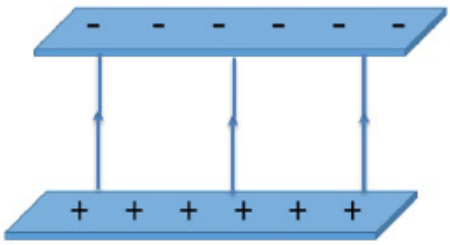
Mark Scheme

Q1.

Question Number	Answer	Mark
	A  **The only correct answer is A** ***B*** *is not correct because the arrows are in the wrong direction* ***C*** *is not correct because the field is not circular* ***D*** *is not correct because the field is not circular*	**(1)** AO 1 1

Q2.

Question Number	Answer	Additional Guidance	Mark
	 at least three vertical straight lines (equally spaced) (1) **with** at least one arrow in the right direction (1)	judge by eye any arrow in the wrong direction = 1 mark max	**(2)**

Q3.

Question Number:	Answer	Additional guidance	Mark
(i)	an explanation linking:		(2) AO 2 2
	sphere A has an electric field (1)	both spheres have electric fields	
	sphere B is in it (1)	the electric fields interact/overlap ignore nature of force; e.g. repulsion	

Question Number:	Answer	Additional Guidance	Mark
(ii)	a description to include:		(2) AO 3 1a AO 3 1b
	as the distance increases the force (on the sphere B) decreases (1)	negative correlation	
	the greatest change is at smallest distances (1)	non-linear gradient changes allow named non-linear functions such as exponential / inversely proportional in this context reference to inverse square law scores 2 marks	

Q4.

	Answer	Acceptable answers	Mark
(i)	Correct responses can be seen in (i) or (ii) An explanation linking • <u>electrons</u> (1) and <u>one</u> of • removed by friction (1) • (transferred) <u>to</u> plastic (1)	["positive electrons/ protons moving", seen anywhere in part (i) or (ii) loses this mark] ignore reference to charge before rubbing transferred from cloth	(2)

(ii)	opposite to charge on plastic (1) <u>equal</u> to charge on the plastic (1)	charge on cloth is positive <u>same size</u> as charge on plastic electrons transferred from the cloth equal to electrons lost by cloth	**(2)**

Q5.

Question Number	Answer	Mark
(i)	**The only correct answer is A**: It removes electrons from the paint drops **B is incorrect** because that would give an overall negative charge to the drops **C is incorrect** because protons are not transferred **D is incorrect** because protons are not transferred	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation linking like charged drops are repelling each other (1) (so) spray is wider (from sprayer Y) (1)	 more spread out / finer / larger area / more dispersed	**(2)**

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation linking metal (wire) can conduct electrons / charge (from earth) (1) (so) prevent (positive) charge accumulating on object (1)	 metal is a conductor discharge (the object)	(2)

Q6.

Question Number:	Answer	Additional Guidance	Mark
(i)	an explanation to link **3** of the following: friction (between cloth and comb) (1) transfer of electrons / charge {from plastic comb / on to the cloth} (1) electrons carry a negative charge (1) leaving **excess** positive charge on the comb (1)	reference to positive electrons or positive charge moving loses that mark point electrons/charges are rubbed off comb (on to cloth) leaving cloth with negative charge more protons than electrons (on the comb)	(3) AO 2 1

Question Number:	Answer	Additional Guidance	Mark
(ii)	an explanation linking: a negative charge is induced (1)	allow a clear description of induction ignore references to positive charge being moved in this context only	(3) AO 2 1
	on the part of the paper closest to the comb (1)		
	opposite charges attract (1)	force of attraction sufficient to pick up the pieces of paper	

Q7.

	Answer	Acceptable answers	Mark
(a)(i)	C		(1)
(a)(ii)	B		(1)
(b)	substitution (1) 3.7 x 13 evaluation (1) 48 (C)	 48.1 Correct answer with no calculation scores 2 marks	(2)
(c)(i)	Correct responses can be seen in (i) or (ii) An explanation linking • <u>electrons</u> (1) and <u>one</u> of • removed by friction (1) • (transferred) <u>to</u> plastic (1)	 ["positive electrons/ protons moving", seen anywhere in part (i) or (ii) loses this mark] ignore reference to charge before rubbing transferred from cloth	(2)
(c)(ii)	opposite to charge on plastic (1) <u>equal</u> to charge on the plastic (1)	charge on cloth is positive <u>same size</u> as charge on plastic electrons transferred from the cloth equal to electrons lost by cloth	(2)

Total question = 8 marks

Q8.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**A** - negative charge has moved from the cloth to the rod		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	An explanation linking they repelled (1) (strips had) like charge (1)	 push away same (type of) charge	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	An explanation linking any **two** from charges are separated (1) possibility of a spark (1) ignite the fuel (1)	ignore ref to electric shock pd between plane and ground cause fire / explosion	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	An explanation linking **three** from Metals are (good) conductors (1) Electrons/(negative) charge can flow through wire (1) charge goes from/to the ground / earth (1) discharge the tank/aircraft/pipes (1)	 Reject flow of positive charge for this mark plane is earthed/grounded charge does not build up/dissipates Allow no pd between plane and ground so no spark possible for 2 marks	**(3)**

(Total for Question = 8 marks)

Q9.

Question Number	Answer	Acceptable answers	Mark
(a)	C (gain electrons)		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	An explanation linking • (Force of) attraction (1) • (plates have) opposite charge (to dust) (1)	Plates have a positive charge Ignore different charge	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	transferred to plate / lost (1)	neutral / become discharged	**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	An explanation linking any two of • Metal is a conductor (1) • Electrons / (negative) charge moves (through the plates/ wire) (1) • Towards the voltage supply / earth /ground (1)	Metal not an insulator Plates / charges are earthed	**(2)**

Question Number	Answer	Acceptable answers	Mark
(d)	Substitution: $Q = 1.2 \times 10^{-3} \times 40$ (1) Evaluation: 0.048 or 4.8×10^{-2} (1) C / coulombs (1)	Give 2 marks for correct answer with no working shown Unit mark is independent Allow for 1 mark 48 (with incorrect or no units) Allow for 2 marks 48 C Allow for all 3 marks 48 mC	**(3)**