Oxford Cambridge and RSA

GCSE Physics A (Gateway)

J249/04 Physics A P5-P8 and P9 (Higher Tier)

Question Set 13

1 A teacher measures the activity of different radioactive isotopes.

Fig. 1.1 is a graph of her results for isotope **A**.

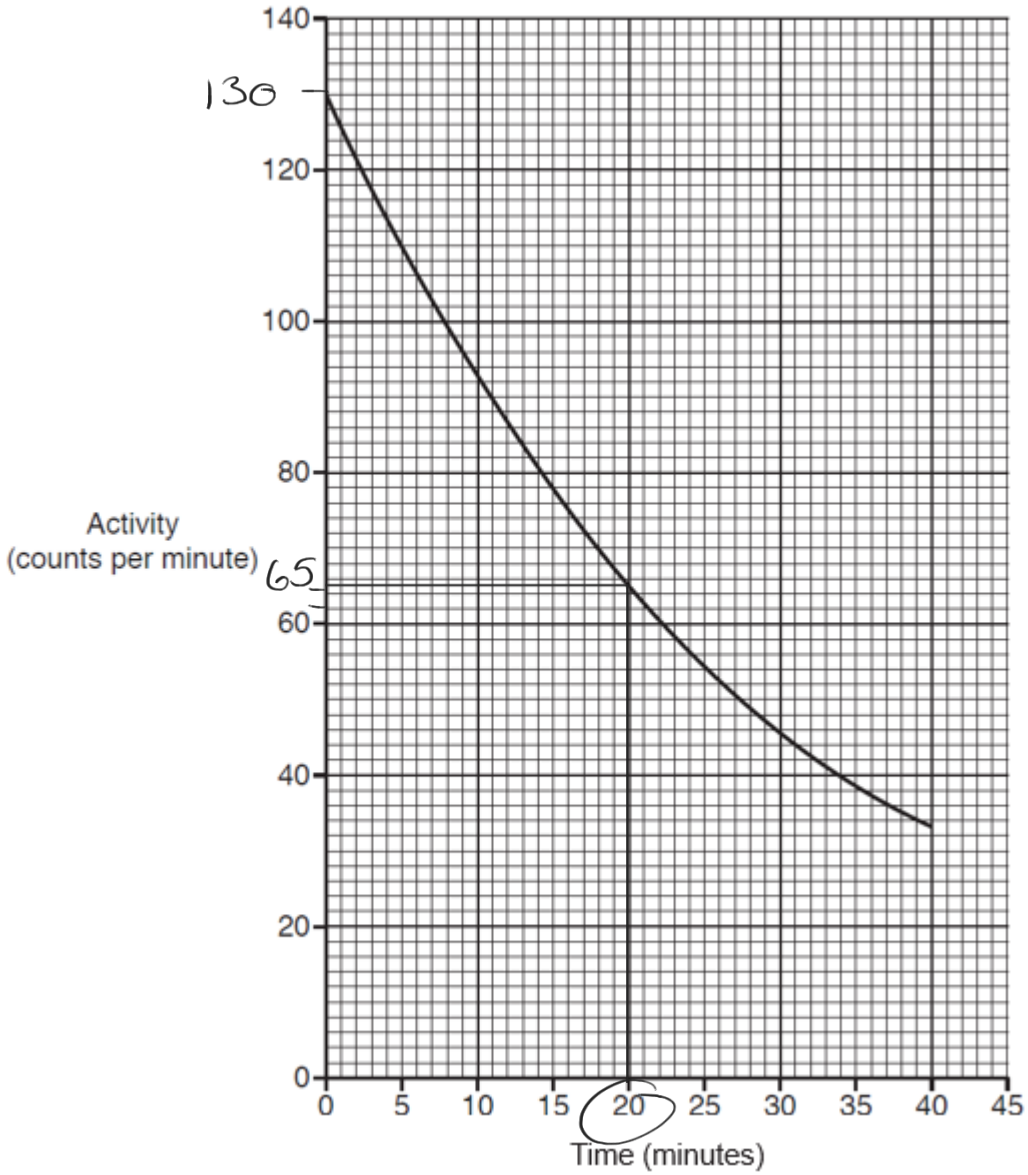

Fig. 1.1

(a) Use **Fig. 1.1** to calculate the half-life of isotope **A**.

Show your working on the graph in **Fig. 1.1**.

