Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
	Determines number of half-lives and rounds (1) 263/87.7 = 3 Determines that 3 half-lives is 1/2 × 1/2 × 1/2 = 1/8 (1) Determines mass of Pu-238 after 3 half-lives (1) 925/8 = 115.625 (g) Determines average energy released per second (1) 115.625 × 0.54 = 62.4 (J)	 allow repeated division by 2 allow ecf from step 2 for 1 mark (mass of Pu-238 after1 half-life 925/2 = 462.5 (g)) allow ecf from 1 half-life or from step 3	 **(4)**

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Q2.

Question Number	Answer	Acceptable answers	Mark
(i)	**B 21**		**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	**A** $^{39}_{19}K$		**(1)**

Question Number	Answer	Acceptable answers	Mark
(iii)	A description to include any two of • (nucleus/isotope is) unstable (1) • (nucleus/isotope is) radioactive (1) • decay is random (1) • long half life (1)		**(2)**

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Q3.

Question Number	Answer	Acceptable answers	Mark
(i)	An explanation linking two of the following:- CT scan lasts much longer / X-ray short exposure (1) CT scan is many X-ray (slices) (1) The <u>intensity</u> of radiation for CT scans is higher than for normal X-rays (1)	 For CT scan X-ray machine moves (slowly) around the body many pictures / series of X-rays/ 3D image	**(2)**

Question Number	Answer	Acceptable answers	Mark
(ii)	Justification including:- appreciation that there would be risks (1) ONE from:- non-invasive/ not painful (1) OR more accurate/better/earlier diagnosis (1) OR life-saving/ provide cure (1)	 the benefits outweigh the risks/drawbacks/concerns/dangers gives more useful information	**(2)**

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Q4.

Question Number	Answer	Acceptable answers	Mark
(i)	**B** a few hours		**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	An explanation including three of the following: MP1 alpha/the radiation is (highly) ionising (1) MP2 the radiation destroys cancers/tumours (1) MP3 alpha particles/ do not penetrate very far in the body/inserted close to the cancer (1) MP4 half-life is long enough for the treatment to take effect (1) MP5 half-life is short enough so that the pellets do not need to be removed (1)	 kills/ destroys/mutates cells mutates DNA alpha particles do not/ get out of the organ being treated/ damage cells in other organ Ignore patients being radioactive Ignore replacement of pellets	**(3)**

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Q5.

Question Number	Answer		Mark
	• point after first half-life 6, 40 (1) • point after second half-life 12, 20 (1) • point after third half-life 18, 10 (1)	within 1 small square by eye smooth curve starting at 80, with a decreasing gradient passing through one correct half-life point scores 2 marks smooth curve starting at 80, with a decreasing gradient passing through two correct half-life points scores 3 marks **if no other mark scored** smooth curve showing decreasing gradient but not going through any correct points scores 1 mark	**(3)** AO 3 1a

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