13.1 Atoms, Nuclei & Radiation

Question Paper

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Course	CIE A Level Physics (9702) 2019-2021
Section	13. Particle & Nuclear Physics
Topic	13.1 Atoms, Nuclei & Radiation
Difficulty	Hard

Time allowed: 10

Score: /4

Percentage: /100

Question 1

Thorium $^{232}_{90}Th$ decays through a series of transformations. The particles emitted in successive transformations are

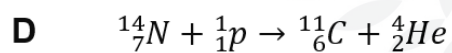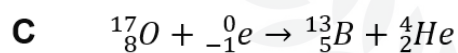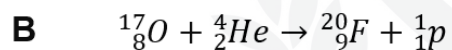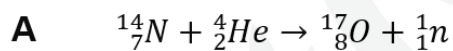$$\alpha \quad \beta \quad \beta \quad \gamma \quad \alpha$$

The resulting nuclide may be represented by

A $^{230}_{82}Pb$ **B** $^{227}_{85}At$ **C** $^{225}_{87}Fr$ **D** $^{224}_{88}Ra$
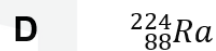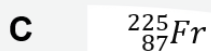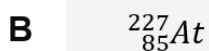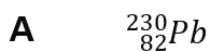
[1 mark]

Question 2

Which of the following equations correctly shows an α-particle causing a nuclear reaction?

A $^{14}_{7}N + ^{4}_{2}He \rightarrow ^{17}_{8}O + ^{1}_{1}n$

B $^{17}_{8}O + ^{4}_{2}He \rightarrow ^{20}_{9}F + ^{1}_{1}p$

C $^{17}_{8}O + ^{0}_{-1}e \rightarrow ^{13}_{5}B + ^{4}_{2}He$

D $^{14}_{7}N + ^{1}_{1}p \rightarrow ^{11}_{6}C + ^{4}_{2}He$

[1 mark]

Question 3

A stationary decay of $^{210}_{84}Po$ by α-emission has a total kinetic energy of E_k

$$^{210}_{84}Po \rightarrow {}^{206}_{82}Pb + \alpha$$
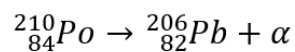
What is the kinetic energy of the daughter nucelus $^{206}_{82}Pb$?
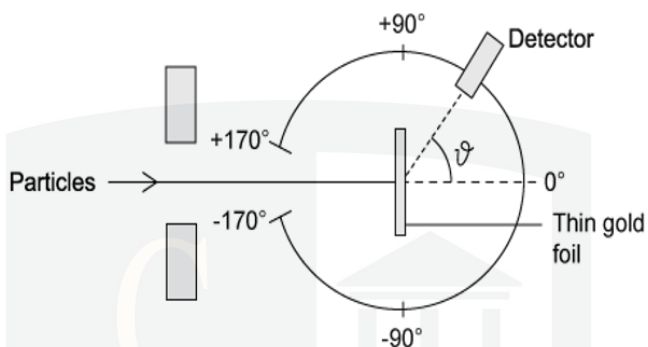
A   0

B   between 0 and $\frac{E_k}{2}$

C   between $\frac{E_k}{2}$ and E_k
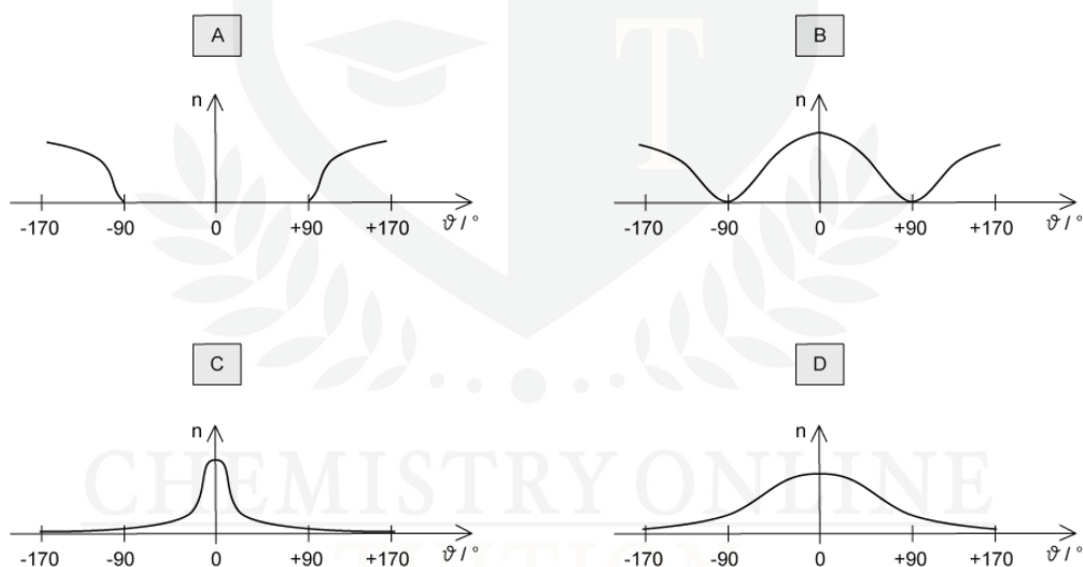
D E_k

