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## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level and GCE Advanced Subsidiary Level

## MARK SCHEME for the May/June 2006 question paper

## 9702 PHYSICS

9702/04

Paper 4

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*.

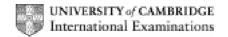
All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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.



-	ı age		GCE A/AS Level – May/June 2006	9702	04	_
1	(a)	cer	atripetal force is provided by gravitational force	3102	B1	_
	` ,	<i>mv</i> her	B1 A0	[2]		
	(b)	(i)	$E_{\rm K} (= \frac{1}{2}mv^2) = GMm / 2r$		B1	[1]
		(ii)	$E_{P} = -GMm/r$		B1	[1]
		(iii)	$E_T = -GMm / r + GMm / 2r$ $= -GMm / 2r.$		C1 A1	[2]
	(c)	(i)	if $E_{\rm T}$ decreases then - $GMm$ / $2r$ becomes more negative or $GMm$ / $2r$ becomes larger so $r$ decreases		M1 A1	[2]
		(ii)	$E_{\rm K}$ = $GMm$ / $2r$ and $r$ decreases so ( $E_{\rm K}$ and) $v$ increases		M1 A1	[2]
2	(a)	_	. fixed mass/ amount of gas al gas			
			y two, 1 each)		B2	[2]
	(b)	(i)	$n = pV / RT$ = $(2.5 \times 10^7 \times 4.00 \times 10^4 \times 10^{-6}) / (8.31 \times 290)$ = 415 mol		C1 C1 A1	[3]
		(ii)	volume of gas at $1.85 \times 10^5$ Pa = $(2.5 \times 10^7 \times 4.00 \times 10^4)$ / $(1.8 = 5.41 \times 10^6 \text{ cm}^3$ 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)	5 × 10 <sup>5</sup> )	C1 C1 A1	[3]
3	(a)		dient of graph is (a measure of) the sensitivity gradient varies with temperature		M1 A1	[2]
	(b)	T/	$60 \pm 20~\Omega$ corresponds to 15.0 $\pm$ 0.2 °C K = $T$ / °C + 273.15 (allow 273.2) uperature is 288.2 K		C1 C1 A1	[3]
4	(a)	(i)	1.0		В1	[1]
		(ii)	40 Hz		B1	[1]
	(b)	(i)	speed = $2\pi fa$ = $2\pi \times 40 \times 42 \times 10^{-3}$		C1	
			= $10.6 \text{ m s}^{-1}$		A1	[2]
		(ii)	acceleration = $4\pi^2 f^2 a$ = $(80\pi)^2 \times 42 \times 10^{-3}$		C1	
			= $2650 \text{ m s}^{-2}$		A1	[2]
	(c)	(i)	S marked correctly (on 'horizontal line through centre of wheel)		B1	
		(ii)	A marked correctly (on 'vertical line' through centre of wheel)		B1	[2]

Mark Scheme

Syllabus

Paper

Page 1

	Page 2		Mark Scheme		Paper	
			GCE A/AS Level – May/June 2006	9702	04	
5	(a)	(i)	force per unit positive charge (ratio idea essential)		B1	[1]
		(ii)	$E = Q / 4\pi \varepsilon_0 r^2$ $\varepsilon_0$ being the permittivity of free space		M1 A1	[2]
	(b)	(i)	$2.0 \times 10^6 = Q / (4\pi \times 8.85 \times 10^{-12} \times 0.35^2)$ $Q = 2.7 \times 10^{-5} \text{ C}$		C1 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,			B1	
		(giving rise to a current)		B1	[2]	
6	(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 oppositive of the other body.	site in	B1	[1]
		(ii)	direction opposite to that in (a)(ii)		B1	[1]
	(c)	sug me ford con		B1 B1 M1 A1	[4]	
7	(a)	ʻuni	form' distribution		B1	[1]
	(b)	) concentric rings			B1	[1]
	(c)	higher speed, more momentum $\lambda = h/p$ so $\lambda$ decreases and ring diameter decreases				[3]
8	(a)	arro	arrow labelled E pointing down the page		B1	[1]
	(b)	(i)	Bqv = qE forces are independent of mass and charge 'cancels' so no deviation		M1 M1 A1	[3]
		(ii)	magnetic force > electric force so deflects 'downwards'		M1 M1 A1	[3]