because different elements have different atomic composition.

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Banner image: 'Bullet coming from Smith & Wesson revolver' by Niels Noordhoek. CC-BY-SA-3.0, commons.wikimedia.org/wiki/File:Bullet_coming_from_S%26W.jpg

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Associated SPICE resources

Atoms and elements 1: Elementary forensics may be used in conjunction with related SPICE resources to teach the topic of atomic structure.

DESCRIPTION	LEARNING PURPOSE
Atoms and elements (overview)	
Atoms and elements 1: Elementary forensics A video shows how a forensic scientist uses knowledge of differences between elements to characterise bullets.	**Engage**
Atoms and elements 2: Looking at atoms Students use an interactive learning object to explore how advances in scientific understanding have lead to knowledge of atomic structure that explains differences between elements.	**Explore**
Atoms and elements 3: Creating atoms Students use an interactive learning object to create elements from protons, electrons and neutrons.	**Explain**
Atoms and elements 4: Element fingerprints Students research trace element analysis and its applications in forensic science.	**Elaborate**