7 **(a)** State experimental evidence to suggest that the process of radioactive decay is

(i) random

……..

…… [1]

(ii) spontaneous

……..

…… [1]

(b) A student determines the half-life of the radioactive isotope of phosphorous-32. Phosphorous-32 decays by beta emission to form sulfur-32 which is stable.

The student measures the average count-rate from a sample of phosphorous-32 at various times *t*. The background-subtracted count rate, *R*, is shown in Fig. 7.1.

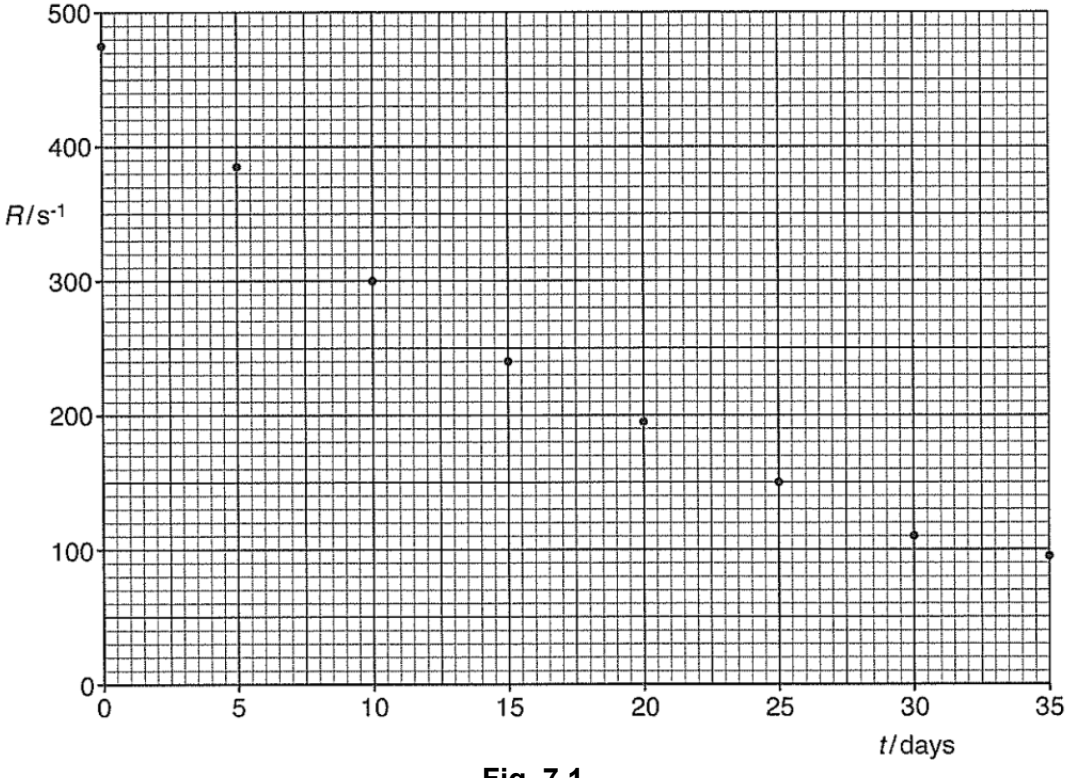

Fig. 7.1

(i) Use Fig. 7.1 to determine a value for the half-life of phosphorous-32. Show your working clearly.

half-life = …….. days [3]

(ii) Explain why, although the count rates are too low for the radiation to cause immediate symptoms in the student, careful shielding of the source is necessary.

……..

……..

……..

……..

…… [2]

(iii) Suggest why the determination of the half-life of phosphorus-32 by this method requires that the product of the decay is stable.

……..

……..

…… [1]

[Total: 8 marks]