

**Additional Applied Science A  
Twenty First Century**

General Certificate of Secondary Education J632

**Mark Scheme for the Components**

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**June 2009**

**J632/MS/R/09**

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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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### GCSE Additional Applied Science A (Twenty First Century) (J632)

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# Guidance for Examiners

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

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

## A324/01 Foundation

Question		Expected Answers		Marks	Rationale
1	a	alcohol consumption	√ (1)	3	if more than three ticked deduct one mark for each additional tick
		current medication	√ (1)		
		favourite music			
		shoe size			
		tobacco consumption	√ (1)		
		visits to Egypt			
	b	to reduce risk of injury / to avoid exercise being too strenuous / tailor exercise to fitness level owtte (1)		1	looking for a sensible reason <b>not</b> 'to see if she is healthy' <b>allow</b> 'judgement of current fitness level' <b>allow</b> 'make sure she doesn't hurt herself'
		<b>Total</b>		<b>4</b>	

Question			Expected Answers	Marks	Rationale
2	a	i	assessed (1) ranked (1)	2	<b>allow</b> 'most serious first' or stating an example of a serious injury being treated first - one mark <b>ignore</b> 'prioritised' <b>allow</b> named examples compared for two marks, such as 'heart attacks <u>before</u> broken bones' <b>allow</b> 'triage' for two marks
	b			3	4 correct = 3 marks 3 / 2 correct = 2 marks 1 correct = 1 mark
<b>Total</b>				<b>5</b>	

Question			Expected Answers	Marks	Rationale
3	a		C (1)	1	
	b	i	acknowledgement of the procedure carrying a risk / problem / harm (1) acknowledgement of the procedure having a benefit (1)	2	<b>allow</b> 'benefits outweigh the risks of such a major operation' or 'risks outweigh the benefits' for two marks
		ii	best / specialist doctors (1) allows resources to be focussed in one area / best equipment (1) more efficient economically / in use all the time owtte (1)	3	1 mark associated with staff 1 mark associated with resources/equipment/facilities  1 mark associated with cost effectiveness  allow reverse argument 'centre of excellence' = one mark
			<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Rationale
4	a	any two of the following: rest; ice; compression; elevation; massage; pain relief; some form of gentle / suitable exercise (2)	2	<b>allow</b> 'RICE' for two marks <b>allow</b> stretch as a form of suitable exercise
	b	suitable title (1) (1) suitable role (1) (1)	4	<b>allow</b> any appropriate title such as surgeon / nurse / dietician / radiologist / consultant / dentist / optician / psychiatrist <b>not</b> cleaner / receptionist / porter / physiotherapist / fitness instructor / social worker the role must match the title
		<b>Total</b>	<b>6</b>	



Question		Expected Answers	Marks	Rationale	
5	a	A trachea (1) B ribs (1) C diaphragm (1) D alveolus (1)	4	1 mark for each correct label <b>ignore</b> extra label lines	
	b	features, any two from: thin walls / (lots of) capillaries / good transport system / blood supply / large surface area / moist walls (2) explanations, any two from: allows easy diffusion / maintains concentration gradient / speed up gas exchange / facilitates diffusion of gases (2)	4	1 mark for a feature and the second mark for the related explanation <b>not</b> any reference to cell walls <b>allow</b> oxygen and carbon dioxide as named gases	
	c	i	any one of: different people respond differently to the same medication; different medications have different side effects in different people; often a process of trial and error to find the most suitable medication; there are lots of different treatments available for any one condition (1)	1	<b>allow</b> 'to see which one works best'
		ii	any two of: there is no cure for asthma; all the available medication treats the symptoms; it reduces the unpleasant feelings of asthma or enables the person to breathe but the person will still have asthma (2)	2	<b>allow</b> asthma is long-term / will always have it = 1 mark <b>not</b> restating the question 'medication has not cured his asthma'
<b>Total</b>			<b>11</b>		

Question		Expected Answers	Marks	Rationale
6	a	likely to get the stomach illness (because it is inherited) / chances of getting it are increased (1) saves her life / stops her getting it / saves money in the long term (1)	2	
	b	any two of: food easy to digest (without stomach); very small / light meals; frequent meals; five-a-day / fruit and vegetables; liquid diet (2)	2	<b>ignore</b> reference to fat content <b>allow</b> increased protein only in context of (tissue) repair for liquid diet accept examples of such food eg. yoghurt, soup
		<b>Total</b>	<b>4</b>	
		<b>Paper total</b>	<b>36</b>	

## A324/02 Higher

Question		Expected Answers	Marks	Rationale	
1	a	correctly labelled A trachea/windpipe (1) B ribs/rib cage (1) C diaphragm (1) D alveolus/air sac(s) (1)	4	1 mark for each correct label <b>ignore</b> extra label lines	
	b	any 2 features from: thin walls / (lots of) capillaries/ large surface area/good transport system / blood supply moist walls (2) explanations, any two from: allows easy diffusion / maintains concentration gradient/ speed up gas exchange/ facilitates diffusion of gases (2)	2  2	1 mark for feature and the second mark for the linked explanation <b>not</b> any reference to cell walls <b>allow</b> oxygen and carbon dioxide as named gases	
	c	i	any one of: different people respond differently to the same medication/ different medications have different side effects in different people/ often a process of trial and error to find the most suitable medication/ there are lots of different treatments available for any one condition (1)	1	<b>allow</b> 'to see which one works best'
		ii	any two of: there is no cure for asthma; all the available medication treats the symptoms; it reduces the unpleasant feelings of asthma or enables the person to breathe but the person will still have asthma (2)	2	<b>allow</b> asthma is long term/will always have it <b>not</b> restating the question 'medication has not cured his asthma'
<b>Total</b>			<b>11</b>		

Question		Expected Answers	Marks	Rationale
2	a		3	4 correct = 3 marks 3 correct = 2 marks 2 / 1 correct = 1 mark
	b	no surgery involved/no cutting open/ without entering body(1) qualification for second mark eg. way of finding out (structural or functional) information (inside the body)/less/no risk of infection/quicker recovery/less distressing(1)	2	<b>ignore</b> reference to damage/harm
	c	a suitable example such as (cancerous) tumour or to check the body organs are functioning properly(1)	1	<b>allow</b> answers based on how a PET scan works, different tissues absorb different amounts of radioactive chemical combined with a sugar many possible answers including bone density, coronary heart disease/blood clots/internal bleeding/tissue damage
<b>Total</b>			<b>6</b>	

