Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

	Answer	Acceptable answers	Mark
(a)(i)	any one of X-ray (machines) / smoke alarms/ nuclear/ radioactive waste (1)	nuclear weapons (tests) nuclear power plants (medical) tracers/technetium	**(1)**
(a)(ii)	an explanation linking: comes from granite / rocks (1) none/ less of these (rocks) in some areas (1)	in some areas/Cornwall/Aberdeen the second mark is dependent on the first.	**(2)**
(b)(i)	suitable lines on graph to show halving after about 200 000 years (2) • horizontal line at 750 +or –50 Bq on y-axis to curve (1) • meeting (by eye) vertical line from x-axis between 190,000 years and 230,000 years (1)	use of data from graph to show halving after about 200 000 years 1500/2 =750(Bq) or 1600/2=800(Bq) gives a half-life of 210,000 +or- 20 000 (years)	**(2)**
(b)(ii)	any one of • penetrates/passes through the skin (1) • ionises (1) • damages tissue/ cells/DNA (1) • mutates cells/DNA(1) • causes cancer(1)		**(1)**

Total marks for question = 12

		Indicative Content	Mark
QWC	***(c)**	an explanation which may include some of	**(6)**

		the following points: properties of nuclear waste • radioactivity is dangerous • some isotopes in nuclear waste have long half-lives/radioactive for thousands of years • products of fission are warm • identified radiation from nuclear waste e.g alpha, beta, gamma problems caused by nuclear waste • leakage of radioactivity • contamination of ground/sea water/lakes /rivers • contamination of crops/fish/animals/drinking water • harm to humans/cancer/radiation poisoning/ damage to cells/mutation of cells or DNA • difficulty in transporting safely/ stolen by terrorists fears of local people solutions for dealing with nuclear waste safely • long term storage, underground /under the sea • radiation shielding, lead/steel/concrete/ containers, sealed in glass. • human safety, radiation suits, using tongs/lead jackets safe location, away from people/remote areas/sea cooling, ponds • information to persuade local people of safety	
Level	**0**	No rewardable content	
1	**1 - 2**		

		• a limited explanation mentioning at least one point, but without linking, e.g. radioactivity is dangerous ; nuclear waste should be stored underground ; terrorists might steal nuclear waste; • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple explanation mentioning two points with an appropriate linkage e.g. nuclear waste is dangerous and it must be stored underground ; the isotopes in nuclear waste have long half-lives so they must be stored for a long time; • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed explanation mentioning a range of points with appropriate linkages e.g. gamma rays from nuclear waste causes damage to cells so it must be stored away from where people live ; the isotopes in nuclear waste have long half-lives so they must be stored underground or in remote areas; • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q2.

Question Number	Answer	Additional guidance	Mark
	any two sources from: • oil • (natural) gas • coal • nuclear/uranium	accept petrol /diesel for oil accept fossil fuel(s) for any of the first three i.e. fossil fuel and oil or coal or gas scores 1 mark but fossil fuel and nuclear scores 2 marks	**(2)** AO 1 1

Q3.

Question Number	Answer	Additional guidance	Mark
	discussion to involve two points each giving change and effect (max 4 marks) some examples: change: biomass-solar-geothermal (fraction) increases (1) effect: e.g. reduces greenhouse gas / CO_2 emissions (1) change: 'wind' (fraction) increases (1) effect: e.g. visual/noise pollution arguments (1) change: 'natural gas' (fraction) increases (1) effect: e.g. contributes to global warming (1) change: 'uranium' (fraction) decreases (1) effect: e.g. less radioactive waste (1)	ignore vague responses such as 'environmentally friendly', less pollution etc. candidates may give positive or negative effects for this change (and for oil) allow decreases (with a correct accompanying effect for 2 marks) accept conserves non-renewables but not just 'more renewable'	**(4)** AO 3 2a AO 3 2b