Deformation of Solids

Mark Scheme 7

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Deformation of Solids
Sub Topic	
Paper Type	Theory
Booklet	Mark Scheme 7

Time Allowed: **33 minutes**

Score: **/27**

Percentage: **/100**

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 (a) (i) stress = ***F I A*** C1
= 25 *I* (1.7 x 10-
= 1.47 x 10^7 Pa .....(do not allow 1 sig fig) A1

(ii) stress = E x strain C1
1.47 x 10^7 = 7.1 x 10^{10} x **(Af / 1.8)**
Af = 0.37 mm .....;..... A1 [4]

(b) ***R*** = ***JJIIA*** OR ***RocL*** C1
so, ***ARIR*** = Af***I l*** C1
M = (3.7 x 10^{-4} 1 1.8) x o.o3 = 6.2 x 10-^{6} n ..... A1 [3]

May calculate ***p*** = 2.833 ... x 10^{-8} nm
giving new ***Ras*** 3.0006167 x 10^{-2} Q
hence M - full credit possible

However, if rounds off ***p*** as 2.83 x 10^{-8} n m,
then R_{new} < Rold!
Allow 1 mark only for R ∝ L

CHEMISTRY ONLINE
— TUITION —

2	**(a**	ampere	B1	
		kelvin	B1	[2]
		(allow mole and candela)		
	(b) **(i)**	stress: N m^{-2}	C1	
		$kg\,m\,s^{-2}/m^2 = kg\,m^{-1}\,s^{-2}$	A1	[2]
	(ii)	Young modulus = stress / strain and <u>strain has no units</u>		
		hence units: $kg\,m^{-1}\,s^{-2}$	B1	[1]
3	**(a**	current, mass and temperature		
		two correct 2/2, one omission or error 1/2	A2	[2]
	(b)	σ: no units, V: m^3	C1	
		E_P: $kg\,m^2\,s^{-2}$	C1	
		C: $kg\,m^2\,s^{-2} \times m^{-3} = kg\,m^{-1}\,s^{-2}$	A1	[3]
4		$= \rho L / A$	B1	
	(ii)	strain = $\Delta L / L$	B1	
		either $\Delta R = \rho \Delta L / A$ *or* $R \propto L$ with ρ and A constant	B1	
		dividing, $\Delta R / R = \Delta L / L$	A0	[3]
	(b)	Young modulus = stress / strain	C1	
		strain $= 72.0 / (1.20 \times 10^{-7} \times 2.10 \times 10^{11})$	C1	
		$= 2.86 \times 10^{-3}$ (*allow 1/350*	A1	
		$\Delta R = 2.86 \times 10^{-3} \times 4.17 = 1.19 \times 10^{-2}\ \Omega$	A1	
		answer given to 3 sig. fig	B1	[5]

1 **(a)** **(i)** angle subtended at centre of circle B1
arc equal in length to the radius ..... B1 [2]

(ii) arc = $r\theta$ and for one revolution, arc = $2\pi r$ M1
so, $\theta = 2\pi r/r = 2\pi$ ..... A0 [1]

(b) **(i)** *either* weight provides/equals the centripetal force
or acceleration of free fall is centripetal acceleration B1
$9.8 = 0.13 \times \omega^2$ M1
$\omega = 8.7$ rad s^{-1} ..... A0 [2]

(ii) force in cord = weight + centripetal force (*can be an equation*) C1
force in cord = $(L - 13) \times 5/1.8$ *or* force constant = 5.0/1.8 ..... C1
$(L - 13) \times 5/1.8 = 5.0 + 5/9.8 \times L \times 10^{-2} \times 8.7^2$ C1
$L = 17.2$ cm ..... A1 [4]
(*constant centripetal force of 5.0 N gives L = 16.6 cm allow 2/4*)

CHEMISTRY ONLINE
— TUITION —