Question		Expected Answers	Marks	Rationale
3	a	2 from: to make sure he is likely to survive the procedure/no further injury/ benefit outweighs risk/ to ensure he understands the risks involved/ so he can give his consent/ to avoid wastage of money / resources (2)	2	look for risk vs. benefit
	b	C	1	
	c	advantages any two from:- will keep him alive for longer/ heart transplants are not easy to find/may be waiting long time/better quality of life (while waiting) (2)	2	looking for two different advantages and two different disadvantages
		disadvantages any two from:- only temporary/all procedures carry a risk eg infection /does not want to swap his heart for a mechanical one/would mean surviving two major operations/named risk associated with artificial heart such as blood clots(2)	2	<b>ignore</b> body may reject
	d	best/specialist doctors (1) allows resources to be focussed in one area/best equipment (1) more efficient economically / in use all the time owtte (1)	3	1 mark associated with staff 1 mark associated with resources/equipment/facilities  1 mark associated with cost effectiveness  <b>allow</b> reverse argument 'centre of excellence' = 1 mark
	e	2 from;- pulse rate; before and after exercise to check recovery rate; ECG; check heart function; blood pressure; measurements to check heart functioning; oxygen monitor; check level of oxygen in blood; body temperature; to check for infection; (2)	2	looking for two different examples or one example with a good explanation
<b>Total</b>			<b>12</b>	

Question		Expected Answers	Marks	Rationale
4	a	2 from:- some people will be affected by the campaign and stop; these are less likely to go on to develop smoking related disorders; saves money for the health service (therefore more is available for other parts of NHS); reduces victims of passive smoking; (2)	2	looking for a logical argument to show that campaigns can cut spending in the long term
	b	1 mark for specific example: (1) 1 mark for further description of campaign: (1)	2	examples do not drink and drive/swine flu/giving blood/obesity/FRANK etc. look for the effect the campaign has on the individual eg. obesity causes increased risk of heart disease/drink driving gives a criminal record etc or details of how the campaign is run eg. leaflets, TV adverts  <b>ignore</b> reference to smoking campaigns
		<b>Total</b>	<b>4</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	41 divided by 1.5 squared 18.2 (2)	2	<b>allow</b> 1 mark for the calculation if correct method <b>allow</b> 2 marks if no calculation but correct answer
		ii	underweight / eat more protein / try to increase body mass(1)	1	<b>allow</b> ecf
			<b>Total</b>	<b>3</b>	
			<b>Paper total</b>	<b>36</b>	

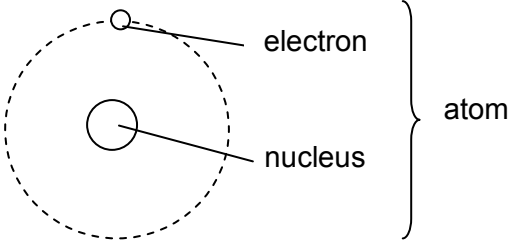
# A325/01 Foundation

Question		Expected Answers	Marks	Rationale										
1	a		2	<p>2 left hand lines correct = 1 mark 2 right hand lines correct = 1 mark</p> <p>do not penalise a genuine attempt to erase a line and redraw a new line.</p> <p><b>allow</b> numbered boxes instead of lines</p>										
	b	<table border="1"> <tbody> <tr> <td>car parking facilities for workers</td> <td></td> </tr> <tr> <td>good health and safety procedures</td> <td>✓</td> </tr> <tr> <td>looking after and checking equipment</td> <td>✓</td> </tr> <tr> <td>making sure staff are well trained</td> <td>✓</td> </tr> <tr> <td>lots of staff to carry out all the procedures</td> <td></td> </tr> </tbody> </table>	car parking facilities for workers		good health and safety procedures	✓	looking after and checking equipment	✓	making sure staff are well trained	✓	lots of staff to carry out all the procedures		3	<p>if more than three boxes are ticked then each incorrect box loses one mark from the total for the question the candidate cannot score less than zero</p>
car parking facilities for workers														
good health and safety procedures	✓													
looking after and checking equipment	✓													
making sure staff are well trained	✓													
lots of staff to carry out all the procedures														
<b>Total</b>			<b>5</b>											

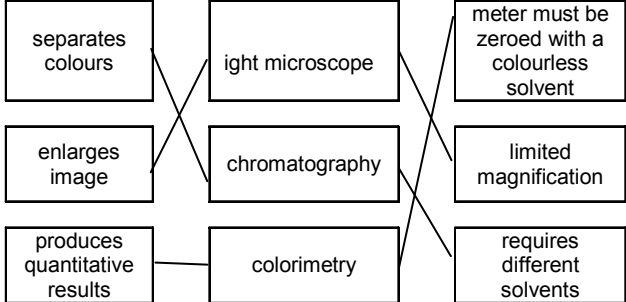


2	a	any three from: drawings; photographs / scanned image; videos / cctv; plaster cast / finger print; (3)	3	<b>allow</b> equipment used eg. camera  these marks are about taking the image and <b>not</b> storing it <b>allow</b> mobile phone either as still photo or video but not both
	b	i	answer between 31 and 34 mm; (1) 32 - 33 mm; (1)	2  if answer = 32 - 33 then 2 marks 3.2 – 3.3 = 1 mark 3.2 – 3.3 cm = 2 marks
		ii	nick / dint etc out of hammer head; (1)	1  <b>allow</b> any indication of correct answer shown on the drawing <b>allow</b> idea of something on hammer head as well as nick answer must refer to <b>this</b> hammer <b>ignore</b> answers that refer to blood, DNA etc. <b>ignore</b> shape <b>of</b> hammer but accept shape <b>on</b> hammer
		iii	B; (1)	1
		<b>Total</b>		<b>7</b>

3	a	specimen OR blood OR sample onto slide; add stain; add (cover) slip; idea of using microscope; sequence correct;	4	<p><b>note</b> some candidates are using the word stain to mean the blood stain from which the specimen is taken- this does not score the “add stain” mark but could get specimen onto slide mark if the meaning is clear do not confuse the ‘stain on slide’ for 2 marks.</p> <p>wording must make sense but may all be written in just two or three sentences, so <b>ignore</b> ‘steps’ and read whole sequence. <b>ignore</b> irrelevant additional information</p> <p>all four steps correct = 3 marks three steps correct = 2 marks one/two steps correct = 1 mark correct sequence = 1 mark</p> <p>if candidates just list the words = 0 marks <b>allow</b> alternative words such as sample for specimen</p> <p>if irrigation used then marking points 2 and 3 can be reversed for sequence</p>
	b	200; (1)	1	
<b>Total</b>			<b>5</b>	

