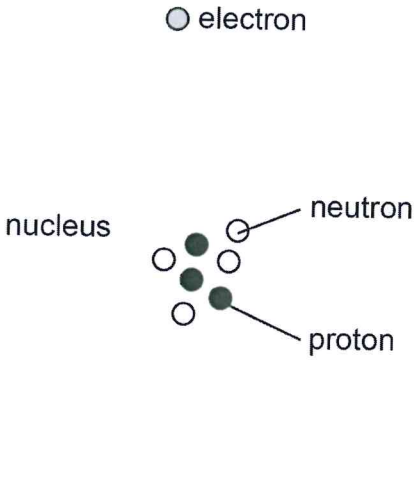
Solutions Ch 3·2 and 3·3 Year 11

Answer 1

(4 marks)

Using the lithium-7 atom as the example, draw a labelled diagram to represent the model of the atom.



Description	Marks
Protons and neutrons in nucleus and electrons around nucleus	1
3 protons and 3 electrons	1
4 neutrons	1
Labels for proton, neutron, electron and nucleus	1
Doesn't need to be to scale If student draws x protons, y neutrons and x electrons, maximum 2 marks	
Total	**4**

Answer 2

(3 marks)

There are at least 37 isotopes of gold, but only one is stable. The stable isotope of gold is written as $^{197}_{79}\mathrm{Au}$.

(a) Determine how many neutrons the stable isotope of gold contains. (1 mark)

(b) Compare what occurs to an isotope that is not 'stable' with an isotope that is 'stable'. (2 marks)

Description	Marks
(a) 197 – 79 = 118 neutrons	1
(b) Unstable isotopes will undergo decay (give off a form of ionizing radiation) until the isotope becomes stable	1
Stable means the isotope will not undergo transmutation and form another isotope. (Must state both cases.)	1
	Total 3

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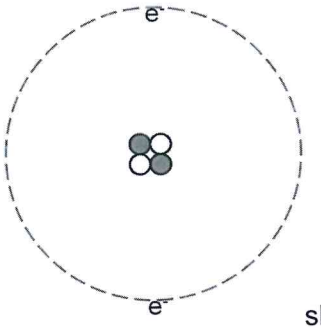
Answer 3

(3 marks)

Draw and label a diagram to show your understanding of the currently accepted structure of a helium - 4 atom.

Description	Marks
 sketch with:	1
All three labels = 2 marks; any two labels = 1 mark 2 electrons, labelled 2 protons, labelled 2 neutrons, labelled	1–2
Total	**3**

Answer 4

(4 marks)

$$^{3}_{2}\mathrm{He} + {}^{3}_{2}\mathrm{He} \rightarrow {}^{4}_{2}\mathrm{He} + 2{}^{1}_{1}\mathrm{H}$$

Using the information below and your Formula and Data Booklet, calculate the energy released in joules during this reaction.

Mass $^{3}_{2}He$ = 5.01×10^{-27} kg

Description	Marks
$(5.01 \times 10^{-27} \times 2) - (6.64 \times 10^{-27} + [2 \times 1.67 \times 10^{-27}])$ $1.002 \times 10^{-26} - 9.98 \times 10^{-27}$ Mass defect = 4×10^{-29} kg	1–2
$E = mc^2$ $= 4.00 \times 10^{-29} \times (3 \times 10^{8})^2$	1
$E = 3.60 \times 10^{-12}$ J	1
Total	**4**