12 **(a)** A radiation detector is placed close to a radioactive source. The detector does not surround the source.
Radiation is emitted in all directions and, as a result, the activity of the source and the measured count rate are different.

Suggest two other reasons why the activity and the measured count rate may be different.

1. .....

.....

2. .....

.....
[2]

(b) The variation with time t of the measured count rate in **(a)** is shown in Fig. 12.1.

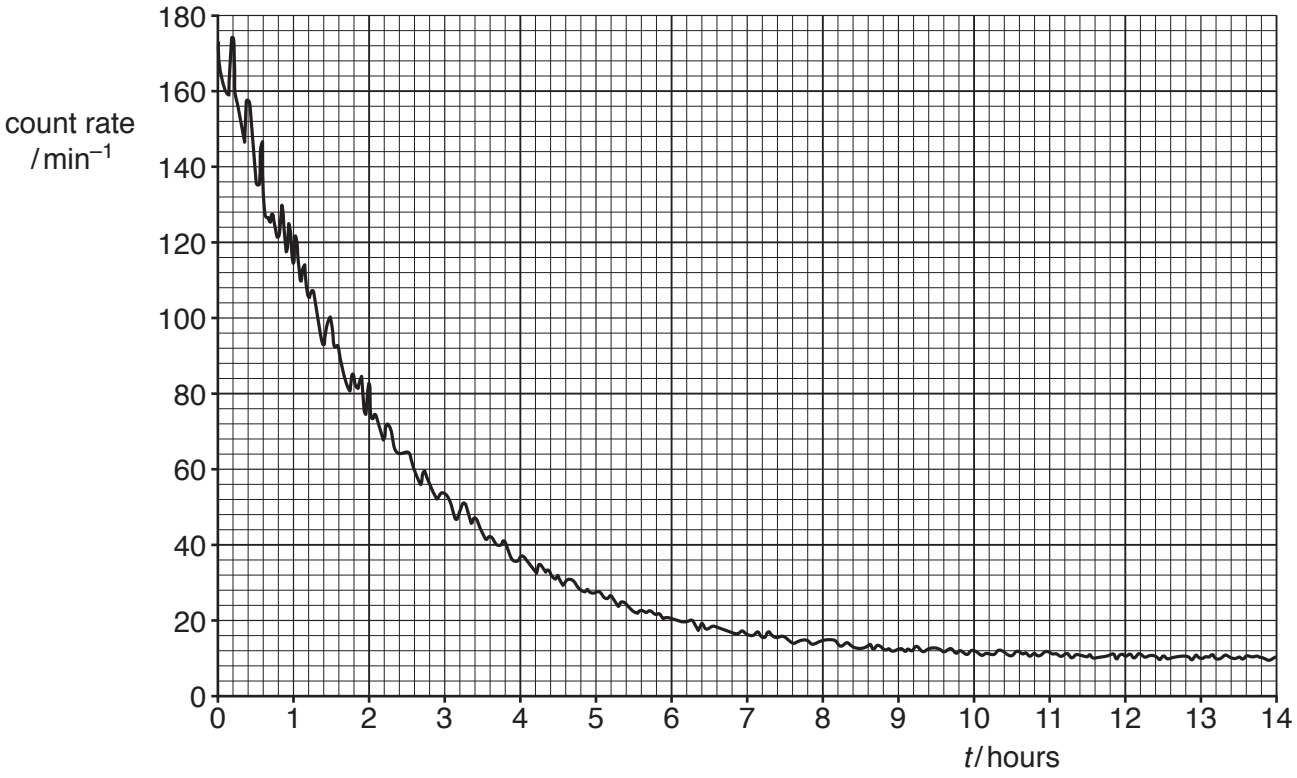

Fig. 12.1

(i) State the feature of Fig. 12.1 that indicates the random nature of radioactive decay.

.....

..... [1]

(ii) Use Fig. 12.1 to determine the half-life of the radioactive isotope in the source.

half-life = ... hours [4]

(c) The readings in **(b)** were obtained at room temperature.
A second sample of this isotope is heated to a temperature of 500 °C.
The initial count rate at time $t = 0$ is the same as that in **(b)**.
The variation with time t of the measured count rate from the heated source is determined.

State, with a reason, the difference, if any, in

1. the half-life,

.....

.....

.....

2. the measured count rate for any specific time.

.....

.....

.....

[3]

[Total: 10]

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