

Additional Applied Science A

General Certificate of Secondary Education

Unit **A336/02**: Materials and Performance (Higher Tier)

Mark Scheme for January 2011

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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 should be read in conjunction with the published question papers and the Report on the Examination.

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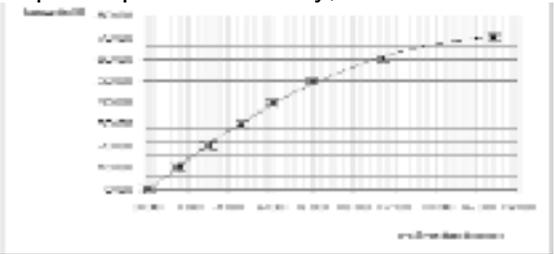
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- 1 Abbreviations, annotations and conventions used in the detailed mark scheme:
- / = alternative and acceptable answers for the same marking point
 - (1) = separates marking points
 - not/reject** = answers which are not worthy of credit
 - ignore** = statements which are irrelevant - applies to neutral answers
 - allow/accept** = answers that can be accepted
 - (words) = words which are not essential to gain credit
 - words = underlined words must be present in answer to score a mark
 - ecf = error carried forward
 - AW/owtte = alternative wording
 - ORA = or reverse argument

Question		Expected Answers	Marks	Additional Guidance
1	(a)	<p>clear indication of: method of applying pure tension;</p> <p>how known force is applied;</p> <p>measure force which causes sample to snap;</p>	[3]	<p>cantilevers, beams or compression tests can only score on the last two marks</p> <p>allow adding known weights</p> <p>allow add weights until it breaks but only allow this mark if it is a sensible method eg no mark for dropping weights onto sample until it breaks</p> <p>reject measurements of length, time, pressure</p>
	(b)	strong in tension;	[1]	<p>needs both for the mark</p> <p>not stiff</p>
	(c)	<p>named composite material;</p> <p>use of material;</p>	[2]	<p>eg (reinforced) concrete (1) for paths/bridges etc (1)</p> <p>woodchip in resin (1) for kitchen units (1)</p> <p>allow bone/wood</p> <p>reject Fibre glass/alloys/cement</p> <p>must name a valid composite to achieve mark for use</p>
	(d)	diagram clearly showing one material embedded in another;	[1]	must be material in c(i) and diagram must be labelled
Total			[7]	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	<p>upright;</p> <p>virtual;</p>	[2]	<p>allow right way up</p> <p>reject not inverted and not real/fake/imaginary</p> <p>size is neutral</p>
	(b)	<p>valid example of specialised glass and use;</p> <p>valid reason;</p>	[2]	<p>eg toughened glass in windows (1); so people don't fall through/not cut by broken glass (1)</p> <p>photochromic glass in spectacles/glasses (1); to protect the eyes/adjust light intensity (1)</p> <p>reject reference to lamps</p>
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	metal wires have high (thermal) conductance & wooden seat has low (thermal) conductance; (1) so heat moves into metal/away from hand/does not move into the wood; (1)	[2]	comparison of (thermal) conductance (1) effect on flow of heat (1)
	(b)	strong;	[1]	must be mechanical property reject shiny, good conductors, stiff, rust proof
	(c)	plastic;	[1]	
(d)	(i)	all points plotted correctly;  smooth curve through points;	[1] [1]	 reject dot-to-dot
	(ii)	for larger forces wire behaves plastically/ does not go back to original shape when force is removed; OR for smaller forces wire behaves elastically/ goes back to original shape when force is removed;	[1]	allow reaches elastic limit
Total			[7]	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	Two materials named with situation in which they are used; named mechanical property(ies) which match; reason why property(ies) should match;	[3]	answers which do not refer to mechanical properties reject other replacement joints and limbs
	(b) (i)	improved hardness/corrosion resistance/ lower melting point;	[1]	allow other valid properties reject strength
	(ii)	the added atoms are dispersed throughout the metal;	[1]	
Total			[5]	

Question		Expected Answers	Marks	Additional Guidance																									
5	(a)	(change in) momentum;	[1]																										
	(b)	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>decreases</th> <th>increases</th> <th>stays the same</th> <th>may increase or decrease</th> </tr> </thead> <tbody> <tr> <td>time</td> <td></td> <td>(✓)</td> <td></td> <td></td> </tr> <tr> <td>force</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>area</td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>height</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		decreases	increases	stays the same	may increase or decrease	time		(✓)			force	✓				area			✓		height	✓				[3]	ignore first row one mark for each correct row
	decreases	increases	stays the same	may increase or decrease																									
time		(✓)																											
force	✓																												
area			✓																										
height	✓																												
	(c)	correct substitution for $t=0.1\text{s}$, $m=0.5\text{kg}$, $u=15\text{m/s}$, $v=0\text{m/s}$ OR manipulation of formula; correct evaluation; Newtons;	[3]	75N scores 3 marks 75 scores 2 marks evidence of dividing by 0.1 OR of (0.5×15) scores 1 mark																									
Total			[7]																										

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	poor (electrical) conductance/ good insulator; stiff/ strong/ tough/low density;	[2]	allow corrosion resistant
		(ii)	ceramic ;	[1]	allow polymer, glass
	(b)		ammeter in series with sample and power supply;(1) voltmeter in parallel with sample;(1) divide current/amps by voltage/volts;(1) OR multimeter set to measure resistance;(1) alone across sample;(1) divide 1 by resistance value;(1)	[3]	accept words, numbers or symbols if meaning is clear. reject simple statement of $G=I/V$ alone
			Total	[6]	
			Paper Total	[36]	

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