

2 Sources of  $\alpha$ -particles are frequently found to contain traces of helium gas.

A radioactive source emits  $\alpha$ -particles at a constant rate of  $3.5 \times 10^6 \text{ s}^{-1}$ . The  $\alpha$ -particles are collected for a period of 40 days. Each  $\alpha$ -particle becomes one helium atom.

- (a) By reference to the half-life of the source, suggest why it may be assumed that the rate of emission of  $\alpha$ -particles is constant.

.....  
..... [1]

- (b) The helium gas may be assumed to be an ideal gas. Calculate the volume of gas that is collected at a pressure of  $1.5 \times 10^5 \text{ Pa}$  and at a temperature of  $17^\circ\text{C}$ .

volume = .....  $\text{m}^3$  [3]