

Maximum raw mark 60

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

• CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2006 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

	Mark Scheme Sylia	er_	_
	GCE A/AS Level – May/June 2006 9702	Pac	
m	Mark SchemeSylaGCE A/AS Level – May/June 20069702entripetal force is provided by gravitational force $v^2 / r = GMm / r^2$ ence $v = \sqrt{(GM / r)}$ $E_K (= \frac{1}{2}mv^2) = GMm / 2r$	AU	ido
(b) (i)	$E_{\rm K} (= \frac{1}{2}mv^2) = GMm / 2r$	B1	
(ii	i) $E_{\rm P} = -GMm / r$	B1	[1]
(ii	ii) $E_T = -GMm / r + GMm / 2r$ = - GMm / 2r.	C1 A1	[2]
(c) (i)	 if E_T decreases then - GMm / 2r becomes more negative or GMm / 2r becomes larger so r decreases 	M1 A1	[2]
(ii	i) $E_{\rm K} = GMm / 2r$ and <i>r</i> decreases so ($E_{\rm K}$ and) <i>v</i> increases	M1 A1	[2]
ide	g. fixed mass/ amount of gas eal gas any two, 1 each)	B2	[2]
(b) (i)	n = pV/RT = (2.5 × 10 ⁷ × 4.00 × 10 ⁴ x 10 ⁻⁶) / (8.31 × 290) = 415 mol	C1 C1 A1	[3]
(ii	i) volume of gas at 1.85×10^5 Pa = $(2.5 \times 10^7 \times 4.00 \times 10^4) / (1.85 \times 10^5)$ = 5.41×10^6 cm ³ so, $5.41 \times 10^6 = 4.00 \times 10^4 + 7.24 \times 10^3 N$ N = 741 (answer 740 or fails to allow for gas in cylinder, max 2/3)	C1 C1 A1	[3]
• • •	radient of graph is (a measure of) the sensitivity e gradient varies with temperature	M1 A1	[2]
T	040 ± 20 Ω corresponds to 15.0 ± 0.2 °C / K = <i>T</i> / °C + 273.15 (allow 273.2) emperature is 288.2 K	C1 C1 A1	[3]
(a) (i)	1.0	B1	[1]
(ii	i) 40 Hz	B1	[1]
(b) (i)) speed = $2\pi fa$ = $2\pi \times 40 \times 42 \times 10^{-3}$ = 10.6 m s ⁻¹	C1 A1	[2]
(;;	i) acceleration = $4\pi^2 f^2 a$	C1	[4]
(II)	$= (80\pi)^{2} \times 42 \times 10^{-3}$ = 2650 m s ⁻²	A1	[2]
(c) (i)	S marked correctly (on 'horizontal line through centre of wheel)	B1	

