6 **(a)** A student is provided with a freshly prepared sample of a radioactive material and the count rate C from the source is found to vary with time t as shown in Fig. 6.1(a).

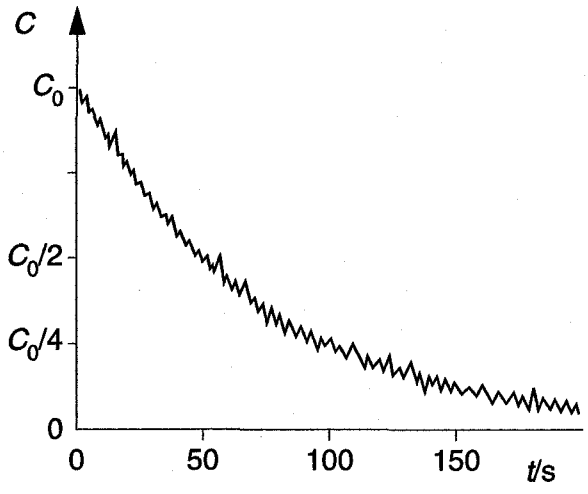

Fig. 6.1(a)

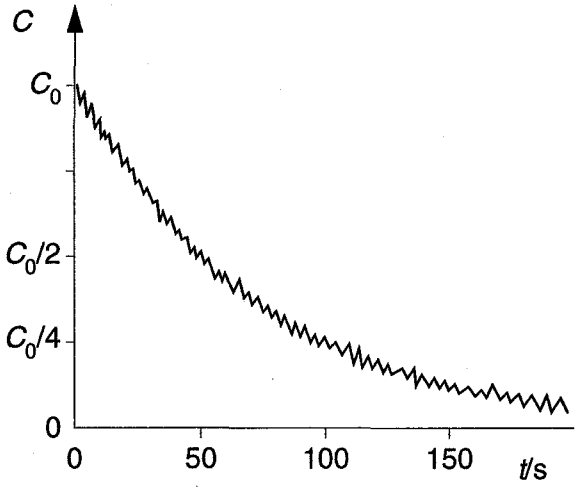

Fig. 6.1(b)

A second similar sample of the radioactive material is then prepared and the student repeats the experiment, but with the sample at a higher temperature. The variation with time of the count rate for the second sample is shown in Fig. 6.1(b).

State the evidence that is provided by these two experiments for

(i) the random nature of radioactive decay,

.....

.....

(ii) the spontaneous nature of radioactive decay.

.....

.....

[2]

(b) The radioactive source in **(a)** is an isotope of radon ($^{220}_{86}$Rn) that emits α-radiation to become polonium (Po).

(i) State the number of neutrons in one nucleus of radon-220.

number = ... [1]

(ii) Write down a nuclear equation to represent the radioactive decay of a nucleus of radon.

$$^{220}_{86}\text{Rn} \rightarrow \text{.....}^{\text{.....}}_{\text{.....}}\text{Po} + \text{.....}^{\text{.....}}_{\text{.....}}$$

[3]

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