

Question	Answer	Marks	Guidance
1 a	he <b>gains</b> negative charge (from the carpet) (1)  <b>but</b>  he <b>gains electrons</b> (from the carpet) (2)	2	Any mention of <b>positive electrons</b> [0] Any mention of <b>moving</b> positive charge [0]  if no other marks scored <b>allow</b> idea that there is a transfer of electrons (1)
b i	(electrostatic) voltage increases with distance / AW [1]  (idea of) voltage related to charge / electrons [1]  the increase in (electrostatic) voltage is faster at the start / increases slower at the end / the increase is not linear [1]	2	<b>allow</b> the (electrostatic) voltage increases as more electrons are transferred (1)  <b>eg.</b> the (electrostatic) voltage increases with distance as he gains more (negative) charge or electrons [2]  <b>allow</b> there is a steeper gradient at the start (1) <b>allow</b> trend shown with data from the graph: e.g. (electrostatic) voltage rises from 0 to 6kV in 2 metres but by only 2 in the next 3 metres [2]
ii	<b>more moisture</b> in air / surroundings / clothing / shoes / carpet [1]  <b>idea of more conductive</b> air / surroundings / clothing / shoes / carpet [1]  less friction / rubbing [1]	1	<b>Eg.</b> Wet day / wet shoes [1]  <b>allow</b> idea of less insulated [1] <b>allow</b> more charge has leaked away (to earth) [1] <b>allow</b> bare feet / use of anti-static spray / [1]  <b>allow</b> idea that feet are picked up or feet are not dragged along the carpet (1) <b>ignore</b> speed of walking [1]
	<b>Total</b>	<b>5</b>	

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2 a	<p>..... charge / positive charge / negative charge</p> <p>..... move away from each other / repel / disperse</p> <p>..... attracted (to the car)</p> <p><b>any two from</b> even coat / shadows painted / less waste / fine spray</p> <p>[3]</p>	3	<p>5 gaps correct for 3 marks 4 gaps correct for 2 marks 3/2 gaps correct for 1 mark</p> <p><b>Allow</b> positive or negative if first answer is 'charge'</p> <p><b>allow</b> better finish for even coat <b>allow</b> cheaper for less waste</p>
b	<p><b>any one from:</b></p> <p><b>gun</b> loses electrons <b>to paint</b> [1]</p> <p><b>paint</b> gains electrons <b>from gun</b> [1]</p> <p><b>paint</b> loses electrons <b>to object</b> / bike [1]</p> <p><b>object</b> / bike gains electrons <b>from paint</b> [1]</p>	1	<p>Reference to 'positive electrons' scores [0]</p>
<b>Total</b>		<b>4</b>	

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3	(a)	<p><b>electron transfer idea:</b></p> <ul style="list-style-type: none"> <li>• <u>electrons</u> move between two insulators</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• <u>electrons</u> move between the socks and the trampoline (1)</li> </ul> <p><b>earthing idea:</b></p> <ul style="list-style-type: none"> <li>• electrons flow through girl / to or from earth / ground (during “shock”) (1)</li> </ul>	2	<p>mention of positive electrons scores (0) for <b>this</b> marking point  mention of <b>movement</b> of protons scores (0) for <b>this</b> marking point  <b>but</b> ‘protons stay fixed and electrons move from trampoline to sock scores’ (1)  <b>allow</b> between girl and trampoline (1)</p> <p>mention of positive electrons scores (0) for <b>this</b> marking point  mention of <b>movement</b> of protons scores (0) for <b>this</b> marking point</p> <p><b>allow</b> current / charge movement through girl / to or from earth / discharged to earth (1)  eg negative charge goes to earth (1)</p> <p><b>ignore</b> electricity / voltage to earth</p>
	(b)	<p>idea that anti-static sprays leave a conducting layer / coating of material (1)</p> <p>so charge cannot build up (1)</p>	2	<p><b>Eg.</b> enables the trampoline to conduct (1)</p> <p>eg can't store electrons (1)  <b>not</b> merely static electricity cannot build up.  <b>but</b> static charge cannot build up (1)</p>
<b>Total</b>			<b>4</b>	

Question		Answer	Marks	Guidance
4	(a)	Real Radio (and) Smooth FM (1)  frequencies very close (so cause interference) / AW (1)	2	stations in either order <b>allow</b> 101.2 and 101.8 (1)  if stations named are incorrect then no marks awarded for explanation  <b>allow</b> frequency difference of 0.6 (mHz can cause interference) (1) <b>allow</b> similar frequencies <b>allow</b> correct responses in terms of wavelength  <b>ignore</b> merely 'same frequency'
	(b)	enables more stations / programmes / more information (1)	1	noise / interference can be removed (1)  <b>allow</b> higher level answers eg multiplexing (1)  <b>allow</b> better quality <b>final</b> signal / improved quality sound (1)  <b>ignore</b> merely 'no interference'
<b>Total</b>			<b>3</b>	