4	a		2	3 correct = 2 2 or 1 correct = 1 0 correct = 0										
	b	<table border="1" data-bbox="387 598 862 853"> <tr> <td>is more expensive to buy</td> <td><input type="checkbox"/></td> </tr> <tr> <td>has a more powerful eyepiece lens</td> <td><input type="checkbox"/></td> </tr> <tr> <td>uses light instead of electrons</td> <td><input type="checkbox"/></td> </tr> <tr> <td>has greater magnification</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>is more difficult to use</td> <td><input type="checkbox"/></td> </tr> </table>	is more expensive to buy	<input type="checkbox"/>	has a more powerful eyepiece lens	<input type="checkbox"/>	uses light instead of electrons	<input type="checkbox"/>	has greater magnification	<input checked="" type="checkbox"/>	is more difficult to use	<input type="checkbox"/>	1	if more than one box is ticked then box scores zero <b>allow</b> any other clearly identified correct response eg. shading in the box
is more expensive to buy	<input type="checkbox"/>													
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uses light instead of electrons	<input type="checkbox"/>													
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is more difficult to use	<input type="checkbox"/>													
	c	<table border="1" data-bbox="414 933 862 1181"> <tr> <td>images are produced on a TV screen</td> <td><input type="checkbox"/></td> </tr> <tr> <td>living material cannot be viewed</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>very thin samples can be viewed</td> <td><input type="checkbox"/></td> </tr> <tr> <td>materials must be dried and fixed</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>very high magnification can be used</td> <td><input type="checkbox"/></td> </tr> </table>	images are produced on a TV screen	<input type="checkbox"/>	living material cannot be viewed	<input checked="" type="checkbox"/>	very thin samples can be viewed	<input type="checkbox"/>	materials must be dried and fixed	<input checked="" type="checkbox"/>	very high magnification can be used	<input type="checkbox"/>	2	if more than two boxes are ticked then each incorrect box loses one mark from the total for the question the candidate cannot score less than zero
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<b>Total</b>			<b>5</b>											

5	a	G; (1)	1											
	b	<table border="1"> <tr> <td>uses electrophoresis</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>produce an image of the suspects face in profile</td> <td><input type="checkbox"/></td> </tr> <tr> <td>can be used on small biological samples</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>joins together strands of DNA</td> <td><input type="checkbox"/></td> </tr> <tr> <td>separates the DNA into different colours</td> <td><input type="checkbox"/></td> </tr> </table>	uses electrophoresis	<input checked="" type="checkbox"/>	produce an image of the suspects face in profile	<input type="checkbox"/>	can be used on small biological samples	<input checked="" type="checkbox"/>	joins together strands of DNA	<input type="checkbox"/>	separates the DNA into different colours	<input type="checkbox"/>	2	if more than two boxes are ticked then each incorrect box loses one mark from the total for the question the candidate cannot score less than zero
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can be used on small biological samples	<input checked="" type="checkbox"/>													
joins together strands of DNA	<input type="checkbox"/>													
separates the DNA into different colours	<input type="checkbox"/>													
	c	two from: paternity testing / pedigree testing; identifying OR match to a person who is a suspect OR victim; diagnosing genetic disease; identifying contents in food; (2)	2	<b>ignore</b> matches blood-groups and fingerprints marks are for <b>uses</b> rather than <b>how</b> it is used <b>ignore</b> 'find' a suspect  if example of disease given it must be correct <b>ignore</b> testing food										
		<b>Total</b>	<b>5</b>											

6	a	all five plots correct; (1) line of best fit straight <u>and</u> goes through 0 and all pre-plotted points; (1)	2	plots to within less than half a square of accuracy								
	b	ring around 0.62; (1)	1	<b>note</b> you may have to reduce image size to include the table <b>allow</b> on graph or in table <b>allow</b> ring around outlier result even if plotted incorrectly								
	c	0.35 – 0.37; (1) g / dm <sup>3</sup> ; (1)	2									
	d	<table border="1" data-bbox="412 544 810 746"> <tr> <td>the shade of a colour</td> <td><input type="checkbox"/></td> </tr> <tr> <td>the age of a substance</td> <td><input type="checkbox"/></td> </tr> <tr> <td>the name of a substance</td> <td><input type="checkbox"/></td> </tr> <tr> <td>the intensity of a colour</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	the shade of a colour	<input type="checkbox"/>	the age of a substance	<input type="checkbox"/>	the name of a substance	<input type="checkbox"/>	the intensity of a colour	<input checked="" type="checkbox"/>	1	if more than one box is ticked then box scores zero <b>allow</b> any other clearly identified correct response eg. shading in the box
the shade of a colour	<input type="checkbox"/>											
the age of a substance	<input type="checkbox"/>											
the name of a substance	<input type="checkbox"/>											
the intensity of a colour	<input checked="" type="checkbox"/>											
	e		3	6 or 5 = 3marks 4 or 3 = 2 marks 2 or 1 = 1 mark  do not penalise a genuine attempt to erase a line and redraw a new line.  <b>allow</b> numbered boxes instead of lines								
<b>Total</b>			<b>9</b>									
<b>Paper total</b>			<b>36</b>									

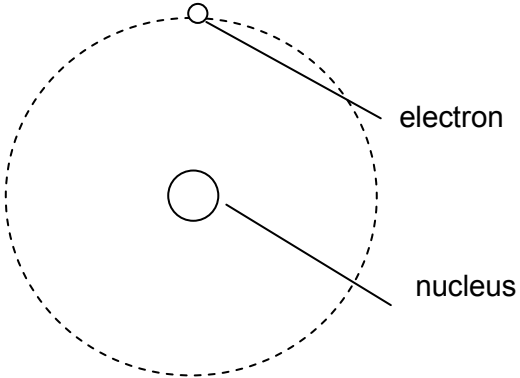
# A325/02 Higher

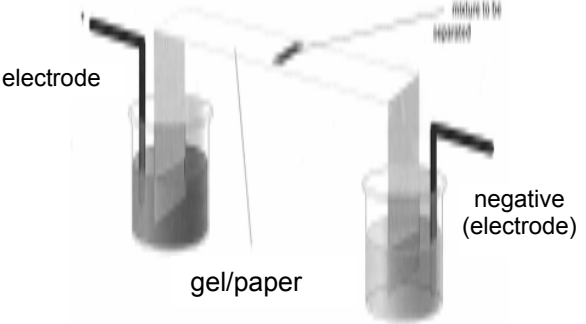
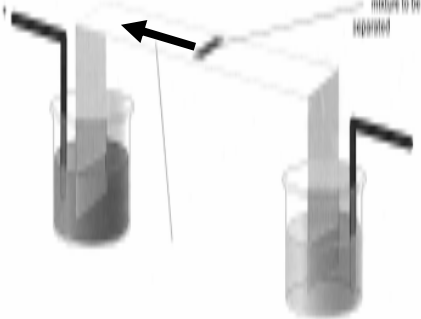
Question		Expected Answers	Marks	Rationale										
1	a		2	three left hand lines correct = 1 mark three right hand lines correct = 1 mark										
	b	<table border="1"> <tbody> <tr> <td>working with other laboratories</td> <td></td> </tr> <tr> <td>good health and safety procedures</td> <td>✓</td> </tr> <tr> <td>using regular proficiency tests</td> <td>✓</td> </tr> <tr> <td>making sure staff are well trained</td> <td>✓</td> </tr> <tr> <td>waiting for accreditation</td> <td></td> </tr> </tbody> </table>	working with other laboratories		good health and safety procedures	✓	using regular proficiency tests	✓	making sure staff are well trained	✓	waiting for accreditation		2	three correct ticks = 2 marks two correct ticks = 1 mark one correct tick = 0  if more than three boxes are ticked then each incorrect box loses one mark from the total for the question the candidate cannot score less than zero
working with other laboratories														
good health and safety procedures	✓													
using regular proficiency tests	✓													
making sure staff are well trained	✓													
waiting for accreditation														
<b>Total</b>			<b>4</b>											

