

**Additional Applied Science A
Twenty First Century**

General Certificate of Secondary Education **J632**

Mark Scheme for the Units

January 2009

J632/MS/R/09J

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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 marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Guidance for Examiners

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Each separate marking point is indicated by (1) at the end of that marking point.
4. Abbreviations, annotations and conventions used in the detailed Mark Scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
allow	=	answers that can be accepted
()	=	words which are not essential to gain credit
—	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW / owtte	=	alternative wording
ora	=	or reverse argument

e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. Annotations: the following annotations are available on SCORIS.

✓	=	correct response
✗	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt not given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. The list principle: if a list of responses greater than the number requested is given, you work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, i.e. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.
8. Marking method for tick boxes:
If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

e.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out). For a two-mark question, the rationale would be:

All boxes are indicated scores 0 marks.

All boxes blank scores 0 marks.

All four boxes correct scores 2 marks.

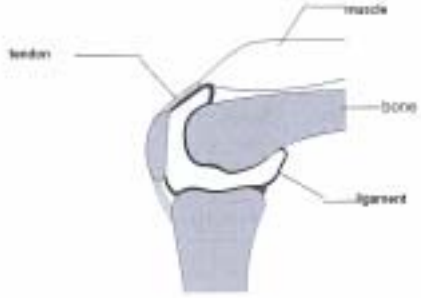
Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

A324/01 Foundation

Question		Grade	Expected Answers	Marks	Rationale
1	(a)		(A) D; C; B;	3	
	(b)		any three from: alcohol consumption; smoking habit; family medical history/genetic problems; personal medical history/treatments; current medication; level of fitness; diet	3	Ignore things which are measured - eg weight, mass, height, BMI, age Ignore employment issues Allergy is an example of personal medical history
			Total	6	

Question		Grade	Expected Answers	Marks	Rationale
2	(a)		temperature receptors in skin; increased blood flow to skin; skin flushed / red; sweating; evaporation causes cooling; hairs lie flat/stay low;	3	Accept: vasodilation or description of it; ignore: blood vessels moving Accept: heat loss via radiation / conduction to the air;
	(b)			2	Any two or three correct = 2 marks One correct = 1 mark
Total				5	

Question			Grade	Expected Answers	Marks	Rationale
3	(a)	(i)		10 (mm)	1	allow +/- 1 mm Accept 1cm if units explicitly stated
		(ii)		10 (mm)	1	ecf if answer from 3ai has been subtracted from a larger value Accept: "twice"
	(b)			capillary vein artery	2	3 correct = 2 marks 2 correct = 1 mark
	(c)	(i)		ECG / electrocardiogram/electrocardiograph	1	Accept: Heart (rate) monitor
		(ii)		to ensure correct medication given; so information can be <u>used</u> in future (e.g. shift change or different specialist); legal record;	2	Accept:: patient progress to be checked/monitored;
	(d)			Dietician/nutritionist; to provide idea of a low fat diet; social worker/counsellor/psychiatrist; helps with practical, emotional and financial problems once discharged; GP/doctor/Nurse/cardiologist; monitoring progress, administering medication etc.; occupational therapist; works with them to overcome physical or psychological problems because of their illness; physiotherapist; idea of a suitable exercise regime to reduce further risks of heart problems;	4	One mark for name, one mark for description to max 4 Ignore: Fitness coach or instructor
				Total	11	

Question		Grade	Expected Answers	Marks	Rationale
4	(a)		advantage: quick/easy/simple to use; disadvantage: not precise/fully quantitative; colours may not match those on the chart	2	Ignore: references to cost Ignore: accurate/correct/incorrect Ignore: Unreliable/correct/incorrect
	(b)		nitrite; (1) presence of bacteria (1)	2	One mark for the chemical; one mark for the condition; allow: hCG/hormone and pregnancy; glucose/sugar and diabetes; protein and kidney damage, urinary/bladder infection protein and high blood pressure; blood and kidney stones Ignore: reference to steroids & drugs
	(c)	(i)	points correctly plotted;; (2) appropriate line; (1)	3	1 mark deducted per error to a maximum of 2 +/- half square tolerance single (smooth) curve through the points by eye ignore extrapolation
		(ii)	read the value off the graph plotted (no line=no mark)	1	+/- half square tolerance (0.1g/100cm ³)
Total				8	

Question	Grade	Expected Answers	Marks	Rationale
5 (a)			2	3 correct = 2 marks 2/1 correct = 1 mark
(b)		Triage/description of triage; treat seriously injured first; example of urgent care;	2	e.g. not breathing/excessive bleeding/head wound unconscious / quiet /etc; accept: using the context from q5a
(c)		Example of a suitable illness/condition with treatment of symptom; explanation of how cure is different; OR Example of a suitable illness/condition with possible cure; explanation how symptoms may be treated;	2	E.g. Heart may be restarted after a heart attack without unblocking the arteries for permanent cure painkiller may reduce pain without repairing broken leg diabetes is not cured by taking insulin but symptom controlled Night nurse will relieve congestion without removing 'flu virus Ignore hypothermia because symptoms and cure are the same Accept: Description of difference between symptom and cure for one mark – but: Reject: restatements of the question stem
		Total	6	
		Section total	36	

A324/02 Higher

Question		Grade	Expected Answers	Marks	Rationale
1	(a)		nitrite; presence of bacteria; hCG/hormone; pregnancy; glucose/sugar; diabetes; protein; kidney damage/problems;	4	allow one mark for each chemical and one for each related condition Accept: protein; Urinary/bladder infection; Protein; high blood pressure; blood; kidney stones/kidney problems/high blood pressure Ignore: reference to steroids
	(b)	(i)	points correctly plotted;; (2) appropriate line; (1)	3	1 mark deducted per error to a maximum of 2 +/- half square tolerance) single (smooth) curve through the points (by eye) ignore extrapolation
		(ii)	read the value off the graph plotted	1	+/- half square tolerance (0.1g/100cm ³)
	(c)		any four from: saliva/ faeces/pus/ tissue/blood/DNA/ hair/semen/stomach contents	2	4 correct = 2 marks 3/2 correct = 1 mark Allow excrement, named tissue
Total				10	

Question	Gd	Expected Answers	Marks	Rationale
2 (a)			2	3 correct = 2 marks 2/1 correct = 1 mark
(b)		Triage/description of triage; treat seriously injured first/example seriously injured;	2	examples of priority care e.g. not breathing/excessive bleeding/unconscious / quiet accept: using the context from Q5a
(c)		Example of a suitable illness/condition with treatment of symptom; explanation of how cure is different; OR Example of a suitable illness/condition with possible cure; explanation how symptoms may be treated;	2	E.g. Heart may be restarted after a heart attack without unblocking the arteries pain may be relieved without repairing broken leg diabetes is not cured by taking insulin Night nurse will relieve congestion without removing 'flu virus Ignore hypothermia because symptoms and cure are the same Accept: Description of difference between symptom and cure for one mark – but: Reject: restatements of the question stem
Total			6	