[1 mark]
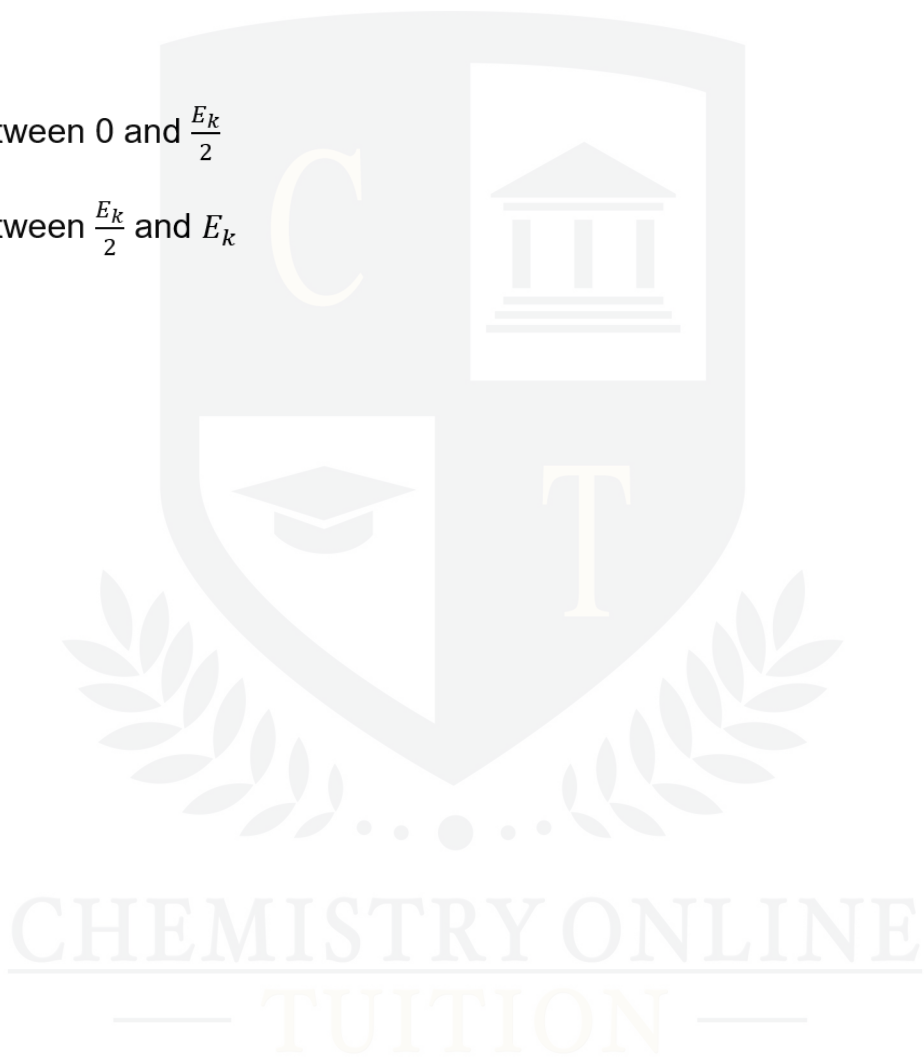
Question 4

In an *α*-particle scattering experiment, a student set up the apparatus below to determine the number *n* of *α*-particles incident per unit time on a detector held at various angles *θ*.

Which of the following graph best represents the variation of *n* with *θ*?

[1 mark]