

Additional Applied Science A

General Certificate of Secondary Education **A336/02**

Unit 6: Materials and Performance (Higher Tier)

Mark Scheme for June 2010

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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.

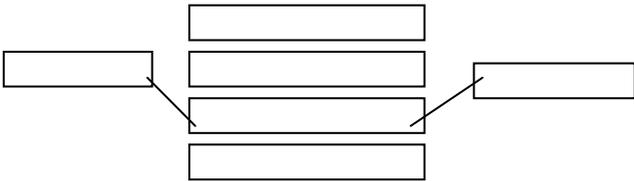
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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question			Expected Answer	Mark	Rationale/Additional Guidance
1	a	i	mass; velocity	[2]	reject weight allow speed/ how fast is going allow Force and time (2 marks) but either alone = 0 e.g. mass and time = 1 only for mass reject units alone
	a	ii	proportional to 	[1]	allow indication of 'proportional to'
	b		mechanical property; how property aids safety;	[2]	no mark for identifying device reject references to optical properties
				[5]	

Question		Expected Answer	Mark	Rationale/Additional Guidance	
2	a	<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">an alloy is...</div> <div style="border: 1px solid black; width: 200px; height: 20px; margin: 5px 0;"></div> <div style="border: 1px solid black; width: 200px; height: 20px; margin: 5px 0;"></div> <div style="border: 1px solid black; width: 200px; height: 20px; margin: 5px 0; position: relative;">a solid solution of elements in a metal </div> <div style="border: 1px solid black; width: 200px; height: 20px; margin: 5px 0;"></div>	[1]		
	b	<p>hard(er); less easily scratched/blunted/ easier to clean; strong(er); because large force on them; shiny; nice appearance tough; does not break/ stays sharp/ does not snap stiff; does not bend <u>lower</u> thermal conductance; does not get hot durable; lasts longer</p>	[2]	<p>allow less brittle; will not snap as easily reject rusts, cost or density or malleable reject if another metal is listed under property as this infers replacing the metal (0 marks)</p>	
	c	<p>make it thicker/ wider prongs / shorter blade or prongs improve shape; change composition/ type of stainless steel</p> <p>use an improved processing method for steel;</p> <p>make into composite</p>	[1]	<p>allow ridges but reject change shape allow add a different metal reject use a different metal / change the material allow any type of heat treatment / mechanical processing allow adding plastic handles</p>	
	d	i	<p>link between heating and an indication of what expansion means: a quantitative method to measure expansion: a method applicable for small measurements of expansion</p>	<p>[1] (1) (1)</p>	<p>can be in words or diagram e.g. ruler or scale for pointer e.g. Vernier / micrometer/ pin and pointer mechanism bimetallic strip being heated worth 1 max</p>
	d	ii	<p>increase in temperature can lead to material becoming: less dense / more flexible / weaker / softer / less brittle / more plastic</p>	[1]	<p>reject melting reject material can bend</p>
Total			[8]		

Question			Expected Answer	Mark	Rationale/Additional Guidance
3	a	i	frequency	[1]	
	a	ii	2000 (Hz)/ 2k (Hz);	[1]	allow 1500-2500 (Hz)
	a	iii	amplitude / power ; (1) frequency / pitch; (1)	[2]	allow descriptions of vibrations or pressure changes in text or diagram reject intensity, volume, Hz
	b		C	[1]	
	c		lower pitched sounds penetrate walls more easily or are less easily absorbed/blocked by walls/furnishings etc in band room	[1]	allow converse answers in terms of high frequency reject travel further reject any reference to Beth's hearing
			Total	[6]	

4	a		500/200; (1) 2.5; (1)	[2]	'500 = 200 x extension' gets 1 mark
	b		evidence of 600N identified from graph, e.g. by use in a calculation or by drawing on graph (1) 450 J; (1)	[2]	reject 1.5 x 400 = 600 allow counting squares (1) to get 450 J (1)
	c		in terms of mechanical properties: a device with 2 valid and complementary materials or components stated; (1) material 1 with property 1; (1) material 2 with property 2; (1)	[3]	answer must involve mechanical properties (which can be implied) of 2 materials or components for any marks to be awarded. answers involving only 1 material/component get no marks. reject non-mechanical properties allow composite materials instead of devices
			Total	[7]	

Question			Expected Answer	Mark	Rationale/Additional Guidance
5	a	i	refractive index	[1]	allow refraction, refractive
	a	ii	different materials; (1) with different refractive indices (1) or value of refractive index is higher for thin lenses (2)	[2]	
	b	i	for low absorption / high transmission (of light) signal transmitted over long distance; signal must be strong enough / not too weak at destination	[1]	reject faster signal
	b	ii	relevant mechanical property + reason (1)	[1]	allow ductile, flexible, tough, strong, low density
	c		Any 3 from: gas permeable – to allow oxygen/gas to the cornea/eye; easily sterilised – to prevent eye infection; stick to tears – so stay in place on eye; soft – for comfort / reduce irritation; hard – so don't scratch easily durable – so they do not have to be replaced too often	[3]	allow other valid reasons allow comments that evidently relate specifically to hard or soft contact lenses reject transparent reject soft – so do not scratch/damage the eye
	d	i	lens becomes thicker / stronger or shorter focal length / higher power	[1]	allow action of ciliary muscles
	d	ii	becomes larger; moves beyond focal length	[1]	
			Total	[10]	
			Paper Total	[36]	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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