Question		Grade	Expected Answers	Marks	Rationale
3	(a)		Sweat/water evaporated from skin; (1) using body heat (1)	2	accept answers based on energy changes
	(b)		Vasodilation/ description of blood vessels opening up; to allow blood to flow closer to skin surface/increase blood flow through them; heat lost through radiation / conduction;	2	do not credit reference to blood flowing on the surface of skin or moving blood vessels
	(c)	(i)	740 x 8 ; = 5920 joules;	2	5920 with no working = 2
		(ii)	balanced diet; high/more protein; for muscles; high/more carbohydrate; for energy; water (for hydration);	3	High energy diet = 1
			Total	9	

Question		Grade	Expected Answers	Marks	Rationale
4	(a)		category 3/20+; more heavy smokers; more risk to health;	3	Allow examples of increased health risks eg cancer/heart disease/ emphysema etc in more risk to health
	(b)		some people will be affected by the campaign and stop/raises awareness; these are less likely to go on to develop smoking related disorders; saves money (therefore more available for other parts of the health service); reduces victims of passive smoking;	3	looking for logical argument to show that the campaigns can cut spending in the long term less money spent on treatments idea
			Total	6	

Question		Grade	Expected Answers	Marks	Rationale
5	(a)		There is a risk/it is dangerous; ensure he is fit enough to survive the procedure; the benefits outweigh the risks; need his (informed) consent;	3	Allow it may not be successful as a risk.
	(b)		to ensure correct medication given; to assess patient progress so can see if getting better or not; so information available to other staff/keep medical record for change of shift or different specialist or for possible litigation issues;	2	
			Total	5	
			Section total	36	

A325/01 Foundation

Question		Grade	Expected Answers	Marks	Rationale				
1	(a)			4	left side all 3 correct = 2 2 or 1 correct = 1 0 correct = 0 right side all 3 correct = 2 2 or 1 correct = 1 0 correct = 0				
	(b)		use the same procedures <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1)			✓		1	Box 3
✓									
Total				5					

Question	Grade	Expected Answers	Marks	Rationale								
2	(a)	<p>estimate cost of collecting samples</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>X</td></tr> </table> <p>(1)</p> <p>dispose of samples</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> </table> <p>(1)</p>		X				X		X	2	<p>Accept ticks (✓) or any other indication of the correct answers</p> <p>Boxes 2 & 6</p>
X												
X												
X												
	(b)	<p>buy new equipment at the end of each test</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> </table> <p>(1)</p> <p>make sure the equipment is from the same manufacturer</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> <p>(1)</p>		X	X				2	<p>Accept ticks (✓) or any other indication of the correct answers</p> <p>Boxes 2 & 3</p>		
X												
X												
	(c)	<p>Two from:</p> <p>charts;</p> <p>graphs;</p> <p>tables / spreadsheets / grids;</p> <p>photograph / videos / films / pictures;</p> <p>drawings / sketches</p>	2	<p>allow other acceptable answers</p> <p>Accept chromatogram but ignore chromatography</p> <p>Not 'sound' but accept 'voice recognition trace'</p> <p>Not 'written' / Not 'Power point display'</p>								
		Total	6									

Question	Grade	Expected Answers	Marks	Rationale
3	(a)	more colours / shades	1	Ignore different shades / colours (not the same as more colours / shades) Accept the idea of 'tells you pH' Ignore ideas of 'semi quantitative'
	(b) (i)	orange	1	Do not accept red / orange or yellow / orange. Ignore 'dark / light'
	(ii)	green-blue / blue-green	1	Do not accept blue or green alone Ignore 'dark / light'
	(c)	qualitative	1	
	(d)	semi-quantitative	1	
		Total	5	

Question	Grade	Expected Answers	Marks	Rationale
4	(a)	so the light absorbed by the solvent did not affect results	1	Only accept answers that closely match the statements
	(b)	so the readings from the meter were accurate	1	
	(c)	to obtain accurate data to plot the calibration graph	1	
	(d)	to be able to work out the concentration of the unknown sample	1	
	(e)	read the concentration at the point where the known absorbency crosses the line of the graph	1	
		Total	5	

Question		Grade	Expected Answers	Marks	Rationale					
5	(a)		spot drawn directly above banned dye; (1) same spot drawn level with 5cm (1)	2	Can be shown as a shaded / unshaded blob, a cross or any clear indication					
	(b)		A; (1) C; (1)	2	accept either way round					
	(c)	(i)	the dye	1						
		(ii)	the solvent	1						
		(iii)	the paper	1						
	(d)		different solvents separate different dyes more data can be collected about which dyes are present <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> (1) (1)		✓	✓			2	Boxes 2 & 3
✓										
✓										
Total				9						

Question		Grade	Expected Answers	Marks	Rationale
6	(a)		10	1	Reject answers with units
	(b)	(i)	D	1	
		(ii)	(same) pattern / shapes / tread; (1) (same) bald patch / line / mark / mud etc(1)	2	Owtte if pattern described eg 'arrow (shaped)', 'sloping rectangles', 'four columns / grooves', 'diagonal' Ignore reference to ' <u>tyre print</u> ' as words appear in question stem
	(c)		10 x 25; (1) 250 (1)	2	250 only = 2 marks Mark answer first before looking at calculation. Do not select calculation if multiple attempts
Total				6	

Section total				36	
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A325/02 Higher

Question			Grade	Expected Answers	Marks	Rationale
1	(a)	(i)		Forensic Science Service; (1) collect evidence from a crime scene (1)	2	Mark organisation and role independently accept alternative agency and task Do not allow a person for either e.g. 'crime scene investigator' Allow correct initials e.g. FSS, CSI Allow police Do not allow predominantly consumer agencies such as TSA FSA for agency or role Do not allow law enforcement owtte for role
		(ii)		Food Standards Agency; (1) prevent banned substances being used in foods (1)	2	Mark organisation and role independently accept alternative agency and task Do not allow a person for either e.g. 'food safety officer' Allow correct initials e.g. FSA, FSO Allow Trading Standards Allow councils or European Commission NOT Government or European Union Do not allow predominantly law enforcement agencies such as police for agency or role Do not allow consumer protection owtte for role
	(b)			common practice / procedures; (1) one example (1)	2	Accept standard/correct (can be implied e.g. 'everyone uses the same method') E.g. Proficiency tests, staff training/qualifications, avoiding contamination, checking/correct equipment, repeat (to check results), collect more samples/evidence
				Total	6	

