10 Technetium-98 and technetium-99 are isotopes of the element technetium.

(a) (i) Describe the difference between the nuclei of technetium-98 and technetium-99

(2)

(ii) Technetium-99 is formed when the element molybdenum-99 decays.

Complete the nuclear equation for the decay of molybdenum into technetium-99

(2)

$$^{99}_{42}\text{Mo} \rightarrow \square\,^{99}\text{Tc} + \square\,^{0}\beta$$

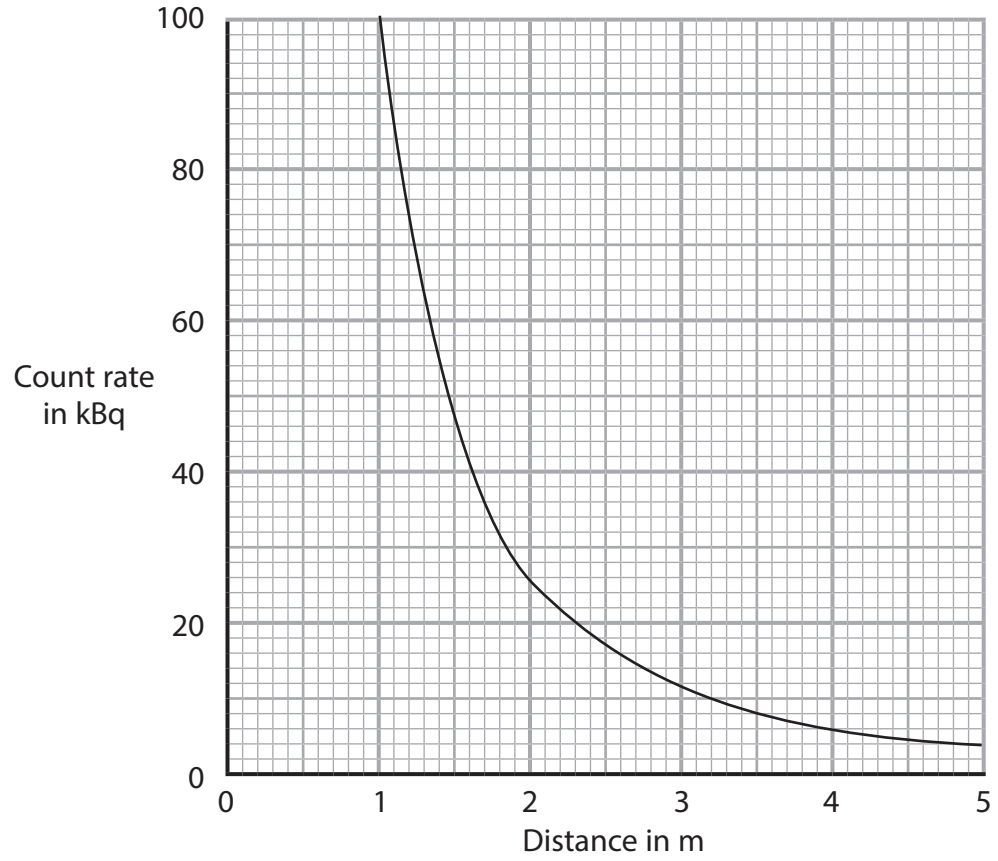
(b) Describe an experiment that a scientist could use to demonstrate that the emission from technetium-99 is gamma radiation.

Include details of a safety precaution in your answer.

(5)

(c) A scientist measures the count rate at different distances from the technetium source.

The graph shows how the count rate changes with distance from the technetium source.



The scientist suggests that the relationship between the count rate and distance is

$$(\text{distance})^2 \times \text{count rate} = \text{constant}$$

Use data from the graph to determine whether these results support this relationship.

(4)

(Total for Question 10 = 13 marks)