9 **(a)** Fig. 9.1 shows a beam of radiation in a vacuum. The beam contains α-particles, β-particles and γ-radiation.

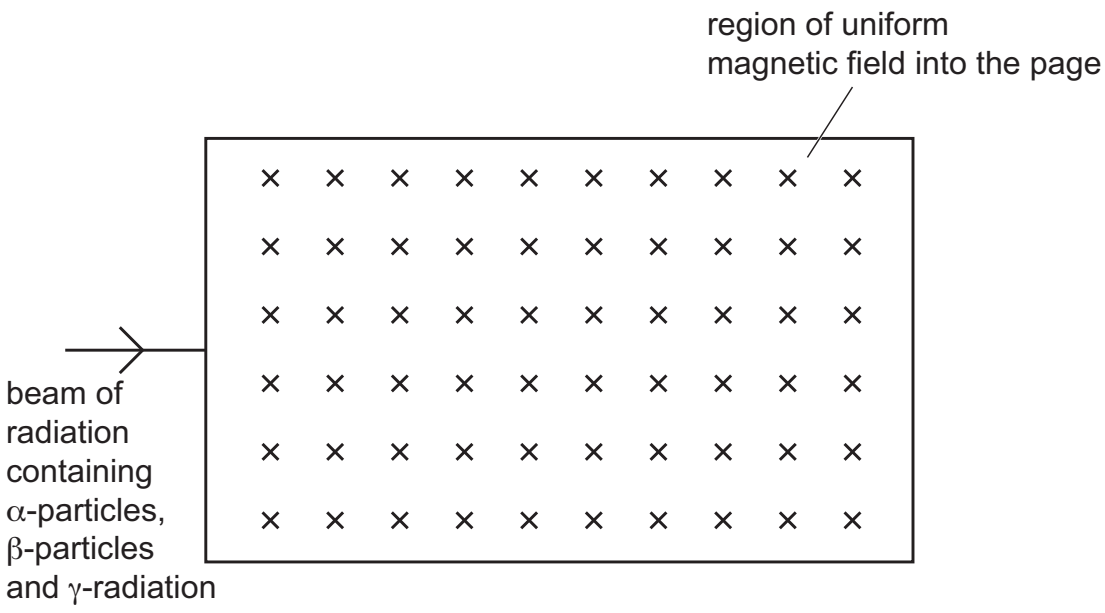

Fig. 9.1

The beam enters a region where there is a strong, uniform magnetic field. The direction of the magnetic field is into the page.

On Fig. 9.1 draw and label the paths within the magnetic field of:

(i) α-particles (label this path α) [1]

(ii) β-particles (label this path β) [2]

(iii) γ-radiation (label this path γ) [1]

(b) Table 9.1 shows five radioactive sources, the main type of radiation emitted by each source and the half-life of each source.

Table 9.1

radioactive source	type of radiation emitted	half-life
P	alpha	460 years
Q	alpha	10 days
R	beta	29 years
S	beta	14 days
T	gamma	30 years

(i) Define half-life of a radioactive isotope.

.....

..... [1]

(ii) Fig. 9.2 shows a simplified diagram of a machine that produces thin sheets of aluminium of constant thickness.

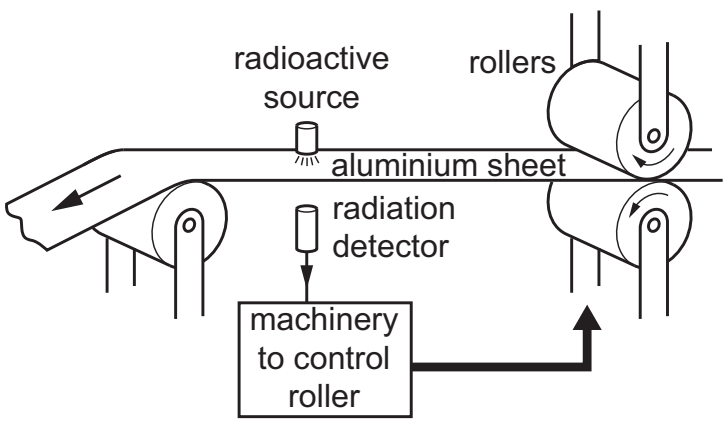

Fig. 9.2

The radiation detector is used to measure the thickness of the aluminium sheets and control the gap between the rollers.

State the most suitable radioactive source in Table 9.1 for the machine in Fig. 9.2.

Explain why this radioactive source is the most suitable and why the other sources are unsuitable.

most suitable source .....

explanation .....

.....

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.....

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.....

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[4]

[Total: 9]