Question		Grade	Expected Answers	Marks	Rationale												
2	(a)		<p>estimate cost of collecting samples</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> <p>(1)</p> <p>dispose of samples</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> <p>(1)</p>		X					X				2	Accept ticks (✓) or any other indication of the correct answers Boxes 2 and 6		
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	(b)		<p>buy new equipment at the end of each test</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> <p>(1)</p> <p>make sure the equipment is from the same manufacturer</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>X</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> <p>(1)</p>		X						X					2	Accept ticks (✓) or any other indication of the correct answers Boxes 2 and 3
X																	
X																	
	(c)		Two from: charts; graphs; tables / spreadsheets / grids; photograph / videos / films / pictures; drawings/sketches	2	allow other acceptable answers Accept chromatogram but ignore chromatography Not 'sound' but accept 'voice recognition trace' Not 'written'												
			Total	6													

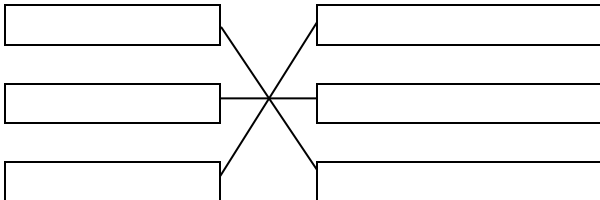
Question		Grade	Expected Answers	Marks	Rationale
3	(a)		More colours/shades	1	Ignore different shades / colours (not the same as more colours/shades) Accept the idea of 'tells you pH' Ignore ideas of 'semi quantitative'
	(b)	(i)	orange	1	Do not accept red / orange or yellow / orange Ignore 'dark / light'
		(ii)	green-blue/blue-green	1	Do not accept blue or green alone Ignore 'dark / light'
	(c)		qualitative	1	
	(d)		semi-quantitative	1	
			Total	5	

Question		Grade	Expected Answers	Marks	Rationale
4	(a)		so the light absorbed by the solvent did not affect results / calibrate/set to zero	1	Accept reverse argument. Ignore reference to fair test.
	(b)		so the reading from the meter were accurate / calibrate	1	Ignore reference to fair test. Ignore 'correct' and 'reliable'
	(c)		to produce a (calibration) graph/to find their absorbencies (intensities)/to compare with the unknown	1	
	(d)		to be able to work out the concentration of the unknown sample	1	
	(e)		References to reading off /drawing a line/following to owtte the line of best fit/ the line of the graph	1	Accept a diagram with both horizontal and vertical lines drawn to the line of the graph
			Total	5	

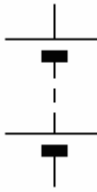
Question		Grade	Expected Answers	Marks	Rationale
5	(a)		spot drawn above banned dye AND level with 5cm	1	
	(b)	(i)	Dye(s)/colour(s)	1	Allow A,B,C,D,E (one or more) Ignore toys and banned Not coloured or colouring
		(ii)	Solvent	1	Allow water or other suitable liquid
		(iii)	paper	1	Allow chromatography paper but NOT paper chromatography
	(c)		Movement depends on attraction to/solubility in the solvent; (1) The greater the attraction, the greater the Rf value/move faster up the paper (1) OR attraction to the paper hinders movement; (1) the greater the attraction the smaller the Rf value/move more slowly up the paper (1)	2	accept reverse argument Allow gets higher accept reverse argument Allow does not get as high
	(d)		0.4	1	Ignore units
	(e)		quicker; (1) more accurate; (1)	2	Allow solvent/sample moves more easily but NOT procedure easier to use.
	(f)		make the spots visible	1	Ignore references to UV radiation Ignore explanations for heat. Allow to see the colour of the spots
			Total	10	

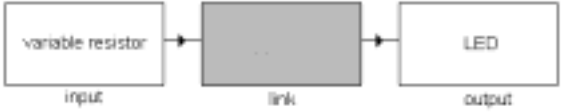
Question		Grade	Expected Answers	Marks	Rationale
6	(a)		C; (1) largest image (1)	2	Second mark depends on first mark Allow implication of largest E.g. Appears closer/zoomed in/pixels look larger/further apart, Accept image C shows less of the object (owtte) Ignore references to focus e.g. blurred, clearer Ignore references to resolution e.g. more detailed
	(b)		reference to separating detail/dots or pixellation; (1) higher resolution greater (detail) (1) ORA	2	'Higher resolution means greater detail' =2 marks 'Higher resolution means less pixellated' =2 marks Ignore references to focus e.g. blurred, clearer Ignore references to magnification e.g. bigger, smaller Ignore references to quality
			Total	4	
			Section total	36	

A326/01 Foundation

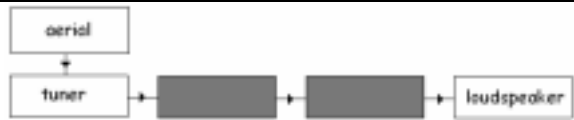

Question			Grade	Expected Answers	Marks	Rationale
1	(a)	(i)		any electronic communications system: e.g. internet, telephone, walkie-talkie, intercom, radio, TV, cable, Facebook..	1	NOT mobile phone ACCEPT email, computers
		(ii)		suitable <u>device</u> for the input of information e.g. type message onto computer (keyboard) suitable device for the output of information e.g. message seen on screen	2	ECF incorrect example ACCEPT a diagram with labels (not just input and output) NOT software
	(b)				2	three correct links [2] one or two correct links [1]
	(c)			the microwaves are absorbed by the walls of the building	1	ACCEPT any clear indication
	(d)	(i)		government; (1) broadcast; (1) power (1)	3	
		(ii)		10GHz	1	ACCEPT any clear indication
				Total	10	

Question		Grade	Expected Answers	Marks	Rationale					
2	(a)			<p>1</p> <p>1</p> <p>1</p>						
	(b)		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="width: 30px; height: 20px;"></td></tr> <tr><td style="width: 30px; height: 20px;"></td></tr> <tr><td style="width: 30px; height: 20px;"></td></tr> <tr><td style="width: 30px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 30px; height: 20px; text-align: center;">✓</td></tr> </table>				✓	✓	2	<p>five boxes correct for [2]</p> <p>three or four boxes correct for [1]</p> <p>less than three correct for [0]</p>
✓										
✓										
	(c)		as infrared pulses	1						
Total				6						

Question		Grade	Expected Answers	Marks	Rationale
3	(a)		any three of the following, [1] each (owtte): <ul style="list-style-type: none"> • (controls) easy to use • high quality sound • sound power • size • weight • looks good / nice colour / nice shape • (rechargeable) battery life 	3	ACCEPT fashion argument once only NOT obvious properties of an MP3 player e.g. digital, headphones, rechargeable batteries, battery charger, ease of connection to computer NOT memory capacity or price
	(b)	(i)		1	
		(ii)	allows system to be portable	1	ACCEPT safer than mains supply
			Total	5	

