

GCSE Physics A (Gateway)

J249/04 Physics A P5-P8 and P9 (Higher Tier)

Question Set 4

1 Nuclear radiation, such as gamma, is used to irradiate some fresh food to increase its 'shelf-life' and make it last longer.

Fresh herbs and spices are dried and irradiated with gamma rays.

(a) Explain the difference between nuclear **irradiation** and nuclear **contamination**.

[2]

(b) Explain how the gamma rays can increase the 'shelf-life' of herbs and spices to make them last longer.

[2]

(c) Some people are worried about eating irradiated food.

Write down two **concerns** they may have about irradiated food.

[2]

(d) Carbon is a common element. Carbon has two different isotopes called carbon-12 and carbon-14. Both of these isotopes have six protons in the nucleus.

(i) Carbon-14 is radioactive and carbon-12 is **not** radioactive.

Explain why some isotopes are radioactive.

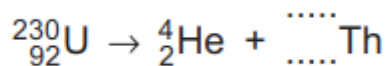
[1]

(ii) Describe how the nucleus of carbon-12 is different to the nucleus of carbon-14.

[1]

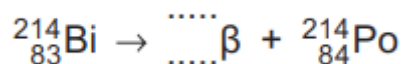
(e) Decay equations are used to show the type of emission from different radioactive elements.

(i) Complete the decay equation for **alpha** emission.



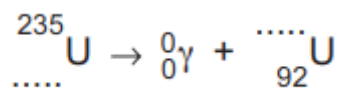
[2]

(ii) Complete the decay equation for **beta** emission.



[2]

(iii) Complete the decay equation for **gamma** emission.



[2]

Total Marks for Question Set 4: 14

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