8 **(a)** Distinguish, for an atom, between a nucleus and a nucleon.

nucleus: .....

.....

nucleon: .....

.....
[3]

(b) Radon gas is a naturally occurring radioactive gas with a half-life of 3.8 days.

The activity of radon gas in a room is found to be 97 Bq in each 1.0 m^3 of air.

(i) Calculate

1. the decay constant, in s^{-1}, of radon,

decay constant = ... s^{-1} [2]

2. the number of radon atoms giving rise to an activity of 97 Bq.

number = ... [2]

(ii) A volume of $2.5 \times 10^{-2}\,m^3$ of air in the room contains 1.0 mol of molecules.

Determine the ratio, for $1.0\,m^3$ of air,

$$\frac{\text{number of radon atoms}}{\text{number of air molecules}}.$$

ratio = ... [2]