

Question number	Answer	Notes	Marks														
1 (a)	<div>3 correct ticks;;;</div> <div>2 correct ticks;;</div> <div>1 correct tick;</div> <table><thead><tr><th>Statement</th><th>Correct</th></tr></thead><tbody><tr><td>all electromagnetic waves are longitudinal</td><td></td></tr><tr><td>all electromagnetic waves travel at the same speed in free space</td><td>✓</td></tr><tr><td>radio waves have the longest wavelength in the electromagnetic spectrum</td><td>✓</td></tr><tr><td>x-rays have the highest frequency in the electromagnetic spectrum</td><td></td></tr><tr><td>all electromagnetic waves transfer energy</td><td>✓</td></tr><tr><td>all electromagnetic waves can cause cancer</td><td></td></tr></tbody></table>	Statement	Correct	all electromagnetic waves are longitudinal		all electromagnetic waves travel at the same speed in free space	✓	radio waves have the longest wavelength in the electromagnetic spectrum	✓	x-rays have the highest frequency in the electromagnetic spectrum		all electromagnetic waves transfer energy	✓	all electromagnetic waves can cause cancer		<div>-1 for each additional tick if more than three ticks shown</div>	3
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(b) (i)	<div>microwaves:</div> <div>one valid use;</div> <div><ul style="list-style-type: none">communication /eqheating food /eq</div> <div>one valid harmful effect;</div> <div><ul style="list-style-type: none">internal heating (of body tissue) / eq</div>	<div>allow other valid uses e.g. radar, locating rain clouds etc.</div> <div>reject "cancer" apply "list principle"</div>	2														
(ii)	<div>gamma rays:</div> <div>one valid use;</div> <div><ul style="list-style-type: none">sterilising {food / medical equipment}kill microbes or bacteria;treating cancer / radiotherapy;medical tracing</div> <div>one valid harmful effect;</div> <div><ul style="list-style-type: none">ionisation / mutation of cells /eqrisk of cancer</div>	<div>allow other valid uses e.g. gamma photography, identifying cancer etc.</div> <div>condone damages or kills cells or tissues</div>	2														

Total for Question 1 = 7 marks