GCE A/AS Level – May/June 20069702(a) (i) force per unit positive charge (ratio idea essential)(ii) $E = Q / 4\pi\epsilon_0 r^2$ ϵ_0 being the permittivity of free spaceA1(b) (i) $2.0 \times 10^6 = Q / (4\pi \times 8.85 \times 10^{-12} \times 0.35^2)$ C1 $Q = 2.7 \times 10^5$ CA1(ii) $V = (2.7 \times 10^6) / (4\pi \times 8.85 \times 10^{-12} \times 0.35)$ C1 $= 7.0 \times 10^5$ VA1(c) electrons are stripped off the atoms electrons and positive ions move in opposite directions, (giving rise to a current)B1(a) (i) arrow B in correct direction (down the page)B1(ii) arrow F in correct direction (towards Y)B1(b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1(ii) direction opposite to that in (a)(ii)B1(ii) direction opposite to that in (a)(iii)B1(ii) uniform' distributionB1(a) 'uniform' distributionB1(b) (i) Bay eqed, more momentum $\lambda = h/p$ M1 so λ decreases and ring diameter decreases(a) arrow labelled E pointing down the pageB1(i)(i)B1(b) (i)Bay eq E forces are independent of mass and charge 'cancels'	3-	2	Mark Scheme Sylla	er er	
$Q = 2.7 \times 10^{-5} C$ A1[2](ii) $V = (2.7 \times 10^{-5}) / (4\pi \times 8.85 \times 10^{-12} \times 0.35)$ $= 7.0 \times 10^{5} V$ C1 A1[2](c) electrons are stripped off the atoms electrons and positive ions move in opposite directions, (giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1[2](a) (i) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of <i>I</i> and <i>d</i> mention of expression $F = BIL$ force between wires is small compared to weight of wireB1(a) 'uniform' distributionB1[1](b) (i) Bay eq E force set and ring diameter decreasesA1[3](a) arrow labelled E pointing down the pageB1[1](b) (i) Bay eq E forces are independent of mass and charge 'cancels' so no deviationM1 A1[3](ii) magnetic force > electric forceM1			GCE A/AS Level – May/June 2006 9702	Ba	
$Q = 2.7 \times 10^{-5} C$ A1[2](ii) $V = (2.7 \times 10^{-5}) / (4\pi \times 8.85 \times 10^{-12} \times 0.35)$ $= 7.0 \times 10^{5} V$ C1 A1[2](c) electrons are stripped off the atoms electrons and positive ions move in opposite directions, (giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1[2](a) (i) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of <i>I</i> and <i>d</i> mention of expression $F = BIL$ force between wires is small compared to weight of wireB1(a) 'uniform' distributionB1[1](b) (i) Bay eq E force set and ring diameter decreasesA1[3](a) arrow labelled E pointing down the pageB1[1](b) (i) Bay eq E forces are independent of mass and charge 'cancels' so no deviationM1 A1[3](ii) magnetic force > electric forceM1	(a)	(i)	force per unit positive charge (ratio idea essential)	ann	i.
$Q = 2.7 \times 10^{-5} C$ A1[2](ii) $V = (2.7 \times 10^{-5}) / (4\pi \times 8.85 \times 10^{-12} \times 0.35)$ $= 7.0 \times 10^{5} V$ C1 A1[2](c) electrons are stripped off the atoms electrons and positive ions move in opposite directions, (giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1[2](a) (i) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of <i>I</i> and <i>d</i> mention of expression $F = BIL$ force between wires is small compared to weight of wireB1(a) 'uniform' distributionB1[1](b) (i) Bapy = qE no λ decreases and ring diameter decreasesA1[3](a) arrow labelled E pointing down the pageB1[1](b) (i) Bapy = qE forces are independent of mass and charge 'cancels' so no deviationM1 A1[3](ii) magnetic force > electric forceM1		(ii)	$E = Q / 4\pi \epsilon_0 t^2$ ϵ_0 being the permittivity of free space	MI A1	dge.c
$= 7.0 \times 10^6$ VA1[2](c) electrons are stripped off the atoms electrons and positive ions move in opposite directions, (giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1[2](a) (i) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of <i>I</i> and <i>d</i> mention of expression $F = B/L$ force between wires is small compared to weight of wireB1(a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum 	(b)	(i)	$2.0 \times 10^{6} = Q / (4\pi \times 8.85 \times 10^{-12} \times 0.35^{2})$ $Q = 2.7 \times 10^{-5} \text{ C}$		[2]
i electrons and positive ions move in opposite directions, (giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1[2](ii) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of / and d mention of expression $F = BIL$ 		(ii)	$V = (2.7 \times 10^{-5}) / (4\pi \times 8.85 \times 10^{-12} \times 0.35) = 7.0 \times 10^5 \text{ V}$		[2]
(giving rise to a current)B1[2](a) (i) arrow B in correct direction (down the page)B1(ii) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of / and d mention of expression $F = B/L$ force between wires is small compared to weight of wireB1[1](a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1(a) arrow labelled E pointing down the pageB1[1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels' so no deviationM1 M1 A1(ii) magnetic force > electric forceM1	(c)		••	B1	
(ii) arrow F in correct direction (towards Y)B1[2](b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of I and d mention of expression $F = BIL$ force between wires is small compared to weight of wireB1[1](a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 A1(a) arrow labelled E pointing down the pageB1[1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels' so no deviationM1 A1(ii) magnetic force > electric forceM1			•	B1	[2]
(b) (i) When two bodies interact, force on one body is equal but opposite in direction to force on the other body.B1 [1](ii) direction opposite to that in (a)(ii)B1 [1](c) suggested reasonable values of I and d mention of expression $F = BIL$ force between wires is small compared to weight of wireB1 B1 [1](a) 'uniform' distributionB1 [1](b) concentric ringsB1 [1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1 M1 M1 so no deviation(a) arrow labelled E pointing down the pageB1 [1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels' so no deviationM1 <b< td=""><td>(a)</td><td>(i)</td><td>arrow B in correct direction (down the page)</td><td>B1</td><td></td></b<>	(a)	(i)	arrow B in correct direction (down the page)	B1	
direction to force on the other body.B1[1](ii) direction opposite to that in (a)(ii)B1[1](c) suggested reasonable values of I and d mention of expression $F = B/L$ force between wires is small compared to weight of wireB1(a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1<		(ii)	arrow F in correct direction (towards Y)	B1	[2]
(c)suggested reasonable values of <i>I</i> and <i>d</i> mention of expression $F = BIL$ force between wires is small compared to weight of wireB1 M1 A1[4](a)'uniform' distributionB1[1](b)concentric ringsB1[1](c)higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1 M1 M1 so λ decreases and ring diameter decreasesM1 M1 M1 M1 M1 M1 M1 So λ decreases and ring diameter decreasesM1 M1<	(b)	(i)		B1	[1]
mention of expression $F = BIL$ force between wires is small compared to weight of wireB1 M1 A1[4](a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1 M1 M1 M1 so λ decreases and ring diameter decreasesM1 <td></td> <td>(ii)</td> <td>direction opposite to that in (a)(ii)</td> <td>B1</td> <td>[1]</td>		(ii)	direction opposite to that in (a)(ii)	B1	[1]
(a) 'uniform' distributionB1[1](b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1 	(c)	mer forc	ition of expression <i>F</i> = <i>BIL</i> e between wires is small	B1 M1	[4]
(b) concentric ringsB1[1](c) higher speed, more momentum $\lambda = h/p$ so λ decreases and ring diameter decreasesM1 M1 M1 A1(a) arrow labelled E pointing down the pageB1[1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels'M1 M1 A1[3](ii) magnetic force > electric forceM1	(a)				
$\lambda = h/p$ M1so λ decreases and ring diameter decreasesA1[3](a) arrow labelled E pointing down the pageB1[1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels'M1 M1 A1[3](ii) magnetic force > electric forceM1	()				[1]
(a) arrow labelled E pointing down the pageB1[1](b) (i) $Bqv = qE$ forces are independent of mass and charge 'cancels'M1 M1 A1[3](ii) magnetic force > electric forceM1	(c)	$\lambda =$	h/p	M1	503
(b) (i) $Bqv = qE$ M1forces are independent of mass and charge 'cancels'M1so no deviationA1(ii) magnetic force > electric forceM1					
forces are independent of mass and charge 'cancels'M1so no deviationA1(ii) magnetic force > electric forceM1	(a)	arro	w labelled E pointing down the page	B1	[1]
	(b)	(i)	forces are independent of mass and charge 'cancels'	M1	[3]
		(ii)			