

- 8 Radon-222 is a radioactive element having a half-life of 3.82 days.

Radon-222, when found in atmospheric air, can present a health hazard. Safety measures should be taken when the activity of radon-222 exceeds 200 Bq per cubic metre of air.

- (a) (i) Define radioactive *decay constant*.

.....  
.....  
.....

[2]

- (ii) Show that the decay constant of radon-222 is  $2.1 \times 10^{-6} \text{ s}^{-1}$ .

[1]

- (b) A volume of  $1.0 \text{ m}^3$  of atmospheric air contains  $2.5 \times 10^{25}$  molecules.

Calculate the ratio

$$\frac{\text{number of air molecules in } 1.0 \text{ m}^3 \text{ of atmospheric air}}{\text{number of radon-222 atoms in } 1.0 \text{ m}^3 \text{ of atmospheric air}}$$

for the minimum activity of radon-222 at which safety measures should be taken.

ratio = ..... [3]

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**Please turn over for Section B.**