

# Nuclear decay equations: Teacher solutions

Education in Chemistry

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[rsc.li/EiC218-thehuntison](http://rsc.li/EiC218-thehuntison)

Differentiated worksheets, ages 14–16, 16+

## Nuclear decay equations 1

- (a) Complete the nuclear equations for a decay of the following isotopes by adding in the products

${}^{210}_{86}\text{Rn}$	$\longrightarrow$	${}^{206}_{84}\text{Po}$	+	${}^4_2\text{He}$
${}^{230}_{90}\text{Th}$	$\longrightarrow$	${}^{226}_{88}\text{Ra}$	+	${}^4_2\text{He}$
${}^{10}_4\text{Be}$	$\longrightarrow$	${}^6_2\text{He}$	+	${}^4_2\text{He}$
${}^{238}_{88}\text{Ra}$	$\longrightarrow$	${}^{234}_{86}\text{Rn}$	+	${}^4_2\text{He}$
${}^{238}_{94}\text{Pu}$	$\longrightarrow$	${}^{234}_{92}\text{U}$	+	${}^4_2\text{He}$

- (b) Complete the nuclear equations for B decay of the following isotopes by adding in the products

${}^{40}_{19}\text{K}$	$\longrightarrow$	${}^{40}_{20}\text{Ca}$	+	${}^0_{-1}\text{e}$
${}^{234}_{90}\text{Th}$	$\longrightarrow$	${}^{234}_{91}\text{Pa}$	+	${}^0_{-1}\text{e}$
${}^8_4\text{Be}$	$\longrightarrow$	${}^8_5\text{B}$	+	${}^0_{-1}\text{e}$
${}^{79}_{34}\text{Se}$	$\longrightarrow$	${}^{79}_{35}\text{Br}$	+	${}^0_{-1}\text{e}$
${}^{85}_{36}\text{Kr}$	$\longrightarrow$	${}^{85}_{37}\text{Rb}$	+	${}^0_{-1}\text{e}$

- (c) Complete the nuclear equations by adding in the isotope that decays and the type of decay

Type of decay					
$\beta$	${}^{125}_{38}\text{Sb}$	$\longrightarrow$	${}^{125}_{39}\text{Y}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{242}_{96}\text{Cm}$	$\longrightarrow$	${}^{238}_{94}\text{Pu}$	+	${}^4_2\text{He}$
$\alpha$	${}^{209}_{83}\text{Bi}$	$\longrightarrow$	${}^{205}_{81}\text{Tl}$	+	${}^4_2\text{He}$

## Nuclear decay equations 2

Complete the nuclear decay equations by adding in the products formed.

	Type of decay					
1	$\beta$	${}^{40}_{19}\text{K}$	$\longrightarrow$	${}^{40}_{20}\text{Ca}$	+	${}^0_{-1}\text{e}$
2	$\alpha$	${}^{210}_{86}\text{Rn}$	$\longrightarrow$	${}^{206}_{84}\text{Po}$	+	${}^4_2\text{He}$
3	$\alpha$	${}^{230}_{90}\text{Th}$	$\longrightarrow$	${}^{226}_{88}\text{Ra}$	+	${}^4_2\text{He}$
4	$\beta$	${}^{234}_{90}\text{Th}$	$\longrightarrow$	${}^{234}_{91}\text{Pa}$	+	${}^0_{-1}\text{e}$
5	$\alpha$	${}^{10}_4\text{Be}$	$\longrightarrow$	${}^6_2\text{He}$	+	${}^4_2\text{He}$
6	$\beta$	${}^8_4\text{Be}$	$\longrightarrow$	${}^8_5\text{B}$	+	${}^0_{-1}\text{e}$
7	$\beta$	${}^{79}_{34}\text{Se}$	$\longrightarrow$	${}^{79}_{35}\text{Br}$	+	${}^0_{-1}\text{e}$
8	$\alpha$	${}^{210}_{84}\text{Po}$	$\longrightarrow$	${}^{206}_{82}\text{Pb}$	+	${}^4_2\text{He}$
9	$\beta$	${}^{85}_{36}\text{Kr}$	$\longrightarrow$	${}^{85}_{37}\text{Rb}$	+	${}^0_{-1}\text{e}$
10	$\beta$	${}^{90}_{38}\text{Sr}$	$\longrightarrow$	${}^{90}_{39}\text{Y}$	+	${}^0_{-1}\text{e}$
11	$\alpha$	${}^{238}_{88}\text{Ra}$	$\longrightarrow$	${}^{234}_{86}\text{Rn}$	+	${}^4_2\text{He}$
12	$\alpha$	${}^{238}_{94}\text{Pu}$	$\longrightarrow$	${}^{234}_{92}\text{U}$	+	${}^4_2\text{He}$
13	$\beta$	${}^{125}_{38}\text{Sb}$	$\longrightarrow$	${}^{125}_{39}\text{Y}$	+	${}^0_{-1}\text{e}$
14	$\alpha$	${}^{242}_{96}\text{Cm}$	$\longrightarrow$	${}^{238}_{94}\text{Pu}$	+	${}^4_2\text{He}$
15	$\alpha$	${}^{209}_{83}\text{Bi}$	$\longrightarrow$	${}^{205}_{81}\text{Tl}$	+	${}^4_2\text{He}$

This can be graded out of 30 marks.

### Nuclear decay equations 3

Complete the equations by adding in the type of decay, the isotope undergoing decay and/or the products. Each equation has one or more parts missing.

Type of decay					
$\beta$	${}^{40}_{19}\text{K}$	$\longrightarrow$	${}^{40}_{20}\text{Ca}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{210}_{86}\text{Rn}$	$\longrightarrow$	${}^{206}_{84}\text{Po}$	+	${}^4_2\text{He}$
$\alpha$	${}^{230}_{90}\text{Th}$		${}^{226}_{88}\text{Ra}$	+	${}^4_2\text{He}$
$\beta$	${}^{234}_{90}\text{Th}$		${}^{234}_{91}\text{Pa}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{10}_4\text{Be}$		${}^6_2\text{He}$	+	${}^4_2\text{He}$
$\beta$	${}^8_4\text{Be}$		${}^8_5\text{B}$	+	${}^0_{-1}\text{e}$
$\beta$	${}^{79}_{34}\text{Se}$		${}^{79}_{35}\text{Br}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{210}_{84}\text{Po}$		${}^{206}_{82}\text{Pb}$	+	${}^4_2\text{He}$
$\beta$	${}^{85}_{36}\text{Kr}$		${}^{85}_{37}\text{Rb}$	+	${}^0_{-1}\text{e}$
$\beta$	${}^{90}_{38}\text{Sr}$		${}^{90}_{39}\text{Y}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{238}_{88}\text{Ra}$		${}^{234}_{86}\text{Rn}$	+	${}^4_2\text{He}$
$\alpha$	${}^{238}_{94}\text{Pu}$		${}^{234}_{92}\text{U}$	+	${}^4_2\text{He}$
$\beta$	${}^{125}_{38}\text{Sb}$		${}^{125}_{39}\text{Y}$	+	${}^0_{-1}\text{e}$
$\alpha$	${}^{242}_{96}\text{Cm}$		${}^{238}_{94}\text{Pu}$	+	${}^4_2\text{He}$
$\alpha$	${}^{209}_{83}\text{Bi}$		${}^{205}_{81}\text{Tl}$	+	${}^4_2\text{He}$

There are 25 missing pieces of information for pupils to fill in so this could be graded as a mark out of 25.