* Assuming no background radiation *

Half-life = ... 20 ..... minutes

[2]

(b) The teacher measures the activity of isotope **B**.

She starts taking activity measurements after 20 minutes.

Table 1.1 shows her results for isotope **B**.

Time (minutes)	Activity (counts per minute)
0	
10	
20	84
30	64
40	52
50	40
60	32
70	25
80	20
90	16

Table 1.1

Predict the activity of isotope **B** at 0 minutes.

Use the information in **Table 1.1** to help you.

Activity = 128 .....counts per minute

[2]

$t = 30 \quad A = 64$

$t = 60 \quad A = 32$

So $T_{1/2} = 30$

So $t = 0$ should be double $t = 30$

$t = 0 \quad A = 64 \times 2 = 128$

(c) The teacher measures the activity of isotope **C**.

Fig. 1.2 is a graph which shows how activity varies with time for isotope **C**.

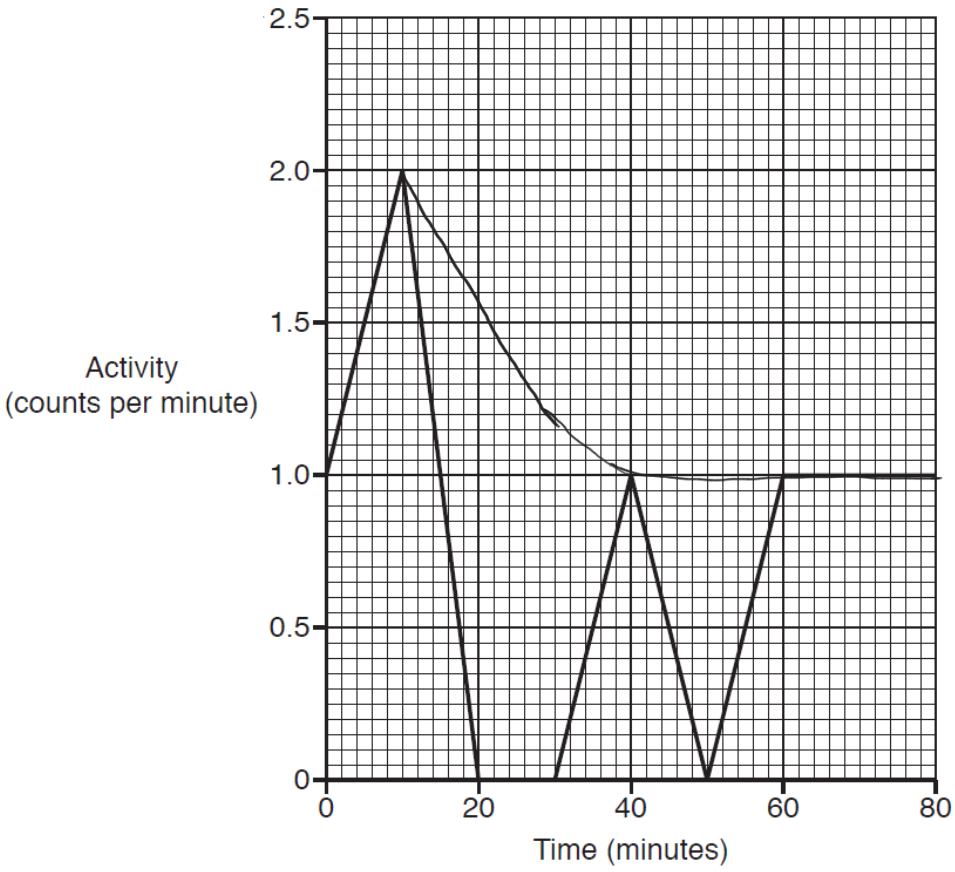

Fig. 1.2

A student makes two conclusions from the graph in **Fig. 1.2**:

Conclusion 1: I think the results are very inaccurate.
The isotope stops being radioactive and then gets more radioactive again.

Conclusion 2: I do **not** think the isotope has a half-life.

Is the student correct?

Evaluate **each** conclusion and explain your answer.

[2]

conclusion 1

Radioactivity is a random process ∴ the isotope decays randomly and may not show an obvious pattern. This lack of pattern highlights that the isotope is randomly decay and ∴ sometimes decays alot in eg minute 12 but not at all at minute 20.

Conclusion 2

All isotopes have a half-life, however this experiment may have to be longer to show an apparent half life / trend.

Total Marks for Question Set 13: 6