2	a	any three from drawings; photographs/scanned image; videos/cctv; plaster cast/finger print; (3)	3	<b>allow</b> equipment used eg. camera  these marks are about taking the image and <b>not</b> storing it <b>allow</b> mobile phone either as still photo or video but not both
	b	i	answer between 31 and 34 mm; (1) 32 - 33 mm; (1)	2  if answer = 32 - 33 then 2 marks 3.2 – 3.3 = 1 mark 3.2 – 3.3 cm = 2 marks
		ii	nick out of hammer head; (1)	1  <b>allow</b> any indication of correct answer shown on the drawing <b>allow</b> idea of something on hammer head as well as nick answer must refer to <b>this</b> hammer <b>ignore</b> answers that refer to blood, DNA etc. <b>ignore</b> shape <b>of</b> hammer but accept shape <b>on</b> hammer
	c		B; (1)	1
		<b>Total</b>		<b>7</b>

3	a	specimen OR blood OR sample onto slide; add stain; add (cover)slip; idea of using microscope; sequence correct;	4	<p><b>note</b> some candidates are using the word stain to mean the blood stain from which the specimen is taken -this does not score the "add stain" mark but could get specimen onto slide mark if the meaning is clear do not confuse the 'stain on slide' for 2 marks</p> <p>wording must make sense but may all be written in just two or three sentences, so <b>ignore</b> 'steps' and read whole sequence <b>ignore</b> irrelevant additional information</p> <p>all four steps correct = 3 marks three steps correct = 2 marks one/two steps correct = 1 mark correct sequence = 1 mark</p> <p>if candidates just list the words = 0 marks <b>allow</b> alternative words such as 'sample' for specimen</p> <p>if irrigation used then marking points 2 and 3 can be reversed for sequence</p>
	b	200; (1)	1	
<b>Total</b>			<b>5</b>	



4	a		1	2 correct = 1 1 correct = 0  <b>allow</b> nucleons, protons or neutrons for nucleus										
	b	<table border="1" data-bbox="365 770 931 1023"> <tr> <td>produce a very focused image</td> <td><input type="checkbox"/></td> </tr> <tr> <td>produce separate images of closely spaced details</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>resolve problems by identifying specimens</td> <td><input type="checkbox"/></td> </tr> <tr> <td>magnify thousands of times</td> <td><input type="checkbox"/></td> </tr> <tr> <td>resolve problems by identifying the source of the specimen</td> <td><input type="checkbox"/></td> </tr> </table>	produce a very focused image	<input type="checkbox"/>	produce separate images of closely spaced details	<input checked="" type="checkbox"/>	resolve problems by identifying specimens	<input type="checkbox"/>	magnify thousands of times	<input type="checkbox"/>	resolve problems by identifying the source of the specimen	<input type="checkbox"/>	1	more than one box is ticked = 0. <b>allow</b> any other clearly identified correct response eg. shading in the box.
produce a very focused image	<input type="checkbox"/>													
produce separate images of closely spaced details	<input checked="" type="checkbox"/>													
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magnify thousands of times	<input type="checkbox"/>													
resolve problems by identifying the source of the specimen	<input type="checkbox"/>													
	c	<table border="1" data-bbox="376 1102 927 1353"> <tr> <td>sharp three dimensional images</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>images deep within a substance</td> <td><input type="checkbox"/></td> </tr> <tr> <td>images of fields</td> <td><input type="checkbox"/></td> </tr> <tr> <td>both close and far parts of the specimen in focus</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>sharp focus across the width of the specimen</td> <td><input type="checkbox"/></td> </tr> </table>	sharp three dimensional images	<input checked="" type="checkbox"/>	images deep within a substance	<input type="checkbox"/>	images of fields	<input type="checkbox"/>	both close and far parts of the specimen in focus	<input checked="" type="checkbox"/>	sharp focus across the width of the specimen	<input type="checkbox"/>	2	each correct tick = 1 mark  if more than two boxes are ticked then each incorrect box loses one mark from the total for the question the candidate cannot score less than zero
sharp three dimensional images	<input checked="" type="checkbox"/>													
images deep within a substance	<input type="checkbox"/>													
images of fields	<input type="checkbox"/>													
both close and far parts of the specimen in focus	<input checked="" type="checkbox"/>													
sharp focus across the width of the specimen	<input type="checkbox"/>													
<b>Total</b>			<b>4</b>											

5	a		3	<p>gel correct = 1 mark  either side labelled as electrode or RH electrode cathode/LH electrode anode = 1 mark  right hand electrode labelled negative = 1 mark</p>
	b		1	<p>arrow on or adjacent to horizontal part of the gel, starting to the left of the mixture and pointing to the left = 1 mark  <b>reject</b> if any arrows are incorrect</p>
	c	<p>size / mass(of particle/ion); (1)  (size of) charge (of particle/ion); (1)</p>	2	<p><b>allow</b> time and idea of applied voltage (eg. electric field) for 2 marks  <b>allow</b> buffers/pH as alternative to charge  <b>ignore</b> strength/temperature/<b>applied</b> charge  <b>ignore</b> procedural errors eg. moving plate  <b>not</b> just different ions</p>
<b>Total</b>			<b>6</b>	

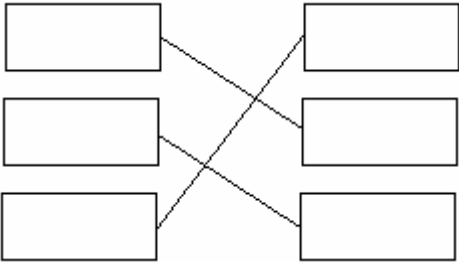
6	a	<p>axis orientation correct (concentration on x axis) and labelled; (1)</p> <p>plots correct; (1)</p> <p>line of best fit drawn through zero; (1)</p>	3	<p>first mark is for correct orientation of axes so can ignore units and numbers</p> <p><b>allow</b> points within half a square non-linear scales/no numbers on scales cannot score points must match axes as labelled</p> <p>i.e. single line, through all correct points except outlier if point(s) plotted incorrectly look for line of best fit drawn through origin - if no numbers on scale this cannot be given as origin not shown</p>	3								
	b	<table border="1" data-bbox="405 639 936 868"> <tr> <td>The solution is more concentrated than it should be.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Some material was spilt when making up this solution.</td> <td></td> </tr> <tr> <td>All readings show a systematic error.</td> <td></td> </tr> <tr> <td>Some water was left in the sample holder after a previous test.</td> <td></td> </tr> </table>	The solution is more concentrated than it should be.	✓	Some material was spilt when making up this solution.		All readings show a systematic error.		Some water was left in the sample holder after a previous test.		1	more than one box ticked = 0	1
The solution is more concentrated than it should be.	✓												
Some material was spilt when making up this solution.													
All readings show a systematic error.													
Some water was left in the sample holder after a previous test.													
	c	i	1	<p>horizontal line at <b>absorbance</b> of 0.28 (vertical if axes labelled the wrong way round) which meets line of graph plus line from graph to concentration axis tolerance should be less than half a square unlabelled axes cannot score</p>	1								
		ii	1	<p>yes - graph shows this result <b>or</b> no – graph does not show this result <b>or</b> no – there may be a (random or systematic) error (in producing the graph); (1)</p>	1								
<b>Total</b>			<b>6</b>										

