

- 3 (a)** Explain how an electric field and a magnetic field may be used for the velocity selection of charged particles. You may draw a diagram if you wish.

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[3]

- (b) The isotopes strontium-87 ($^{87}_{38}\text{Sr}$) and strontium-86 ($^{86}_{38}\text{Sr}$) are found in samples of Moon rock. Particles of a sample of Moon rock are vaporised, releasing strontium isotopes that are sent into the velocity selector of a mass spectrometer as shown in Fig. 3.1. The positive ions of strontium isotopes then pass through a uniform magnetic field which makes them follow separate circular paths.

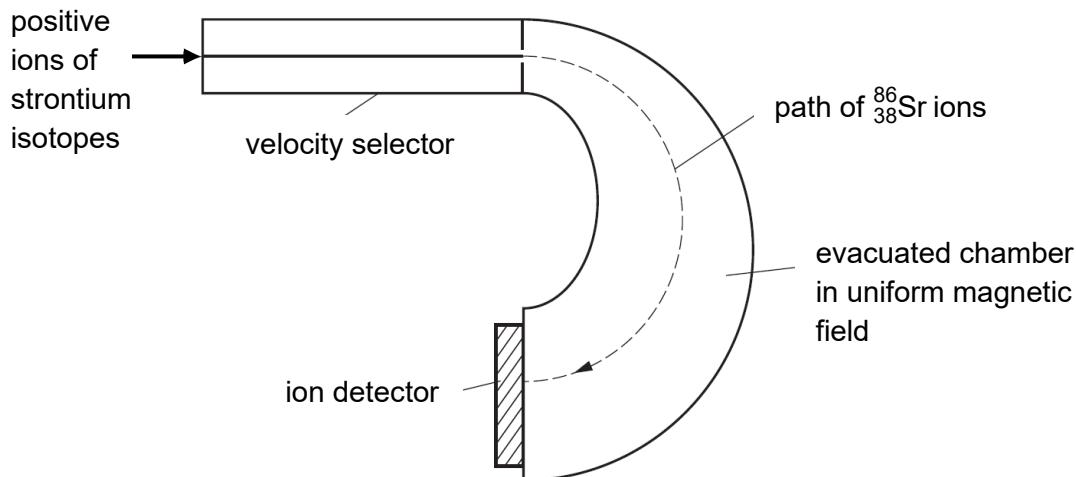


Fig. 3.1

The velocity selector allows strontium ions of speed $7.6 \times 10^5 \text{ m s}^{-1}$ to enter the evacuated chamber in uniform magnetic field of magnetic flux density 680 mT.

Determine the change in the magnetic flux density needed to make the strontium-87 ($^{87}_{38}\text{Sr}$) ions follow the same path taken initially by the strontium-86 ions.

$$\text{change in magnetic flux density} = \dots \text{ T} \quad [2]$$