Question	Answer	Marks	Guidance
1 a	he **gains** negative charge (from the carpet) (1) **but** he **gains electrons** (from the carpet) (2)	2	Any mention of **positive electrons** [0] Any mention of **moving** positive charge [0] if no other marks scored **allow** 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	**allow** the (electrostatic) voltage increases as more electrons are transferred (1) **eg.** the (electrostatic) voltage increases with distance as he gains more (negative) charge or electrons [2] **allow** there is a steeper gradient at the start (1) **allow** 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	**more moisture** in air / surroundings / clothing / shoes / carpet [1] **idea of more conductive** air / surroundings / clothing / shoes / carpet [1] less friction / rubbing [1]	1	**Eg.** Wet day / wet shoes [1] **allow** idea of less insulated [1] **allow** more charge has leaked away (to earth) [1] allow bare feet / use of anti-static spray / [1] **allow** idea that feet are picked up or feet are not dragged along the carpet (1) **ignore** speed of walking [1]
	Total	**5**	

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

Question			Answer	Marks	Guidance
3	(a)		**electron transfer idea:** • <u>electrons</u> move between two insulators **OR** • <u>electrons</u> move between the socks and the trampoline (1)	2	mention of positive electrons scores (0) for **this** marking point mention of **movement** of protons scores (0) for **this** marking point **but** 'protons stay fixed and electrons move from trampoline to sock scores' (1) **allow** between girl and trampoline (1)
			earthing idea: • electrons flow through girl / to or from earth / ground (during "shock") (1)		mention of positive electrons scores (0) for **this** marking point mention of **movement** of protons scores (0) for **this** marking point **allow** current / charge movement through girl / to or from earth / discharged to earth (1) eg negative charge goes to earth (1) **ignore** electricity / voltage to earth
	(b)		idea that anti-static sprays leave a conducting layer / coating of material (1) so charge cannot build up (1)	2	**Eg.** enables the trampoline to conduct (1) eg can't store electrons (1) **not** merely static electricity cannot build up. **but** static charge cannot build up (1)
			Total	**4**	

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 **allow** 101.2 and 101.8 (1) if stations named are incorrect then no marks awarded for explanation **allow** frequency difference of 0.6 (mHz can cause interference) (1) **allow** similar frequencies **allow** correct responses in terms of wavelength **ignore** merely 'same frequency'
	(b)		enables more stations / programmes / more information (1)	1	noise / interference can be removed (1) **allow** higher level answers eg multiplexing (1) **allow** better quality **final** signal / improved quality sound (1) **ignore** merely 'no interference'
			Total	**3**	