7	a	89.7; 90.1; (1)	1	<b>allow</b> either way round	1										
	b	i	1	more than one box ticked = 0	1										
		<table border="1"> <tr> <td>the scientist is not sure how to carry out the procedure</td> <td></td> </tr> <tr> <td>repeating the same experiment several times gives different values</td> <td>✓</td> </tr> <tr> <td>the error is calculated by averaging all of the results</td> <td></td> </tr> <tr> <td>the results are consistent but not accurate</td> <td></td> </tr> <tr> <td>all of the results are accurate and precise</td> <td></td> </tr> </table>	the scientist is not sure how to carry out the procedure		repeating the same experiment several times gives different values	✓	the error is calculated by averaging all of the results		the results are consistent but not accurate		all of the results are accurate and precise				
the scientist is not sure how to carry out the procedure															
repeating the same experiment several times gives different values	✓														
the error is calculated by averaging all of the results															
the results are consistent but not accurate															
all of the results are accurate and precise															
		ii	2	<p><b>allow</b> an example of a systematic error eg. calibration of an instrument  <b>allow</b> lack of checking/calibrating equipment/machines  <b>allow</b> averages are wrong  <b>allow</b> same wrong results each time</p> <p>if systematic error not identified then <b>allow</b> 1 mark for any example of an error in collection, recording or treatment of results from an investigation eg. mis-plotting data, miscalculation of data, operator error, faulty equipment  <b>reject</b> errors unrelated to an investigation eg. spelling errors, unforced errors</p>	2										
		<b>Total</b>	<b>4</b>												
		<b>Paper total</b>	<b>36</b>												

# A326/01 Foundation

Question		Expected Answers	Marks	Rationale
1	a		2	camera and microphone in either input block for 1 mark screen in output block for 1 mark
	b	any professionally qualified person in communications eg. <ul style="list-style-type: none"> <li>• TV repair person</li> <li>• telephone engineer</li> <li>• mobile phone salesperson</li> <li>• electronic engineer</li> <li>• computer serviceperson</li> <li>• radio producer/editor</li> <li>• satellite TV engineers</li> </ul>	1	look for someone earning a living through running, repairing, selling or providing a service in communications - and requiring some formal and necessary training  <b>allow</b> named actors, presenter, newsreader, disc jockey ...
	c	pulses of infrared; (1)	1	
	d		2	correct pattern of ticks and blanks for 2 marks one mistake for 1 mark  a mistake is <ul style="list-style-type: none"> <li>• a tick in the wrong place</li> <li>• a missing tick</li> <li>• an extra tick</li> </ul>
		<b>Total</b>	<b>6</b>	

Question			Expected Answers	Marks	Rationale
2	a	i	to stop others getting hold of personal data eg. bank details; (1)	1	<b>allow</b> consequences of lack of encryption eg. theft
		ii	any one of the following: <ul style="list-style-type: none"> <li>• email</li> <li>• mobile phones</li> <li>• police communications</li> <li>• armed forces communications</li> <li>• online banking (eg. ATM)</li> <li>• ebay (eg.paypal)</li> <li>• TV channels (eg. Sky)</li> </ul>	1	<b>not</b> internet shopping  <b>allow</b> any context where security of details is important
	b	i	any electronic storage which could be written to in this context eg. USB (memory stick), floppy disc, flash memory card, magnetic tape, CD ...(1)	1	<b>not</b> hard drive, MP3 players, Ipod, phone... <b>allow</b> mobile (phone), blackberry, PDA ...
		ii	words; (1) binary; (1) bit rate; (1)	3	each correct word = 1 mark
<b>Total</b>				<b>6</b>	

Question		Expected Answers	Marks	Rationale
3	a	modulates / digitises; (1) transmits; (1)	2	each correct word = 1 mark
	b	i so that he can talk to the other guards (on the same channel); (1)	1	<b>allow</b> to be on same wavelength / frequency as others <b>allow</b> so as not to interfere with other people
		ii VHF; (1)	1	
	c		2	correct pattern for 2 marks one or two mistakes for 1 mark  a mistake is <ul style="list-style-type: none"> <li>• a missing link</li> <li>• a link in the wrong place</li> </ul>
	d	i so that he can walk where he likes (owtte); (1)	1	<b>allow</b> any reference to portability <b>allow</b> no wires to get in the way <b>allow</b> safer (less risk of shock) <b>allow</b> carries on working in a power cut
		ii power doesn't run down / costs less / won't run out / no need to recharge; (1)	1	<b>not</b> higher power
<b>Total</b>			<b>8</b>	

Question		Expected Answers	Marks	Rationale
4	a		2	correct line from top box for 1 mark either or both lines from bottom box for 1 mark
	b		2	correct pattern for 2 marks one mistake for 1 mark  a mistake is <ul style="list-style-type: none"> <li>• a tick in the wrong place</li> <li>• an extra tick</li> <li>• a missing tick</li> </ul>
	c	same chip is used many different ways / economies of scale (owtte) / one chip can replace lots of others; (1)	1	<b>allow</b> anything which shows understanding of the term "programming" in the context of electronic devices eg. can be upgraded, made to do a different task , can be reused...
		<b>Total</b>	<b>5</b>	



Question		Expected Answers	Marks	Rationale
5	a	any code used for transmission of electronic information eg. internet packet protocols, digital TV, DAB, email, ASCII, SMS (texting), Bluetooth, binary, encryption keys, Wi-Fi .....; (1)  probably any method which sends information in digital form from one place to another; (1)	2	<b>not</b> morse (code) each correct code = 1 mark (maximum 2) <b>allow</b> non-electronic codes eg. traffic lights, semaphore, whistles, alarm bells, Braille ... <b>allow</b> any communication system which uses a code eg. internet, SKY TV, intranet, mobile phones, fax, ... <b>not</b> printer, computer, keyboard on their own
	b	noise can be separated from signal at receiver (owtte); (1) signal can be manipulated / compressed / encrypted; (1)	2	each correct advantage for 1 mark <b>not</b> faster / cheaper <b>allow</b> better quality / no errors
		<b>Total</b>	<b>4</b>	

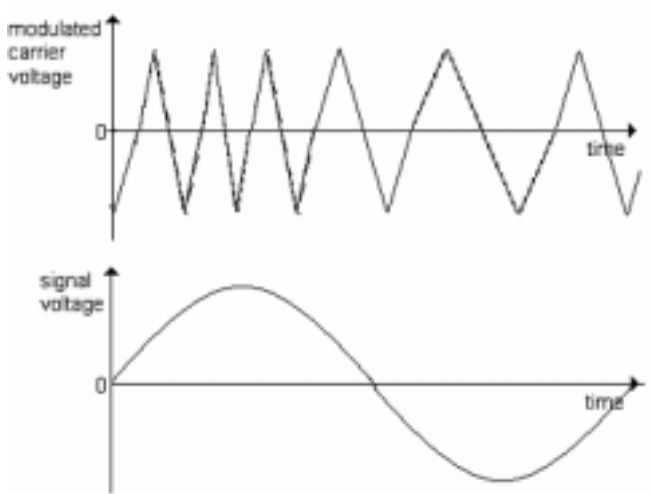
Question		Expected Answers	Marks	Rationale
6	a	<pre> graph LR     A[microphone] --&gt; B[amplifier]     B --&gt; C[loudspeaker]     A --- A_label[input]     B --- B_label[processor]     C --- C_label[output] </pre>	2	each correct box for 1 mark <b>allow</b> speaker <b>not</b> sound input, sound output ...
	b	amplitude; (1) alternating; (1)	2	each correct word = 1 mark
	c	passed a standard test for eg. function / safety / durability ...; (1)	1	<b>allow</b> safe to use / will do its job <b>allow</b> the idea that it has been checked <b>not</b> kitemark/BSA without qualification
	d	example eg. TV, mobile, FM radio, Wi-Fi, Bluetooth; (1) reason eg. don't need to be connected by cable / allows mobility / long distance communication; (1)	2	<b>allow</b> radio if enough to imply broadcast <b>allow</b> valid reason without an example <b>not</b> easy to use / cheap / fast
		<b>Total</b>	<b>7</b>	
		<b>Paper total</b>	<b>36</b>	

## A326/02 Higher

Question		Expected Answers	Marks	Rationale
1	a	<p>any code used for transmission of electronic information eg. internet packet protocols, digital TV, DAB, email, ASCII, SMS (texting), Bluetooth, binary, encryption keys, Wi-Fi .... ; (1)</p> <p>probably any method which sends information in digital form from one place to another; (1)</p>	2	<p><b>not</b> Morse (code) each correct code = 1 mark (maximum 2) <b>allow</b> non-electronic codes eg. traffic lights, semaphore, whistles, alarm bells, Braille <b>allow</b> any communication system which uses a code eg. internet, SKY TV, intranet, mobile phones, fax, ... <b>not</b> printer, computer, keyboard on their own</p>
	b	<p>noise can be separated from signal at receiver (owtte); (1) signal can be manipulated / compressed / encrypted; (1)</p>	2	<p>each correct advantage = 1 mark (maximum 2) <b>not</b> faster / cheaper <b>allow</b> better quality / no errors</p>
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Rationale
2	a	<pre> graph LR     A[microphone input] --&gt; B[amplifier processor]     B --&gt; C[loudspeaker output] </pre>	2	each correct box = 1 mark  <b>allow</b> speaker  <b>not</b> sound input, sound output ...
	b	amplitude; (1) alternating; (1)	2	each correct word = 1 mark
	c	passed a standard test for eg. function / safety / durability ...; (1)	1	<b>allow</b> safe to use / will do its job <b>allow</b> the idea that it has been checked <b>not</b> kitemark/BSA without qualification
	d	example eg. TV, mobile, FM radio, Wi-Fi, Bluetooth; (1) reason eg. don't need to be connected by cable / allows mobility / long distance communication; (1)	2	<b>allow</b> radio if enough to imply broadcast <b>allow</b> valid reason without an example <b>not</b> easy to use / cheap / fast
		<b>Total</b>	<b>7</b>	

Question		Expected Answers	Marks	Rationale	
3	a		2	<p>microphone and camera in either box on the left = 1 mark  <b>allow</b> video recorder or sound recording</p> <p><b>allow</b> TV (set) / screen / monitor / (TV) receiver = 1 mark</p>	
	b	<p>any of the following for (1) each, maximum of (2)</p> <ul style="list-style-type: none"> <li>• people are in the editing suite / studio</li> <li>• they direct what the inputs pick up</li> <li>• they control what goes out to the link</li> <li>• they mix the signals together</li> <li>• they edit the program</li> </ul>	2	1 mark per statement (maximum 2)	
	c	i	infrared (light) / light; (1)	1	
		ii	<p>example: internet, intranets in offices, telephone; (1)</p> <p>reason: networks/ handle large volumes of data / excellent signal-to-noise ratio / very secure / no crosstalk; (1)</p>	2	<p>example for 1 mark  reason for 1 mark  <b>allow</b> fast / high speed</p>
	d		<p>all of the information is sent; (1)</p> <p>simpler circuitry can be employed; (1)</p>	2	<p><b>not</b> cheaper / faster / easier  <b>allow</b> easier to transmit / receive</p>
<b>Total</b>			<b>9</b>		

Question		Expected Answers	Marks	Rationale	
4	a	multiply length of one cycle by time per division / measure time for one cycle; (1) divide into 1 to find frequency; (1)	2	<b>allow</b> a worked example or annotated sketch of cro trace <b>allow</b> wave instead of cycle	
	b	correct substitution $V = 0.56$ , $R = 22$ ; (1) evaluation: $I = 0.025$ A (1)	2	no ecf for incorrect substitution correct answer for [2]	
	c	turns off the power; (1) when current in Sally; (1)	2	<b>allow</b> mains, electricity <b>not</b> 'the equipment' <b>allow</b> when Sally gets a shock / electrocuted	
<b>Total</b>			<b>6</b>		
5	a		2	top graph has to be higher frequency, (constant amplitude) alternating signal (any shape) with frequency which increases and decreases in step with signal voltage for 1 mark  bottom graph: any alternating signal for 1 mark any shape, number of cycles, amplitude, frequency	
	b	i	300 MHz to 900 MHz; (1)	1	<b>allow</b> any value in the range
		ii	range of frequencies needed (to send the modulated carrier); (1)	1	<b>not</b> just width of the frequency band
	c	ferrite rod because it is compact (owtte); (1)	1	must have reason as well as aerial type	
<b>Total</b>			<b>5</b>		

Question		Expected Answers	Marks	Rationale
6	a	1024	1	
	b	any sensible example, provided the reason describes the consequences of lack of security eg. armed forces, police, ATM, mobile phone	1	<b>not</b> internet or computer / file password needs both example <b>and</b> reason for 1 mark
	c	reduces size of file (to reduce transmission time)	1	<b>allow</b> speed up transmission time
	d	takes in data / information / signals (from inputs / other processors) (1) changes it and passes it on (to outputs / other processors) (1)	2	each point worth 1 mark look for high grade responses which clearly match the expected answer
		<b>Total</b>	<b>5</b>	
		<b>Paper Total</b>	<b>36</b>	

## A334/01 Foundation

Question			Expected Answers		Marks	Rationale
1	a	i	air		1	2 or more ticks = 0
			glucose	✓		
			water			
		ii	carbon dioxide		1	2 or more ticks =0
	carbon monoxide					
	oxygen		✓			
		iii	aerobic	✓	1	2 or more ticks =0
	anaerobic					
	aseptic					
		iv	stirrers		1	2 or more ticks =0
	bubbles of air		✓			
	minerals					
	<b>b</b>	any two from: dries it; kills <i>Fusarium</i> / kills bacteria; so prevents contamination; light to handle/carry; easier to store; (2)			2	
	<b>c</b>	any two from: less/low fat; less/low / no cholesterol; more / high fibre; better for vegetarians; (2)			2	for more than two answers use list principle i.e. mark first two answers
<b>Total</b>					<b>8</b>	



Question		Expected Answers	Marks	Rationale	
2	a	<p>Cows are female cattle <input type="checkbox"/></p> <p>Cows die after producing milk <input type="checkbox"/></p> <p>Cows produce beef <input type="checkbox"/></p> <p>Cows still live after producing milk <input checked="" type="checkbox"/></p>	1	more than 1 tick = 0	
	b	<p>doing research on milk quality <input checked="" type="checkbox"/></p> <p>selling the milk <input type="checkbox"/></p> <p>collecting the milk from farms <input type="checkbox"/></p> <p>processing the milk <input type="checkbox"/></p>	1	more than 1 tick = 0	
	c	<p><b>acceptable factors</b>    <b>acceptable explanations</b></p> <p>subsidies                high(er) price</p> <p>low demand              low(er) price</p> <p>high demand             high(er) price</p> <p>fewer cows                high(er) price</p> <p>more cows                 low(er) price</p> <p>high productivity        low(er) price</p> <p>low productivity         high(er) price</p>	2	<p>either one reason plus explanation or two reasons</p> <p><b>allow</b> depends on quality (1) depends on quantity (1)</p> <p><b>reject</b> references to skimmed/ semi skimmed milk/ organic</p>	
	d	i	yoghurt/ cream/ cheese/butter/ ice cream	2	any three = 2marks, any one/ two =1 mark <b>allow</b> chocolate/ cake
		ii	yoghurt/ cheese; (1)	1	

Question		Expected Answers	Marks	Rationale
	iii	dehydration/ pasteurisation/ manufacturing; (1)	1	
	e	any two from: microorganisms/bacteria multiply/ grow/ reproduce; contaminate; with waste/ toxic products; can cause disease/ not safe to eat; make a different product; rot/decay/ become mouldy; change taste; smell bad; (2)	2	<b>reject</b> not healthy/ go off/ reference to sell by date
		<b>Total</b>	<b>10</b>	
3	a	any two from: use its sperm; to fertilise <u>large female</u> pig; to get more pigs like him/ produce large pigs; breed its largest offspring; continue/ repeat for many generations; (2)	2	
	b	C (1); A (1); B (1);	3	
	c	any two from: sperm put near egg / inside female; at correct time; selected good quality sperm; (2)	2	<b>reject</b> (artificial insemination programme)
		<b>Total</b>	<b>7</b>	

Question		Expected Answers	Marks	Rationale
4	a	B; (1)	1	<b>allow</b> correct ringed equation
	b	i	2	1 mark for condition 1 mark for effect condition -answer must state a condition so reject parts of hut effect- answer can be marked if condition (water, temperature, carbon dioxide) implied  <b>reject</b> answers referring to soil <b>allow</b> for condition.....optimum for best/ more growth
		ii	2	2 or 3 correct =2 1 correct =1
			5	

Question			Expected Answers			Marks	Rationale
	<b>c</b>	<b>i</b>	year	mass of rhubarb crop from garden in kg	mass of rhubarb crop from hut in kg	2	
			1	30.5	40.1		
			2	28.5	44.5		
			3	23.5	46.2		
			total mass	<b>82.5</b>	130.8		
			average mass	27.5	<b>43.6</b>		
		<b>ii</b>	any two from: better/ optimum / controlled/ favourable/perfect growing conditions ; named condition eg. warmth/ amount of water; less pests/ insects; less disease; (2)			2	<b>allow</b> not affected by weather
		<b>iii</b>	any two from: softer; tender to eat; better quality/ condition; out of season/ earlier in year; (2)			2	<b>ignore</b> organic/ heavier/ bigger/better
			<b>Total</b>			<b>11</b>	
			<b>Paper total</b>			<b>36</b>	

## A334/02 Higher

Question		Expected Answers	Marks	Rationale
1	a	carbon dioxide; (1) oxygen; (1)	2	<b>allow</b> correct symbols
	b	<p><b>i</b></p> <p><b>condition...</b> water  <b>effect...</b> less water less photosynthesis/ less growth; ora  <b>condition...</b>warmth/ temperature  <b>effect...</b>less warmth less photosynthesis/ less growth;ora  too high a temperature enzymes destroyed;  <b>condition...</b>(amount) of carbon dioxide  <b>effect...</b>less carbon dioxide less photosynthesis/ less growth ;ora</p>	2	<p>1 mark for condition  1 mark for effect  condition- answer must state a condition so reject parts of hut  effect- answer can be marked if condition (water, temperature, carbon dioxide) implied</p> <p><b>reject</b> answers referring to soil  <b>allow</b> for condition.....optimum for best/ more growth</p>
		<p><b>ii</b></p>	2	<p>2 or 3 correct =2  1 correct = 1</p>
	c	<p><b>i</b></p> <p>amount of contained water varies/ contains different amounts of water;</p>	1	
		<p><b>ii</b></p> <p>better/ optimum / controlled/ favourable/ perfect/growing conditions;  named condition eg. water/ warmth;  less pests/ insects;  less disease; (2)</p>	2	<p>any two  <b>ignore</b> light  <b>allow</b> affected by weather</p>
		<p><b>iii</b></p> <p>softer;  tender to eat;  better quality;  out of season/ earlier in year; (2)</p>	2	<p>any two  <b>ignore</b> organic/heavier/bigger/better</p>
<b>Total</b>			<b>11</b>	

Question		Expected Answers	Marks	Rationale
2	a	(glucose) source of energy/ food; (1) (air) for oxygen/ respiration; accept mixing of contents; (1)	2	<b>reject</b> breathe
	b	respiration releases energy, (cooling system) avoids (heat) killing <i>Fusarium</i> ; (1)	1	<b>allow</b> microorganisms for <i>Fusarium</i> <b>reject</b> cooling kills <i>Fusarium</i>
	c	advantages... product continuously made/ no time lost in emptying and cleaning; (1) disadvantages... cannot do small batches/ expensive to set up/ uses complicated controls; (1)	2	
	d	i	1	both required for one mark <b>reject</b> log
		ii	2	slope to roughly match that at B or steeper
		iii	1	<b>allow</b> a correct description of the method
		<b>Total</b>	<b>9</b>	

