Practice Question Set For GCSE
Subject : Physics
Paper-1 Topic : 6_Radioactivity

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

Mark Schemes

Q1.

Question Number	Answer	Mark
	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 strand 1 (6 marks)** • radio waves are (often) produced intentionally (by humans) • gamma rays are (often) produced spontaneously / randomly • radio waves are produced by (free) electrons • radio waves are produced by oscillating (free) electrons / alternating current (ac) • radio waves are produced in electrical circuits / aerials • gamma rays may result from radioactive decay • gamma rays produced in the nucleus • gamma rays produced by energy changes / rearrangement in the nucleus • gamma rays produced to stabilise the nucleus • gamma rays produced in annihilations (PET scanning etc) • gamma rays may be produced as a result of (nuclear) fission or fusion	**(6)**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Summary for guidance			
Level	**Mark**	**Additional Guidance**	**General additional guidance – the decision within levels** e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance isolated fact(s) about one radiation	Possible candidate responses gamma rays are (often) produced spontaneously / randomly
Level 2	3–4	Additional guidance Some understanding shown i.e. a limited comparison made including some facts about the production of each radiation OR more detailed facts given about the production of one of them	Possible candidate responses radio waves produced in wires and gamma produced in nucleus radio waves produced by AC in wires
Level 3	5–6	Additional guidance Understanding is detailed and fully developed. detailed comparison made with linked facts about the production of each (one radiation may have significantly more detail than the other but both should feature for level 3)	Possible candidate responses radio waves produced by electrons oscillating in wires; gamma produced by annihilation of electrons interacting with positrons

Q2.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. AO1 1 **(6 marks)** **fission** • (heavy) nucleus split • by a neutron • releases 2 daughter nuclei + more neutrons + energy • starts chain reaction **advantages** • already in use **disadvantages** • waste is radioactive • hard to dispose of • risk of accident	**(6)** **AO1**

	fusion • (light) nuclei joined • at high energy/temperature/pressure/particle density • releases (eg) helium + energy **advantages** • no harmful waste products **disadvantages** • not achieved yet (on a practicable scale) • difficulty in achieving high energy/temperature/pressure/particle density	

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance isolated facts	Possible candidate responses fission involves a nucleus being split by a neutron
Level 2	3–4	Additional guidance simple comparison of fission and fusion	Possible candidate responses fission involves a nucleus being split by a neutron whereas fusion requires combining two light nuclei.
Level 3	5–6	Additional guidance detailed comparison of fission and fusion and one advantage or one difficulty compared to the other	Possible candidate responses Fission involves nuclei split by a neutron. Fusion involves combining two light nuclei. The waste from fission is radioactive. Practicable fusion has not been achieved.

Q3.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. AO1 1 **(6 marks)** **alpha** • a particle (not a wave) • made up of 4 particles • helium nucleus • has a positive charge • when emitted by a nucleus, atomic number goes down by 2 • mass number goes down by 4 **beta** • a particle (not a wave) • made up of 1 particle • electron (or positron) • has a negative charge • when emitted, atomic number goes up by 1 • mass number does not change Ignore references to range, penetration, ionisation.	**(6)** **AO1**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance isolated facts	Possible candidate responses A beta particle is an electron. An alpha particle is a helium nucleus
Level 2	3–4	Additional guidance effect of alpha and beta decay or nature and effect of alpha or beta	Possible candidate responses A beta particle is an electron. When emitted the mass number doesn't change but atomic number goes up by one
Level 3	5–6	Additional guidance detailed comparison that includes nature of alpha and nature of beta and effect of either alpha or beta OR effect of alpha and beta and nature of either alpha or beta	Possible candidate responses Alpha particle is a helium nucleus AND A beta particle is an electron. When emitted the mass number doesn't change but atomic number goes up by one