

GCSE Physics B (Twenty First Century Science)
J259/03 Depth in physics (Higher Tier)

Question Set 8

1 **Table 8.1** shows data for four radioactive isotopes.

Isotope	Half life	Type of decay
molybdenum-98	stable	
molybdenum-99	66 hours	beta
technetium-99m	6 hours	gamma
thallium-201	73 hours	gamma

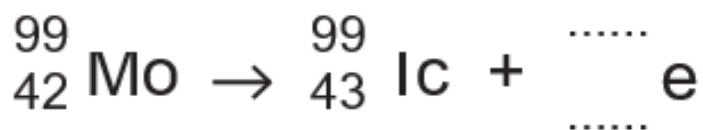
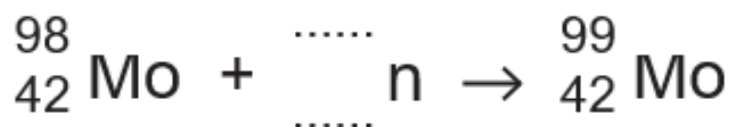
Table 8.1

Technetium-99m is used in hospitals.

Technetium-99m is produced when molybdenum-99 emits beta radiation.

One method of producing molybdenum-99 is by firing neutrons at molybdenum-98.

(a) Complete these nuclear equations to show the production of technetium-99m.



[2]

(b) Molybdenum-99 is produced in nuclear reactors and then transported to hospitals. It may take several days for the molybdenum-99 to be transported.

In the hospital molybdenum-99 decays and the technetium-99m is produced as shown in part (a).

Using information from **Table 8.1**, explain why technetium-99m is not transported directly to hospitals.

[2]

(c) Production of technetium-99m is becoming more expensive. An alternative for many medical procedures is thallium-201.

A patient is injected with a compound containing thallium-201. After 24 hours, 80% of the thallium-201 has not decayed.

A second patient is injected with a compound containing technetium-99m.

- (i) Calculate the percentage of technetium-99m remaining after 24 hours.

Percentage remaining = %

[2]

- (ii) A doctor is deciding which radioactive isotope is best to use.

Dr Phillips
Using technetium-99m is safer for the patient than using thallium-201.



Evaluate this statement.

Use the data in **Table 8.1** and the information above in your answer.

[2]

Total Marks for Question Set 8: 8

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge