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EDEXCEL GCSE PHYSICS: QUESTIONS BY TOPIC

Static Electricity (11)

GCSE Physics (Higher) Topic 11

7 questions · 60 marks · Mark schemes included

Pearson Edexcel GCSE (9-1) Physics 1PH0, Higher Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

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QUESTIONS

7 questions · 60 marks · lowest tariff first



6-MARK QUESTIONS

1 question in this booklet



1 This question is about static electricity and electric fields.

(a) Figure 1 shows three charged objects, X, Y and Z.



Figure 1

Y has a positive charge and is held stationary.
The charge on Y causes X and Z to move in the directions of the arrows.
Which row of the table is correct for the charges on X and Z?

(1)

	charge on X	charge on Z
☐ A	negative	negative
☐ B	negative	positive
☐ C	positive	negative
☐ D	positive	positive

(b) Give the meaning of the term **electric field**.

(1)

(c) Figure 2 shows the electric field around a point charge.

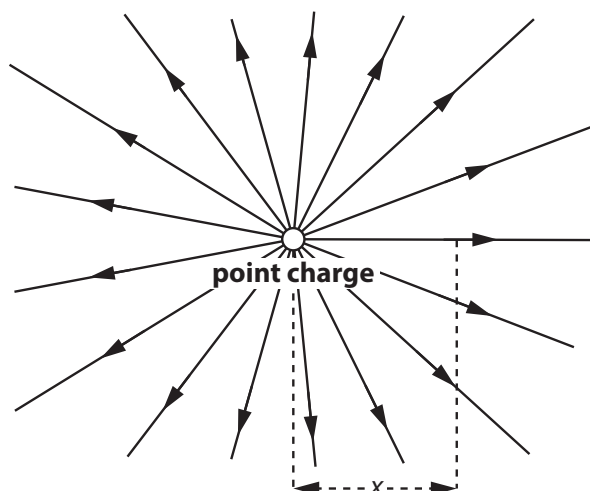


Figure 2

(i) State how Figure 2 gives evidence that the point charge is positive.

(1)

(ii) In Figure 2, x is the distance from the point charge.

State how Figure 2 gives evidence that the electric field strength decreases as x increases.

(1)

(iii) Figure 3 shows a graph of electric field strength against distance x .

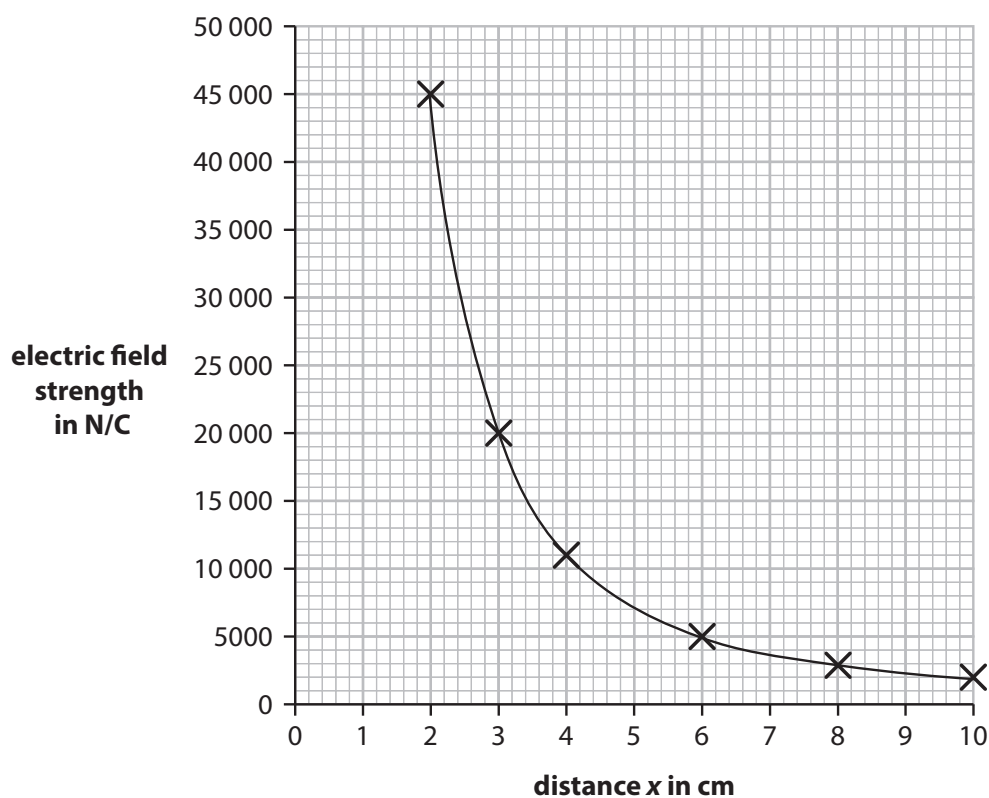


Figure 3

The equation relating electric field strength to distance, x , is

$$\text{electric field strength} = \frac{A}{x^2}$$

A is a constant.

Using data from the graph in Figure 3, calculate the value of A when $x = 3$ cm.

(2)

$A = \dots\dots\dots \text{N cm}^2/\text{C}$

(Total for Question 1 = 6 marks)



7-MARK QUESTIONS

3 questions in this booklet



1 (a) A student gives a plastic strip an overall electric charge.

- (i) Describe **one** way that the student can give the plastic strip an overall electric charge.

(1)

- (ii) Figure 1 shows a gold leaf electroscope that can be used to investigate static electricity.

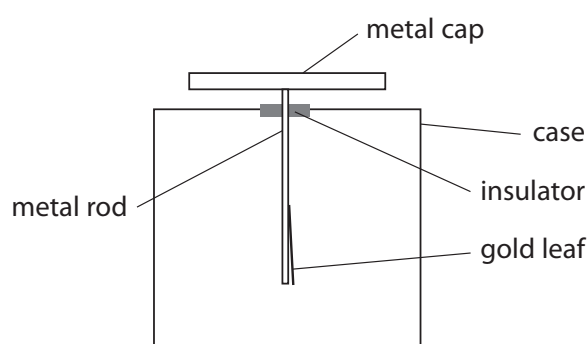


Figure 1

The electroscope has no overall charge.

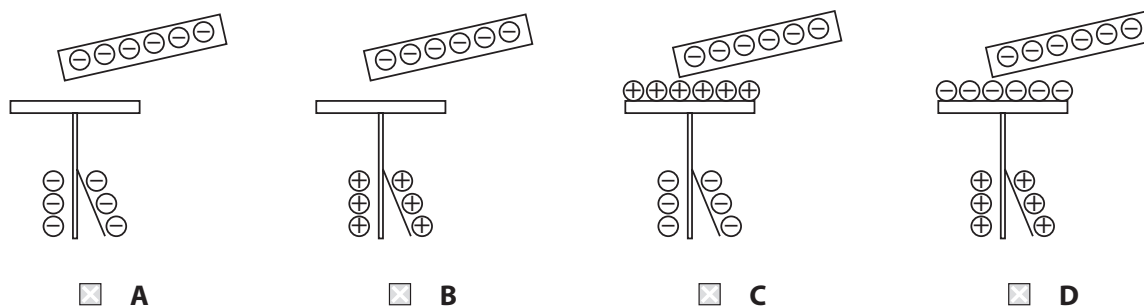
The gold leaf has a very small mass and can bend very easily.

The student brings a negatively charged plastic strip near to the cap of the electroscope.

The gold leaf bends away from the metal rod.

Which diagram shows the way that electric charge is now distributed?

(1)



- (b) Figure 2a shows another gold leaf electroscope that has been given an overall negative charge.

A student connects the metal cap of the charged electroscope to earth with a piece of wire as shown in Figure 2b.

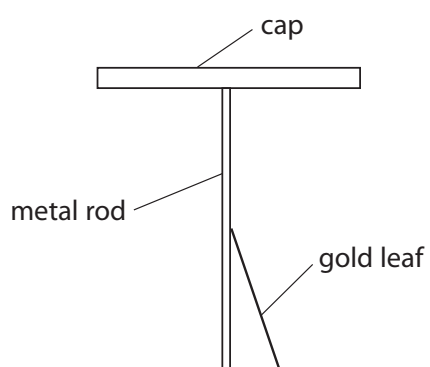


Figure 2a

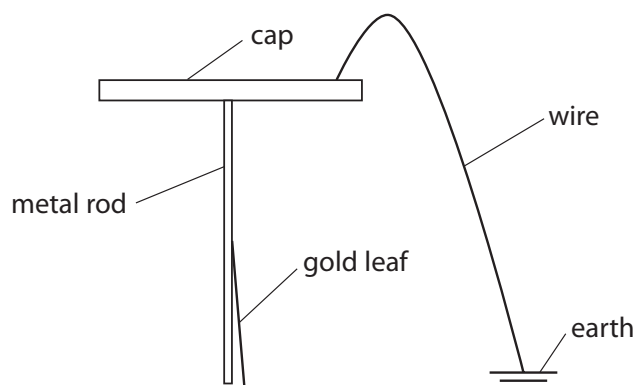


Figure 2b

Explain why the gold leaf has moved.

(2)

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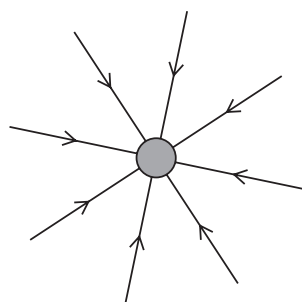
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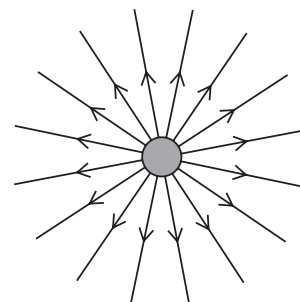
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(c) Two small objects, P and Q, are each given an electric charge.

Figure 3 represents the electric fields around the objects, P and Q.



object P



object Q

Figure 3

(i) Use information from Figure 3 to give **two** differences between the charge on P and the charge on Q.

(2)

1

2

(ii) Object P and object Q are held near to each other so that their electric fields interact with each other.

State the effect that the electric field of object Q has on object P.

(1)

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.....

(Total for Question 1 = 7 marks)

1 This question is about static electricity.

- (a) Draw on Figure 1 the shape and direction of the electric field due to the positive point charge.

(2)



Figure 1

- (b) A student rubs a plastic ruler against a woolly jumper.

The student tests the ruler and finds it has a positive charge.

Explain how the ruler becomes positively charged.

(2)

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(c) An insecticide sprayer charges droplets of insecticide.

Figure 2 shows the sprayer being used to spray a leaf.

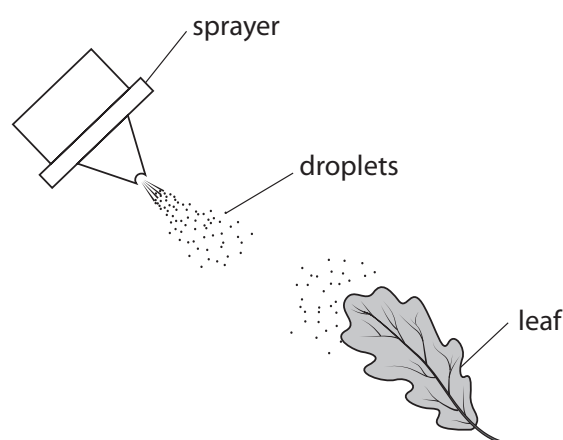


Figure 2

The leaf is connected to the ground (earthed).

Explain how charging the droplets helps to make sure that the leaf gets covered with insecticide.

You may add to Figure 2, including the sign (+ or –) of any charges, to help your answer.

(3)

(Total for Question 1 = 7 marks)

- 1 (a) Figure 1 shows a prize that is made from a metal star on a plastic base.

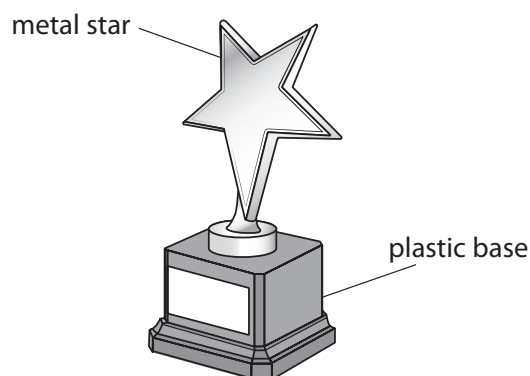


Figure 1

A person starts to clean the prize by rubbing the plastic base with a dry cloth.

The plastic base becomes positively charged and the cloth becomes negatively charged.

- (i) The plastic base has

(1)

- ☐ **A** gained electrons
- ☐ **B** gained protons
- ☐ **C** lost electrons
- ☐ **D** lost protons

- (ii) Explain why the cloth has become negatively charged.

(2)

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- (b) The person then holds the metal star and rubs it with the charged cloth.

The cloth loses its charge.

Explain why the cloth loses its charge.

(2)

- (c) The charged plastic base attracts some dust from the air.

Figure 2 shows a magnified view of part of the surface of the plastic base and a dust particle.

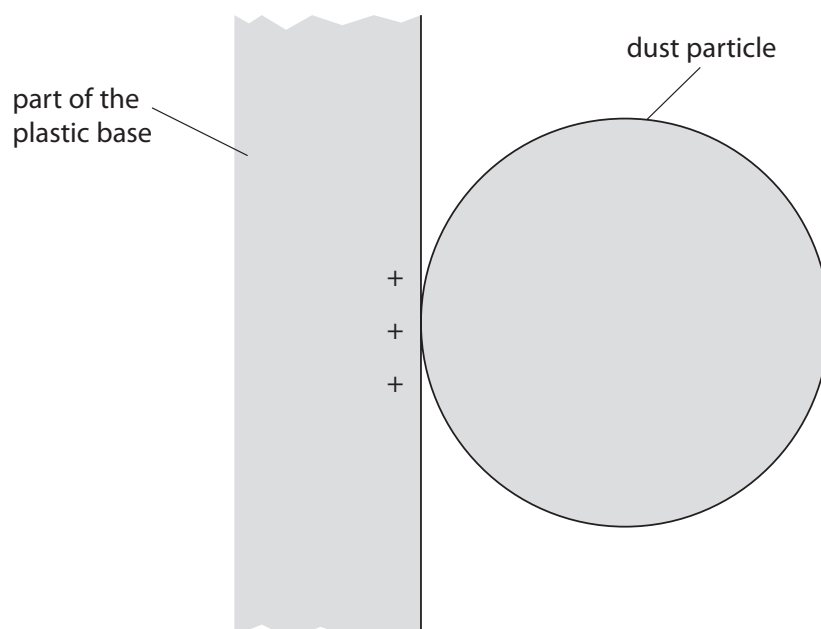


Figure 2

Some of the charges on the plastic base are shown but the charges induced on the dust particle are not shown.

Draw the charges induced on the dust particle in Figure 2.

(2)

(Total for Question 1 = 7 marks)

11-MARK QUESTIONS

3 questions in this booklet



- 4 (a) A student rubs a plastic comb with a dry cloth to give the comb a positive electric charge.

Figure 6 shows the charged plastic comb picking up small pieces of paper.



(Source © GIPhotoStock/SCIENCE PHOTO LIBRARY)

Figure 6

- (i) Explain how rubbing the comb with a dry cloth gives the comb a positive electric charge. (3)

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- (ii) Explain how the positively-charged plastic comb picks up the small pieces of paper. (3)

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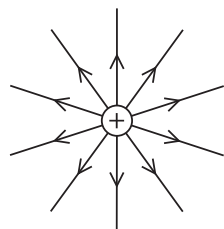
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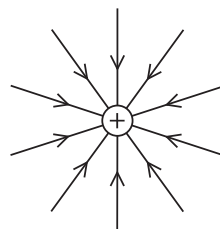
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(b) Which of these diagrams shows the shape and direction of the electric field around a positive point charge?

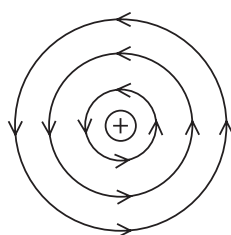
(1)



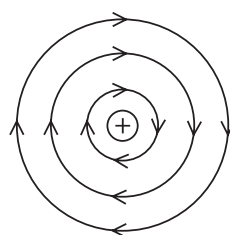
☐ A



☐ B



☐ C



☐ D

(c) Figure 7 shows two metal spheres.

Metal sphere A is fixed to a table.

Metal sphere B can be moved.

Metal sphere B is placed at a short distance from metal sphere A.

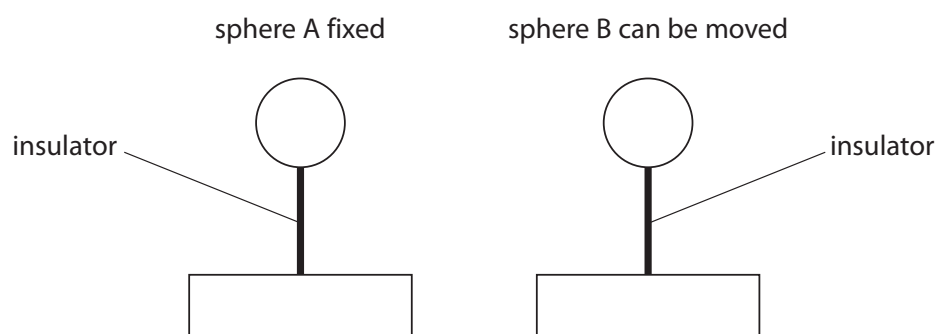


Figure 7

Both spheres are insulated from the table and given a negative charge.

The force between the charged spheres is measured.

(i) Explain, in terms of electric fields, why a force is exerted on sphere B.

(2)

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- (ii) Sphere B is moved and the force between the spheres is measured at several different distances.

Figure 8 is a graph of force on sphere B against distance between the centres of the spheres.

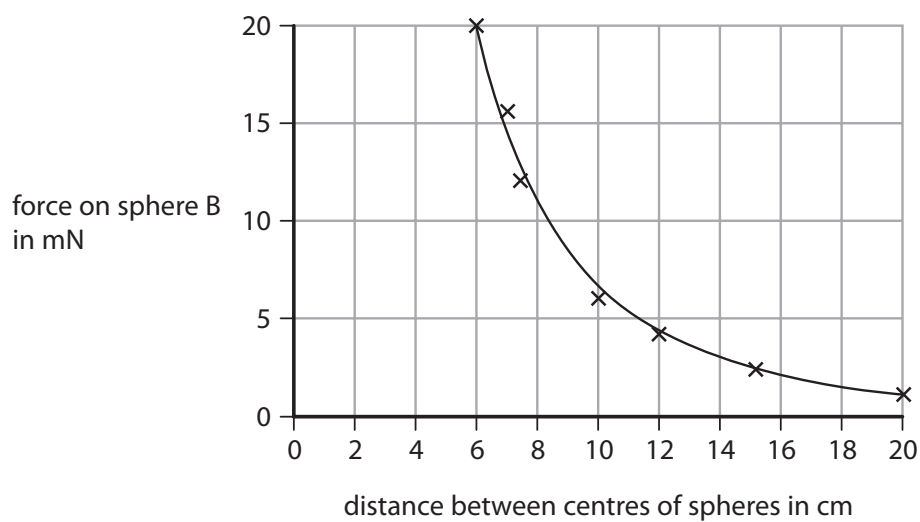


Figure 8

Describe how the force on sphere B varies with the distance between the centres of the spheres.

(2)

(Total for Question 4 = 11 marks)

4 This question is about static electricity.

(a) A student has a rubber balloon tied to a long piece of cotton thread.

The student gives the balloon an overall electrostatic charge.

(i) Describe **one** way that the student could give the balloon an overall electrostatic charge.

(2)

(ii) The student gives the balloon an overall negative charge.

Which of these sentences explains why the overall charge on the balloon is negative?

(1)

- ☐ A Negative charge has been removed from the balloon.
- ☐ B Negative charge has been added to the balloon.
- ☐ C Positive charge has been removed from the balloon.
- ☐ D Positive charge has been added to the balloon.

(iii) The student charges another balloon on a long thread.

Explain how the student can show that the two balloons have the same type of charge.

(3)



(b) Figure 9 shows a plastic block and a metal disc with an insulating handle.

The top surface of the plastic block has a negative charge.

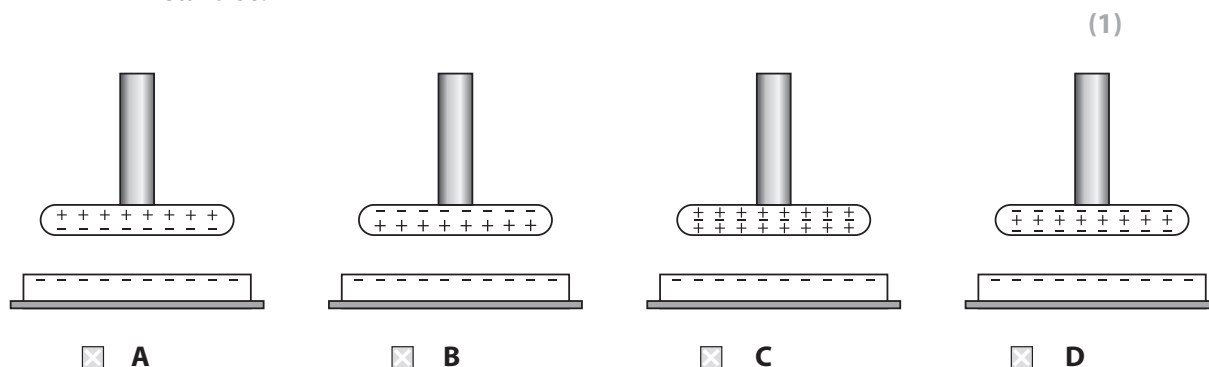
The metal disc has no overall electric charge.



Figure 9

A student uses the insulating handle to hold the metal disc above the plastic block.

(i) Which of these diagrams shows how the charge is distributed on the metal disc?



(ii) The student keeps holding the metal disc above the charged plastic block and taps the metal disc with a finger.

This earths the metal disc for a short time.

Explain why the disc now has an overall positive charge.

(2)

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(iii) Figure 10 shows the charges on part of the metal disc and the plastic block.

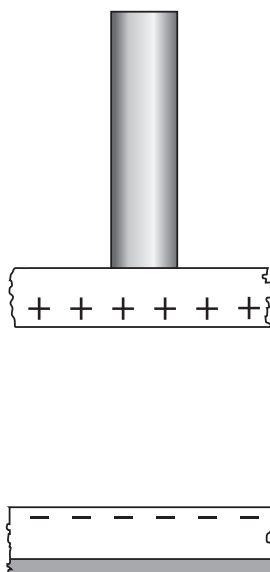


Figure 10

On Figure 10, draw lines to show the shape and direction of the electric field between the metal disc and the plastic block.

(2)

(Total for Question 4 = 11 marks)

- 4 (a) Figure 5 shows **two** metal plates.

The plates are charged by a very high voltage (potential difference).

Draw, on Figure 5, the shape and direction of the electric field between the two plates.

(2)

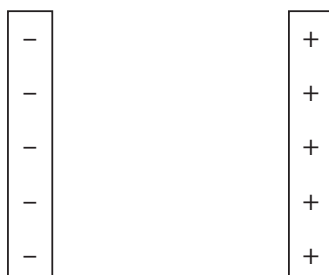


Figure 5

- (b) Figure 6 shows a device that removes small particles of soot from sooty air.

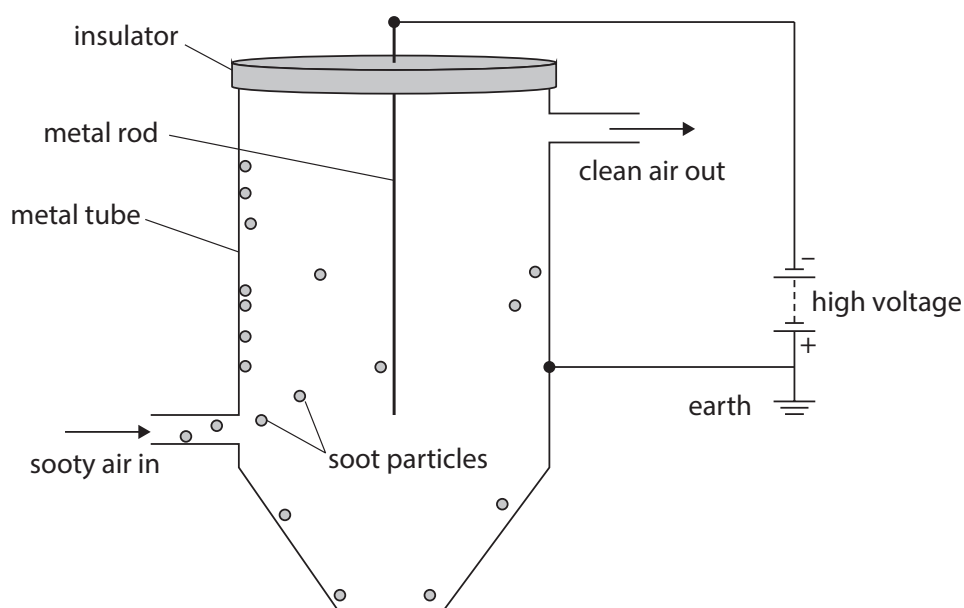


Figure 6

- (i) There is a large potential difference between the metal tube and the metal rod in the centre of the tube.

This large potential difference causes the soot particles to gain a negative charge as they pass between the rod and the tube.

The soot particles have

(1)

- ☐ A lost protons
- ☐ B lost electrons
- ☐ C gained protons
- ☐ D gained electrons

- (ii) Explain why, in Figure 6, the charged soot particles move towards the metal tube.

(2)

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.....

- (iii) When the soot particles reach the metal tube, the charge on them changes.

State how the charge on them changes.

(1)

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- (iv) The metal tube does not become charged when the soot particles reach it.

Explain why the metal tube does not become charged.

(2)

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(c) There is a current of 2.5 mA in a circuit.

Calculate the amount of charge that moves past a point in the circuit in 80 seconds.

State the unit of charge.

(3)

charge = ... unit

(Total for Question 4 = 11 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Mark
1(a)	B negative positive The only correct answer is B correlating with attraction of X to Y, and repulsion of Z from Y.	(1) A01.1

	Answer	Additional guidance	Mark
1(b)	(a region / place / area / volume) where (electric) charge experiences / feels a force (1)	(a region) where a charge experiences attraction / repulsion ignore 'electricity' accept where direction of force on a (positive) charge (is shown)	(1) A01.1

	Answer	Additional guidance	Mark
1(c) i	field lines / arrows point away from (positive) charge(s) (1)	field lines / arrows show the direction of force(s) on a positive charge accept (because) field lines / arrows point outwards ignore statements about charge flow / current	(1) A01.1

	Answer	Additional guidance	Mark
1(c) ii	field lines get further apart / diverge (as x increases) (1)	distance between field lines gets bigger concentration of lines gets smaller	(1) A02.1

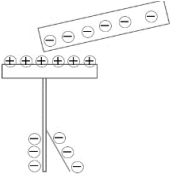
	Answer	Additional guidance	Mark
1(c)(iii)	rearrangement and substitution (1)		(2) A02.1

	A = 20 000 x 3 ² evaluation (1) 180 000 (N cm ² / C)	award full marks for the correct answer without working. 1.8 to any other power of 10 scores 1 mark	
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Question 1 total 6 marks



Question number	Answer	Additional guidance	Mark
1 (a) (i)	use friction (1)	rub (the plastic rod)	(1) AO1

Question number	Answer	Additional guidance	Mark
1 (a) (ii)	C  A and B are incorrect because the cap would become charged D is incorrect because the cap would have an opposite charge to that on the rod		(1) AO1

Question number	Answer	Additional guidance	Mark
1 (b)	An explanation linking: electrons move_(1) with one from: (leaf and/or rod) have been discharged (1) (gold leaf) is no longer repelled (1)	negative charges move reject positive electrons for this mark to the earth	(2) AO1

Question number	Answer	Additional guidance	Mark
1 (c) (i)	(size of) charge on Q is greater than (size of charge) on P (1) P has (overall) negative charge and Q has (overall) positive charge (1)	in any order Q has more charge / stronger field than P accept abbreviations such as +’ve, -’ve charge on P is opposite to charge on Q	(2) AO3

Question number	Answer	Additional guidance	Mark
1 (c) (ii)	(force of) attraction on (object) P from (object) Q (1)		(1) AO1

Total 7 marks

Question number	Answer	Additional guidance	Mark
8c(i)(F) 2(ai)(H)	A description including as the potential difference (voltage) increases so does the current (1) idea of gradient of graph decreasing as V increases (1)	positive correlation at a decreasing rate non-linear not directly proportional	(2) AO3

Question number	Answer	Additional guidance	Mark	
8(c)(ii)(F) 2(aii)(H)	Award one mark for each row of the table		(2) AO2	
		voltage in V		current in mA
	point P	1(.00)		20
	point Q	3.4 ±0.1		43 ±1

Question number	Answer	Additional guidance	Mark
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Question number	Answer	Additional guidance	Mark
1 (a)	at least three radial lines from the charge (1) direction shown away from the charge (1)	do not allow curved lines ignore circles without arrows consistently	(2) AO1.2

Question number	Answer	Additional guidance	Mark
1 (b)	an explanation linking any two from charged by friction (1) electrons / negative charges rubbed off ruler (1) woolly jumper becomes negative (1)	electrons / negative charges transfer to jumper ignore positive electrons / charges / particles	(2) AO2.1

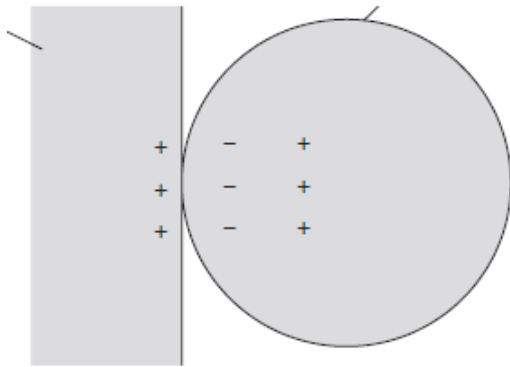
Question number	Answer	Additional guidance	Mark
1 (c)	an explanation including any three from: the leaf (becomes) charged (1) opposite to charge on droplets / spray (1) charges on leaf are induced (1) opposite charges attract (1) as a result of movement of electrons (between earth and leaf) (1) idea of spray reaching parts of the back of the leaf (1) charged droplets repel each other (having the same charge) (1)	accept marks scored on diagram ignore polarity for this marking point states charge opposite to what they have on the leaf ignore positive electrons / charges / particles allow all over	(3) AO1.1

Total 7 marks

Question number	Answer	Additional guidance	Mark
1(a)(i)	C lost electrons A is incorrect because it would give the base a negative charge B and D are incorrect because protons do not move in this situation.		(1) AO1

Question number	Answer	Additional guidance	Mark
1 (a) (ii)	any two from electrons have been transferred / moved (1) by friction (1)	cloth has gained electrons accept negative charge for electrons do not credit positive electrons / protons	(2) AO1

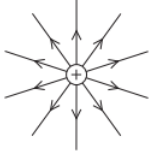
Question number	Answer	Additional guidance	Mark
1 (b)	An explanation linking two from electrons transferred (from the cloth) to the metal (1) metal is a conductor (1) electrons travel through person / to earth (1)	accept <u>negative charge</u> for electrons accept star for metal electrons move through metal (metal is) earthed / grounded	(2) AO1

Question number	Answer	Additional guidance	Mark
1 (c)	 at least one negative charge on left hand side of dust particle (1) at least one positive charge to the right of the negative charge(s) (1) net negative charge on left hand side / near to base (1) net positive charge to the right of the negative charge / further from base than negative charge (1)	ignore charges drawn on base	(2) AO1

Total 7 marks

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

Question Number	Answer	Mark
4(b)	A  The only correct answer is A <i>B is not correct because the arrows are in the wrong direction</i> <i>C is not correct because the field is not circular</i> <i>D is not correct because the field is not circular</i>	(1) AO 1 1

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

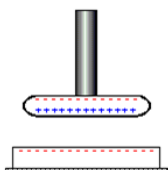
Question Number:	Answer	Additional Guidance	Mark
4(c)(ii)	a description to include: as the distance increases the force (on the sphere B) decreases (1) the greatest change is at smallest distances (1)	negative correlation non-linear gradient changes allow named non-linear functions such as exponential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

(Total for Question 4 = 11 marks)

Question number	Answer	Additional guidance	Mark
4 (a)(i)	rub (the balloon) (1) with a piece of cloth/hair/fur (1)	use friction allow on any insulated object	(2)

Question number	Answer	Additional guidance	Mark
4 (a)(ii)	B Negative charge has been added to the balloon A is incorrect removing negative charge would make the balloon positively charged. C and D are incorrect because positive charge cannot be moved		(1)

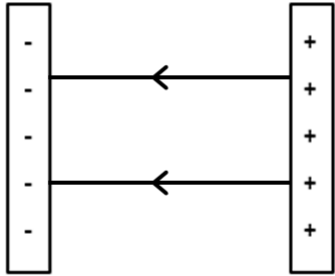
Question number	Answer	Additional guidance	Mark
4(a)(iii)	an explanation linking: method of handling balloons without discharging them (1) bring balloons near to each other (1) observation of repulsion (1)	hang balloons up by their strings they/balloons will push away (from each other)	(3)

Question number	Answer	Additional guidance	Mark
4 (b)(i)	B  A and D are incorrect because a negative charge cannot induce a negative charge C is incorrect because the disc is insulated so negative charge cannot be removed		(1)

Question number	Answer	Additional guidance	Mark
4 (b)(ii)	an explanation linking: <u>electrons</u> / <u>negative</u> charges move/ flow/transfer (1) from the metal disc / to the student / to earth/ground (1)	reject positive charge moving for first mark accept lose electrons	(2)

Question number	Answer	Additional guidance	Mark
4(b)(iii)	at least three straight lines joining disc and plastic (1) arrow(s) from disc towards plastic (1)	judge by eye ignore curved lines at edge do not award mark if there are arrows in both directions	(2)

Total marks for Question 4 = 11

Question number	Answer	Additional guidance	Mark
4 (a)	at least two horizontal straight lines between the two plates, judge by eye (1) arrows only from +ve towards -ve (1)	independent marks lines do not have to touch plates ignore curved lines at top and bottom of plate(s) example, scores 2 marks 	(2) AO1.1

Question number	Answer	Additional guidance	Mark
4(b)(i)	D gained electrons A and C are incorrect because protons are not exchanged in this context B is incorrect because it would give the particles a net positive charge		(1) AO1.1

Question number	Answer	Additional guidance	Mark
4(b)(ii)	an explanation linking any two from (soot particles are in an) electric field (1) AND EITHER attraction (1) (surface of) it/tube has (induced) <u>positive/opposite/unlike</u> charge (1) OR repulsion (1) rod (and soot particles) has a <u>negative/like/same</u> charge (1)		(2) AO1.1

Question number	Answer	Additional guidance	Mark
4(b)(iii)	(net charge) becomes zero (1)	discharged / charge is lost / charge moves on to the metal tube/ becomes neutral allow electrons for charge ignore becomes positively charged	(1) AO1

Question number	Answer	Additional guidance	Mark
4(b)(iv)	an explanation linking metal is a conductor (1) (connected to) earth/ground (1)	allow electrons for charge charge moves through the metal / tube / wire	(2) AO1

Question number	Answer	Additional guidance	Mark
4(c)	substitution into $Q = I \times t$ (1) ($Q =$) $2.5 \times 10^{-3} \times 80$ evaluation (1) ($Q =$) 0.2 unit (1) coulombs OR C OR As	allow 0.2 to any other power of ten for 1 mark award first two marks for correct answer without working independent mark allow c award 3 marks for 200 mC OR 200 mAs award 2 marks for 200 C OR 200 As	(3) AO2

Total for Question 4 = 11 marks