Question			Grade	Expected Answers	Marks	Rationale
4	(a)	(i)		 <pre> graph LR A[variable resistor input] --> B[link] B --> C[LED output] </pre>	1	
	(b)	(i)		any <u>complete</u> system linked by copper wire: e.g. intercom, baby alarm, morse (code), telephone, doorbell, fire alarm ...	1	ACCEPT email, computers NOT partial system e.g. TV aerial, mobile phone
		(ii)		input and output <u>devices</u> described for their example: e.g. microphone and loudspeaker, switch and buzzer	1	ECF incorrect example
		(iii)		cheap / secure / simple to connect / easy to use	1	NOT good conductor / long lasting / reliable
				Total	4	

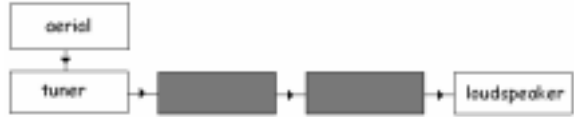
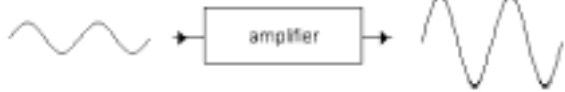
Question	Grade	Expected Answers	Marks	Rationale
5 (a)		substitution: $I = 5/200$ evaluation: $I = 0.025A$	2	correct calculation of 0.025 A for [2] ACCEPT reverse calculation $0.03 \times 200 = 6$ V for [2]
(b)		ecf: substitution: $P = 5 \times 0.025$ evaluation: $P = 0.125W$	2	ecf 5a [2] ACCEPT 0.13 [2] 0.03 A gives 0.15 W for [2]
(c)		ecf: 0.2W	1	value just greater than calculated power ecf 5b: accept 0.2 W for any power above 0.2 W If no response for 5 b, then accept 0.2 W
Total			5	

Question	Grade	Expected Answers	Marks	Rationale
6 (a)			3	[1] for each correct entry ACCEPT earpiece / headphones / speaker for loudspeaker
(b)		alternating signal input (any shape) output with greater amplitude (same shape) 	2	ACCEPT different period for input and output
(c)		each station broadcasts on a different frequency (wtte)	1	ACCEPT channel instead of frequency / wavelength NOT tune into ...
Total			6	


Section total			36	
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A326/02 Higher

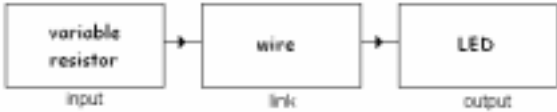
Question	Grade	Expected Answers	Marks	Rationale
1	(a)	substitution: $I = 5/200$ evaluation: $I = 0.025A$	1 1	correct calculation of 0.025 A for [2]
	(b)	ecf: substitution: $P = 5 \times 0.025$; (1) evaluation: $P = 0.125W$ (1)	1 1	ecf 5a [2] ACCEPT 0.13 [2] 0.03 A gives 0.15 W for [2]
	(c)	ecf: 0.2W	1	value just greater than calculated power ecf 5b: accept 0.2 W for any power above 0.2 W If no response for 5 b, then accept 0.2 W
Total			5	

Question	Grade	Expected Answers	Marks	Rationale
2	(a)		3	[1] for each correct entry ACCEPT earpiece / headphones / speaker for loudspeaker
	(b)	alternating signal input (any shape) output with greater amplitude (same shape) 	1 1	ACCEPT different period for input and output
	(c)	each station broadcasts on a different frequency / wavelength (wtte)	1	ACCEPT channel instead of frequency / wavelength NOT tune into ...
Total			6	

Question			Grade	Expected Answers	Marks	Rationale
3	(a)	(i)		<pre> graph LR M[microphone] --> Mod[modulator] Mod --> Amp[amplifier] Amp --> A[aerial] B[] --> Mod </pre>	3	4 correct [3] 3 or 2 correct [2] 1 correct [1]
		(ii)		(coding changes) amplitude of microwave (carrier) increasing / decreasing / changing (wtte) to follow the (voltage of the) voice (signal)	1 1 1	ACCEPT labelled sketches of waves. e.g. unlabelled for [2] unlabelled for [1] NOT frequency modulation
	(b)			absorption described: amount of microwaves reduced as they pass through buildings (wtte) reflection described microwaves bounce off buildings instead of passing into them (wtte) interference described: microwaves from different paths meet and cancel each other out (wtte)	1 1 1	LOOK FOR absorbed by ... LOOK FOR reflection off ... LOOK FOR signals from other electrical devices ...
Total					9	

Question	Grade	Expected Answers	Marks	Rationale
4 (a)		<p>[1] for each correct entry</p> 	3	<p>ACCEPT DAC NOT analogue-to-digital converter / decoder ACCEPT speaker</p>
	(b)	<p>CBDE(A) can birds digest egg?</p>	2	<p>all correct for [2] one mistake for [1] a mistake is a letter in the wrong place in the sequence</p>
Total			5	

Question	Grade	Expected Answers	Marks	Rationale
5	(a)	advantages (wtte): <ul style="list-style-type: none"> • mobility / portability • can operate away from mains supply • no danger of shock disadvantages (wtte): <ul style="list-style-type: none"> • expensive • limited time of operation • can leak 	1 1	ACCEPT rechargeable batteries cheaper than one-time batteries need two advantages and two disadvantages for [2] any two or three valid points (advantages or disadvantages) for [1]
	(b)	symbol means <u>double insulated</u> reduces risk of electrocution / shock should the charger become faulty (wtte)	1 1 1	NOT just safer ACCEPT sensible description of double insulation for [1]
Total			5	

Question	Grade	Expected Answers	Marks	Rationale
6	(a)	[1] for each correct entry (owtte) 	3	ACCEPT copper wire ACCEPT light emitting diode NOT light
	(b)	analogue current / power information	3	NOT variable
Total			6	

Section total			36	
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A334/01 Foundation

Question		Grade	Expected Answers	Marks	Rationale			
1	(a)		intensive farming <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓		1	
✓								
	(b)	(i)	120	1				
		(ii)	B	1				
		(iii)	(amount of) food; temperature; pests / parasites; disease; genetic factors; (water) pollution; competition;	2	any two Reject : overfishing / changes to habitat / predators			
			Total	5				

Question	Grade	Expected Answers	Marks	Rationale					
2 (a)		ring around tomato / tomato label	1	Reject : ring that includes significant amount of other parts * Scroll over complete diagram*					
(b)		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>Germinating ✓ (1)</td></tr> <tr><td>Rotting ✓ (1)</td></tr> </table>				Germinating ✓ (1)	Rotting ✓ (1)	2	If more than two deduct 1 mark for each incorrect tick
Germinating ✓ (1)									
Rotting ✓ (1)									
(c)		use 100 seeds / specified number; plant / sow; in suitable conditions/ with water, warmth; count number that germinate; convert to % if not 100 planted	3	any three					
(d)			4	Mark each side (left and right) separately For each side : 2/3 correct = 2 marks 1 correct = 1 mark					
Total			10						

Question		Grade	Expected Answers	Marks	Rationale
3	(a)		26 = 2 marks: 74 = 1 mark if 74 not present adds up 4+6+12+23+29 and then subtracts from 100 = 1 mark	2	
	(b)		not dependent on one type if costs rise/fall owtte; avoids build up of pests / diseases; improves cash flow / money at different times; variety of products / more products; to find the best / profitable crop :	1	any one Reject : to get more money
	(c)		milk; wheat / plants; eggs;	3	
			Total	6	

Question		Grade	Expected Answers	Marks	Rationale												
4	(a)		Correct reference to <u>fat</u> content by comparison; Correct reference to effect on health by link with fat / cream; Correct reference to taste; people think skimmed milk is too watery / poor value;	2	any two Reject : more / less fat without comparison Accept : less fat than whole milk so it is healthier = 2 marks Accept : tastes good / better												
	(b)	(i)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>to ensure food quality</td><td><input type="checkbox"/></td><td>(1)</td></tr> <tr><td>to make sure it is safe to drink</td><td><input checked="" type="checkbox"/></td><td>(1)</td></tr> <tr><td></td><td><input type="checkbox"/></td><td></td></tr> <tr><td></td><td><input type="checkbox"/></td><td></td></tr> </table>	to ensure food quality	<input type="checkbox"/>	(1)	to make sure it is safe to drink	<input checked="" type="checkbox"/>	(1)		<input type="checkbox"/>			<input type="checkbox"/>		2	If more than two deduct 1 mark for each incorrect tick
to ensure food quality	<input type="checkbox"/>	(1)															
to make sure it is safe to drink	<input checked="" type="checkbox"/>	(1)															
	<input type="checkbox"/>																
	<input type="checkbox"/>																
		(ii)	appearance and smell	1													
		(iii)	some bacteria still present; these multiply / breed / reproduce / grow; releasing acids / toxins;	2	Reject : bacteria entering Accept most bacteria killed												
		(iv)	so it keeps longer / keeps it fresh / does not go off / bad; bacterial growth / reproduction slowed down;	2	Accept : reverse arguments eg if warmer bacteria reproduce faster												
			Total	9													

Question			Grade	Expected Answers	Marks	Rationale
5	(a)	(i)		Food Standards Agency / FSA / British Farm Standard	1	
		(ii)		British Potato Council / Milk Development Council / Meat and Livestock Commission / ADAS	1	Apply list principle mark first answer only Reject : ASDA
	(b)	(i)		to produce seeds / for fertilisation / to make oil / to reproduce / to make more plants;	1	Reject : grow more Accept : so plants don't die out / become extinct
		(ii)		contamination of pollen / honey / reference to GM pollen;	1	
		(iii)		18,000 = 2 marks 36,000 / 6,000/ 9 = 1 mark	2	No £ sign needed Two steps performed correctly
				Total	6	

				Section total	36	
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A334/02 Higher

Question		Grade	Expected Answers	Marks	Rationale
1	(a)		intensive	1	
	(b)		B; has been growing fast / shows biggest increase / marketable size; Or comparison with A, slow growing / too small; Or comparison with C, stopped growing / too big / spending money on food with little mass increase;	2	Allow 1 mark for C with correct explanation e.g. heaviest
	(c)		more food / regular food / controlled diet; (high) protein food; no pests / diseases; optimum environment / controlled conditions / temperature, salinity, pH correct; use less energy in swimming; little competition for food;	3	any three Reject : no predators
	(d)	(i)	not sold as dry fish / fish sold fresh / only used for stored products / don't know weight of water in fish / fish killed	1	
		(ii)	tea / cereal grains	1	Accept : hay / corn
			Total	8	

Question	Grade	Expected Answers	Marks	Rationale
2 (a)		correct reference to <u>fat</u> content by comparison; correct reference to effect on health by link with fat / cream; correct reference to taste; people think skimmed milk is too watery / poor value;	2	any two Reject : more / less fat without comparison Accept : less fat than whole milk so it is healthier = 2 marks Accept : tastes good / better
(b) (i)		to ensure food quality <input type="checkbox"/> (1) to make sure it is safe to drink <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	2	If more than two deduct 1 mark for each incorrect tick
(ii)		appearance and smell	1	
(iii)		some bacteria still present; these multiply / breed / reproduce / grow; releasing acids / toxins;	2	Reject : bacteria entering Accept most bacteria killed
(iv)		so it keeps longer / keeps it fresh / does not go off / bad; bacterial growth / reproduction slowed down;	2	Accept : reverse arguments eg if warmer bacteria reproduce faster
Total			9	

Question	Grade	Expected Answers	Marks	Rationale
3 (a)		to produce seeds / for fertilisation / to make oil / to reproduce / to make more plants;	1	Reject : grow more Accept : so plants don't die out / become extinct
(b)		contamination of pollen / honey / reference to GM pollen;	1	
(c)		18,000 = 2 marks 36,000 / 6,000 / 9 = 1 mark	2	No £ sign needed Two steps performed correctly
Total			4	

Question			Grade	Expected Answers	Marks	Rationale
4	(a)	(i)		yeast	1	Reject : fungi
		(ii)		Sugar / glucose → alcohol and carbon dioxide	2	1 mark for each side Accept : formulae / lactic acid
		(iii)		no stopping / no time lost; no cleaning / sterilisation; higher productivity; can be automated	2	any two Reject : reference to crops
	(b)			F before C; C before D;	2	No marks if more than 3 letters
				Total	7	

Question			Grade	Expected Answers	Marks	Rationale
5	(a)			fast growing / plenty of wood / cheap wood / poor quality so cannot charge more	1	accept cheap labour
	(b)			fast growing / straight grain / no knots;	1	two required for one mark
	(c)	(i)		select willow trees with required characteristics; cross breed / pollinate / fertilise; select trees with best required characteristics; repeat process; when happy with results mass produce;	4	any four
		(ii)		trees take years to grow / mature / produce seeds; many generations required;	2	Accept reference to tree growth
				Total	8	

				Section total	36	
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A335/01 Foundation

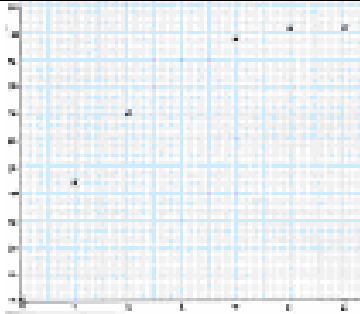
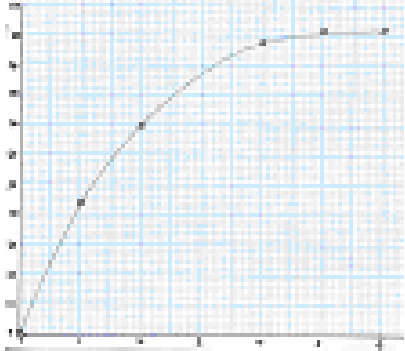
Question		Grade	Expected Answers	Marks	Rationale						
1	(a)		the <u>minerals are dissolved</u> ; (1) in <u>water</u> / idea that water is the solvent ;(1)	2	allow higher level answers referring to a solute dissolved in a solvent ; (2) do not allow references to mixing do not allow things/chemicals/solids can be dissolved						
	(b)		pH decreases <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td> </td></tr><tr><td>✓</td></tr></table> (1)			✓	1				
✓											
	(c) (i)		Mg	1	do not allow 'MG' or 'mg'.						
	(ii)		potassium chloride <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td> </td></tr><tr><td>✓</td></tr></table> (1) sodium sulfate <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td> </td></tr><tr><td>✓</td></tr></table> (1)			✓			✓	2	
✓											
✓											
	(iii)		Bunsen burner / hotplate / (hot) water bath / heating mantle/heating coil	1	do not allow 'immersion heater'/kettle. ignore references to containers for water						
	(iv)		1 litre = 1000ml /30÷ 4; (1) = 7.5 (1)	2	correct answer scores two marks. allow '8'.						
			Total	9							

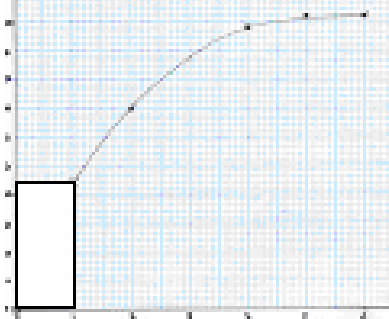
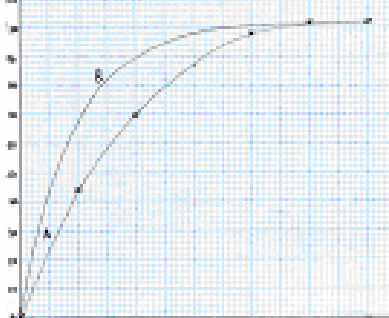
Question	Grade	Expected Answers	Marks	Rationale	
2	(a)	<p>can petrol be distilled using a continuous process <input checked="" type="checkbox"/> (1)</p> <p>how much energy is needed <input checked="" type="checkbox"/> (1)</p> <p>how can workers be kept safe <input checked="" type="checkbox"/> (1)</p>	3		
	(b)	(i)	highly flammable	1	
		(ii)	to <u>prevent</u> people being harmed (owtte); (1) to reduce any harm to the environment (owtte) (1)	2	Allow cleaned properly/quickly/safely/correctly ideas (1) Ignore references to catching fire
Total			6		

Question	Grade	Expected Answers	Marks	Rationale
3	(a)	<p>it is sweeter / less is needed (owtte); (1)</p> <p>it is renewable / sustainable / comes from plants / can be regrown (1)</p>	2	do not allow ideas suggesting that it can be reused. do not allow sucralose does not use coal or crude oil unless qualified (ora)
	(b)	needs to be tested for safety (owtte)	1	allow 'finding out how to scale up the process' (owtte). do not allow testing without reference to safety
	(c)	fine	1	
Total			4	

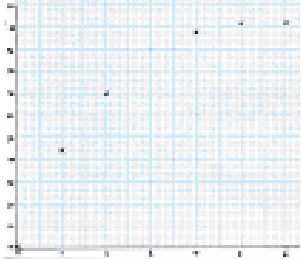
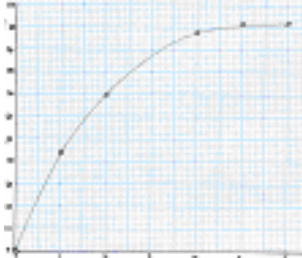
Question	Grade	Expected Answers	Marks	Rationale	
4	(a)	HNO ₃	1	answer could be in the table or ringed	
	(b)	(i)	C ₂ H ₅ OH / ethanol	1	correct formula
		(ii)	NH ₃ / ammonia	1	correct formula
		(iii)	CH ₃ COOH / ethanoic acid; (1) C ₂ H ₅ OH / ethanol (1)	2	correct formulae
Total			5		

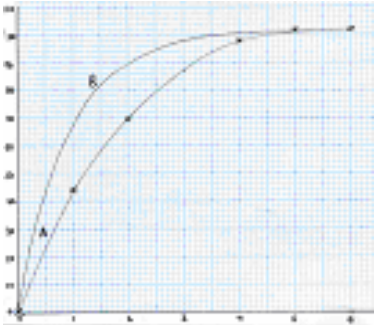
Question		Grade	Expected Answers	Marks	Rationale
5	(a)		<u>hydrochloric acid</u> + <u>calcium carbonate</u> →; (1) calcium chloride + <u>carbon dioxide</u> + water (1)	2	allow ' <u>calcium carbonate</u> + <u>hydrochloric acid</u> →'
	(b)		measuring cylinder / pipette / burette/graduated flask	1	allow beaker do not allow conical flask/jug
	(c)		to stop / reduce the amount of gas / carbon dioxide escaping	1	do not allow ideas of reaction/everything/anything/nothing/air escaping do not allow keeps everything in do not allow to stop air entering ignore comments about accuracy/reliability
	(d)		no more gas / carbon dioxide is produced / bubbling/fizzing	1	allow 'no marble left.' Accept no limestone/calcium carbonate left do not allow 'no acid left.' do not allow reaction will stop do not allow when level in measuring cylinder stops changing (owtte)

Question			Grade	Expected Answers	Marks	Rationale
5	(e)	(i)			2	4 correct = 2 marks 2 or 3 correct = 1 mark points correct if within +/- half a square
		(ii)		correctly drawn <u>curve</u> of best fit for all points 	1	do not allow straight lines/ dot to dot do not allow breaks in curve/more than one line
		(iii)		value read <u>from graph</u>	1	allow guess of '86 – 88' if no curve drawn

Question			Grade	Expected Answers	Marks	Rationale
5	(e)	(iv)		any part from time '0-1 minute' 	1	allow answers within marked box bounded by and including time 1 min and volume 44
		(v)		steeper; (1) finishes at same total volume (1) 	2	curve must start at origin
Total					12	
Section total					36	

A335/02 Higher

Question		Grade	Expected Answers	Marks	Rationale
1	(a)		2(HCl); (1) CaCl ₂ (1)	2	do not allow 'CaCl ₂ ', 'cacl ₂ ', 'CaCl ₂ ', 'CaCl ² ' or 'CaCl ₂ '.
	(b)		to stop / reduce the amount of gas / carbon dioxide escaping	1	do not allow ideas of reaction/everything/anything/nothing/air escaping do not allow 'keeps everything in' do not allow 'to stop air entering' ignore comments about accuracy and reliability
	(c)		no more gas / carbon dioxide is produced / bubbling	1	allow 'no marble left' / 'no limestone/calcium carbonate left' do not allow 'no acid left' do not allow reaction will stop do not allow when level in measuring cylinder stops changing (owtte)
	(d) (i)			2	5 correct = 2 marks 3 or 4 correct = 1 mark points correct if within +/- half a square
	(ii)		correctly drawn <u>curve</u> of best fit for all points 	1	do not allow straight lines/ dot to dot do not allow breaks in curve/more than one line

Question		Grade	Expected Answers	Marks	Rationale
		(iii)	(rate) decreases (owtte); (1) (explanation) less (reactant) <u>particles</u> available to react (owtte) (1)	2	
1	(d)	(iv)	steeper; (1) finishes at same total volume (1) 	2	curve must start at origin
			Total	11	

Question		Grade	Expected Answers	Marks	Rationale
2	(a)		(saccharin is made from coal or crude oil) which is non-renewable / not sustainable / finite source; (1) (sucralose is made from sugar cane) which can be grown again / is renewable / sustainable (1) or (sucralose) is much sweeter; (1) and so less is needed / less side-effects (1)	2	allow 2 reasons or 1 reason + explanation do not allow sucralose is 'more sustainable' do not allow sugar cane can be 'reused'
	(b)		needs to be tested for safety (owtte)	1	allow 'finding out how to scale up the process' (owtte). do not allow testing without reference to safety
	(c)		fine	1	
			Total	4	

Question			Grade	Expected Answers	Marks	Rationale
3	(a)			ethanol / C ₂ H ₅ OH	1	only allow the correct formula
	(b)			40 + 12 + (3 x 16); (1) = 100 (1)	2	correct answer scores both marks
	(c)			<u>ethanoic acid</u>	1	do not allow 'CH ₃ COOH'
				Total	4	

Question			Grade	Expected Answers	Marks	Rationale
4	(a)	(i)		All reactants added at the start and all products removed when the reaction has finished / set quantity is made at a time / (owtte)	1	
		(ii)		(liquid) with <u>lowest boiling point</u> ; (1) (liquid) vaporises / evaporates / turns to a gas; (1) (vapour) condenses / turns back to a liquid / others left in original flask (owtte) (1)	3	allow 'crude oil / mixture contains liquids with different boiling points'
	(b)			(process is) continuous / constantly feed in crude oil and collect petrol (owtte)/quicker; (1) less labour required (owtte) (1)	2	do not allow references to cost
	(c)	(i)		(precaution to protect themselves) safety glasses / face masks / overalls; (1)	1	allow any correct precautions
		(ii)		(precaution to protect others) no smoking / naked flames / report spills (owtte) (1)	1	allow any correct precautions
				Total	8	

Question		Grade	Expected Answers	Marks	Rationale				
5	(a)		a solution contains a soluble substance, called the <u>solute</u> , <u>dissolved</u> ; (1) in a <u>solvent</u> , such as water (1)	2					
	(b)		KCl <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)			✓		1	
✓									
	(c)		(carbon dioxide) reacts / neutralises / dissolves to form (weak) acid	1					
	(d)	(i)	1 litre = 1000ml / 30 ÷ 4; (1) = 7.5 (1)	2	correct answer scores two marks. allow '8'.				
		(ii)	silver chloride	1	allow 'AgCl'				
		(iii)	dry the precipitate	1	allow 'wash the precipitate' (owtte)				
		(iv)	not all (water / minerals) were transferred (when performing the test) (owtte)	1					
			Total	9					
			Section total	36					

A336/01 Foundation

Question		Grade	Expected Answers	Marks	Rationale															
1	(a)		opaque; transparent; translucent;	3																
	(b)		<table border="1"> <thead> <tr> <th></th> <th>ceramic</th> <th>polymer</th> </tr> </thead> <tbody> <tr> <td>stiff</td> <td>✓</td> <td>(✓)</td> </tr> <tr> <td>flexible</td> <td></td> <td>✓</td> </tr> <tr> <td>tough</td> <td></td> <td>✓</td> </tr> <tr> <td>brittle</td> <td>✓</td> <td></td> </tr> </tbody> </table>		ceramic	polymer	stiff	✓	(✓)	flexible		✓	tough		✓	brittle	✓		3	A Tick in either column is accepted for stiff all correct = 3 marks 3 correct = 2 marks 2 OR 1 correct = 1 mark
	ceramic	polymer																		
stiff	✓	(✓)																		
flexible		✓																		
tough		✓																		
brittle	✓																			
	(c)		cork; (1) correct reference to thermal conductance / insulation (1)	2	Allow cork circled in table Accept it is 0.05/lowest/ low/poor conductor/good insulator Reject – Marble (x) best conductor (x) Second mark independent of first															
			Total	8																

Question		Grade	Expected Answers	Marks	Rationale
2	(a)			4	
	(b)		so doesn't scratch (easily) / stays shiny / to make it stiff(er) / strong(er) / tough(er)/ hard(er) / lasts long(er) / costs less;	1	any one Reject different or changes strength
			Total	5	

Question			Grade	Expected Answers	Marks	Rationale
3	(a)	(i)		electrical conductance	1	
		(ii)		metal; (1) polymer; (1)	2	
	b			freezer plug because (conductance measurement) is less than 10 S	1	Accept 'freezer because conductance is below minimum (safe) conductance / not enough Siemens Reject Freezer because its conductance is lowest/ 9/ poor
				Total	4	

Question			Grade	Expected Answers	Marks	Rationale
4	(a)	(i)		in order: rumble of thunder, school bell, pen squeaking on a whiteboard	1	Allow if school bell omitted from middle line
		(ii)		goes up / increases;	1	
	(b)			decibels	1	
	(c)	(i)		permanent hearing loss	1	
		(ii)		material used; (1) reflects / absorbs sound; (1)	2	Allow for sources of sound coming from inside or outside of room eg Double glazing/ egg boxes/ carpet/underlay/ soft furnishings/soft materials/polystyrene or fibreglass (not foam) in cavity wall. General rule hard surfaces reflect soft surfaces absorb but polystyrene must absorb. Double glazing must reflect unless reference to cavity Allow open window/ open door (1) sound to escape (1) Second mark only allowed if material or object stated
				Total	6	

Question		Grade	Expected Answers	Marks	Rationale
5	(a)		how fast something moves; (1) in a particular direction (1)	2	Each column marked separately only one box per column allowed
	(b)		substitute 0.8×2.4 ; (1) $= 1.9(2)$ (1)	2	1.9 or 1.92 is worth 2 marks (working out not necessary – ignore incorrect working if answer is correct)
	(c)	(i)	refers to force; (1) (force) reduced (1)	2	If a reduction in force is implied without the word force then 1 max (eg less impact, not as hard) Rate of change of momentum is less (1) Reject – less injury, longer time
		(ii)	two from: named material with device/use; mechanical property which improves safety; how the material / property improves safety	2	Eg Seatbelts with Fabric/webbing/polymer (not material) (1), Is tough/strong/elastic/can stretch (1), increases time of impact/absorbs energy (1) Air Bags with any named suitable material (1), flexible/soft(1), increases time/ gas(1), compressible/squashable (1) , increases time (1) Tyres with rubber (1), improves friction/ grip (1), shorter stopping distance (1) Helmets with polystyrene (not just foam) (1) , compressible (1), increases time (1) Reject – speed bumps, traffic light, cameras
			Total	8	

Question		Grade	Expected Answers	Marks	Rationale
6	(a)		job with at least one relevant specific material property;	1	Job must require knowledge of properties quoted Must have a job and a relevant property of a material or an implied material eg An aeroplane engineer has to chose the right material for the engine so when engine gets hot it does not expand
	(b)		damper; fluid filled; OR springs; metal	2	Suitable material Rubber (not foam) (1), Quality mark either where the material is placed (eg under the steering wheel not around) or how it stops the vibration (eg absorbs energy (1) Shock absorber (1) equivalent to damper
	(c)		a composite material has more than one material (1) embedded in another AW(1); (carbon) fibres embedded in a matrix (=2)	2	Reject alloy / mixture Embedded (stated or shown in diagram)(1 mark)
Total				5	
Section total				36	

A336/02 Higher

Question		Grade	Expected Answers	Marks	Rationale
1	(a)		how fast something moves; (1) in a particular direction (1)	2	Each column marked separately only one box per column allowed
	(b)		substitute 0.8×2.4 ; (1) $= 1.9(2)$ (1)	2	1.9 or 1.92 is worth 2 marks (working out not necessary – ignore incorrect working if answer is correct)
	(c)	(i)	refers to force; (1) (force) reduced (1)	2	If a reduction in force is implied without the word force then 1 max (eg less impact, not as hard) Rate of change of momentum is less (1) Reject – less injury, longer time
		(ii)	two from: named material with device/use; mechanical property which improves safety; how the material / property improves safety	2	Eg Seatbelts with Fabric/webbing/polymer (not material) (1), Is tough/strong/elastic/can stretch (1), increases time of impact/absorbs energy (1) Air Bags with any named suitable material (1), flexible/soft(1), increases time/ gas(1), compressible/squashable (1) , increases time (1) Tyres with rubber (1), improves friction/ grip (1), shorter stopping distance (1) Helmets with polystyrene (not just foam) (1) , compressible (1), increases time (1) Reject – speed bumps, traffic light, cameras
			Total	8	

Question		Grade	Expected Answers	Marks	Rationale
2	(a)		job with at least one relevant specific material property;	1	Job must require knowledge of properties quoted Must have a job and a relevant property of a material or an implied material eg An aeroplane engineer has to chose the right material for the engine so when engine gets hot it does not expand
	(b)		damper; fluid filled; OR springs; metal	2	Suitable material Rubber (not foam) (1), Quality mark either where the material is placed (eg under the steering wheel not around) or how it stops the vibration (eg absorbs energy (1) Shock absorber (1) equivalent to damper
	(c)		a composite material has more than one material (1) embedded in another AW(1); (carbon) fibres embedded in a matrix (=2)	2	Reject alloy / mixture Embedded (stated or shown in diagram)(1 mark)
			Total	5	

Question		Grade	Expected Answers	Marks	Rationale
3	(a)		labelled diagram including long rod and thermometer (1); method of increasing temperature by large amount (1); suitable practical method for monitoring small expansion / increase in length (1)	3	Bimetallic strip can get 1 max Not a ruler alone
	(b)		(volume) increases (1); (density) decreases (1);	2	
	(c)		names of materials with matching thermal expansions (1); reason why thermal expansions must match / consequence of mismatch (1);	2	
Total				7	

Question		Grade	Expected Answers	Marks	Rationale
4	(a)		use of area under graph (1) 1600J (1)	2	1600 on its own gets 2 marks 3200 gets 1
	(b)		$k=F/x$ seen or implied by correct substitution (1) 200 (1); N/m (1);	3	
Total				5	

Question			Grade	Expected Answers	Marks	Rationale
5	(a)	(i)		dioptries	1	
		(ii)		focal plain drawn through point where rays cross, perpendicular to main axis of lens ;	1	
		(iii)		great;	1	
	(b)	(i)		image moves away (from lens);	1	
		(ii)		(lens) thickens / becomes more convex;	1	allow fatter
	(c)	(i)		B;	1	
		(ii)		camera / binoculars / telescope / other named optical device;	1	reject glasses and contact lenses
	(d)			gas permeable; to let oxygen to the cornea; easily sterilised; to prevent infection; stick to tears; stay in place; or other relevant properties	4	up to 4 marks property alone get 1 mark property with reason gets 2 marks reject flexible, light, smooth, soft, tough, strong, durable, scratch resistant
				Total	11	

				Section total	36	
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Grade Thresholds

General Certificate of Secondary Education
 Additional Applied Science (Specification Code J632)
 January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A324/01	Raw	36	n/a	n/a	n/a	26	22	18	14	10	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A324/02	Raw	36	31	26	21	17	14	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A325/01	Raw	36	n/a	n/a	n/a	26	22	19	16	13	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A325/02	Raw	36	30	25	20	16	10	7	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A326/01	Raw	36	n/a	n/a	n/a	17	14	11	8	5	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A326/02	Raw	36	32	26	20	14	9	6	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A334/01	Raw	36	n/a	n/a	n/a	22	18	15	12	9	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A334/02	Raw	36	29	24	19	15	13	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A335/01	Raw	36	n/a	n/a	n/a	22	18	15	12	9	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A335/02	Raw	36	32	26	20	14	11	9	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A336/01	Raw	36	n/a	n/a	n/a	21	17	14	11	8	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A336/02	Raw	36	29	23	17	12	8	6	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J632	300	270	240	210	180	150	120	90	60	0

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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