Question		Expected Answers	Marks	Rationale	
3	a	any two from: use its sperm; to fertilise <u>large female</u> pig; to get more pigs like him/ produce large pigs; breed its largest offspring; continue/ repeat for many generations; (2)	2		
	b	i	collection / extraction of sperm; (1) storage of sperm; (1) insertion of sperm; (1)	3	<b>allow</b> timing of insertion of sperm as a separate stage after insertion of sperm; <b>allow</b> screening of sperm as a separate stage after collection of sperm if there are two correct answers in the correct sequence <b>ignore</b> an incorrect one in between them .
		ii	fertilised egg/or egg fertilised by IVF (outside body); (1)  placed into uterus/womb of surrogate/ another pig/ animal; (1)	2	<b>reject</b> embryos fertilised
		iii	any two from: sperm put near egg/inside female; at correct time; selected good quality sperm; (2)	2	any two <b>reject</b> (artificial insemination programme)
		<b>Total</b>	<b>9</b>		

Question		Expected Answers	Marks	Rationale	
4	a	any two from: no pollination / bees linked to pollination; no reproduction; no seeds/ no fruits/ no crops/ no new plants/ plants die out; no honey; (2)	2	<b>reject</b> fertilisation of flowers/ no new flowers	
	b	i	any two from: change in genetic code; different enzymes produced; different enzymes result in different reactions/ products; (2)	2	
		ii	organisms DNA; (1) contains genetic material from a different/ another organism; (1)	2	
		iii	yeast to produce chymosin (for cheese making)	1	
		<b>Total</b>	<b>7</b>		
		<b>Paper total</b>	<b>36</b>		



## A335/01 Foundation

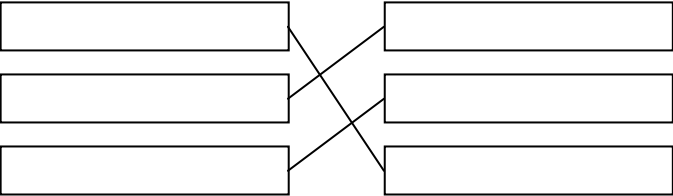
Question		Expected Answers	Marks	Rationale
1			6	<p>1 mark for each correct connection  <b>only allow</b> one line <u>from</u> each box  <b>allow</b> 'heating mantle → increasing the temperature.....'  <b>not</b> 'pipette → measuring the volume of a liquid approximately'.</p>
		<b>Total</b>	<b>6</b>	
2	a	pharmaceuticals; (1)	1	
	b	organic; (1) bulk; (1) ammonia; (1)	3	
	c	i	2	<b>allow</b> in either order <b>allow</b> correct symbols
		ii	1	
	d	any two from: developing / using more renewable resources; making efficient use of energy (owtte); reducing the amount of waste (owtte); (2)	2	<b>not</b> ideas of recycling/safety/damage to environment
		<b>Total</b>	<b>9</b>	

Question			Expected Answers	Marks	Rationale
3	a		(they have different levels of) <u>purity / quality</u> ; (1)	1	<b>not</b> any other terms (e.g. amount, grade, concentration)
	b	i	0.5 kg = 500 g / £9.36 ÷ 500 / 936 p ÷ 500 (=1.87 p for 1 g); (1) (1.87 x 66) = £ <u>1.23 / 123</u> p; (1)	2	correct answer gets both marks <b>allow</b> £1.24 or 124 p
		ii	(28 + 4 + 123) = £1.55 / 155 p ; (1)	1	<b>allow</b> ecf from 4bi ( answer to (b)(i) +32p)
		iii	they make it in larger quantities / chemicals cost less when bought in larger amounts / he needs to buy more than he needs (owtte); (1)	1	<b>allow</b> it is a bulk chemical
	c		baking powder; (1) cement powder; (1)	2	
			<b>Total</b>	<b>7</b>	
4	a	i	sulfuric acid; (1)	1	
		ii	corrosive; (1)	1	
	b		copper carbonate / copper oxide; (1) will <u>react</u> with the acid (owtte); (1)	2	<b>ignore</b> speed of reaction
	c		increase the temperature (owtte); (1) increase the concentration (of the acid); (1)	2	<b>allow</b> catalyst / stir/mix/shake <b>do not allow</b> different temperature/more acid
			<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Rationale
5	a	sulfuric acid + ammonia; (1) ammonium sulphate; (1)	2	<b>allow</b> 'ammonia + sulfuric acid' <b>not</b> ammonium for ammonia on LHS
	b	funnel; (1)	1	<b>not</b> filter on its own
	c	add universal indicator; (1) it will <u>change</u> colour / goes to green / shows pH 7 <u>on the scale</u> ;(1) or add phenolphthalein; (1) it will change (from pink) to colourless; (1) or remove a drop of the mixture and test on a piece of universal indicator paper; (1) (continue) until it turns it green; (1) or use a pH meter; (1) it will read 7; (1)	2	<b>allow</b> pH paper  <b>allow</b> 'smell the mixture carefully';(1) 'it will no longer smell of ammonia' (1)
	d	do not heat / set aside for a few days (owtte); (1) so the crystals grow slowly; (1)	2	
	e	endothermic	1	
		<b>Total</b>	<b>8</b>	
		<b>Paper Total</b>	<b>36</b>	

## A335/02 Higher

Question		Expected Answers	Marks	Rationale
1	a	funnel; (1)	1	<b>not</b> filter on its own
	b	add universal indicator; (1) it will <u>change</u> colour / goes to green / shows pH 7 <u>on the scale</u> (1); or add phenolphthalein; (1) it will change (from pink) to colourless; (1) or remove a drop of the mixture and test on a piece of universal indicator paper; (1) (continue) until it turns it green; (1) or use a pH meter; (1) it will read 7; (1)	2	<b>allow</b> pH paper  <b>allow</b> 'smell the mixture carefully';(1) 'it will no longer smell of ammonia'; (1)
	c	do not heat / set aside for a few days (owtte); (1) so the crystals grow slowly; (1)	2	
	d	endothermic; (1)	1	
		<b>Total</b>	<b>6</b>	

Question			Expected Answers	Marks	Rationale
2	a	i	(bulk) is <u>made / produced / processed</u> ; (1) on a <u>larger</u> scale (than a fine chemical); (1)	2	<b>allow</b> reverse argument <b>allow</b> correct explanation as to why fine chemicals are more expensive – for 1 mark
		ii	H <sub>2</sub> SO <sub>4</sub> ; (1)	1	all letters must be in capitals and numbers in subscript
	b		seasonal; (1) labour; (1) equipment; (1)	3	
	c		(2 + 4) x 1000 = <u>6000</u> ; (1)	1	
	d	i		3	1 mark for each correct link
		ii	<u>functional group</u> ; (1)	1	
	e		any two from: developing / using more renewable resources; making efficient use of energy (owtte); reducing the amount of waste (owtte); (2)	2	<b>not</b> ideas of recycling/safety/damage to environment
			<b>Total</b>	<b>13</b>	

Question		Expected Answers	Marks	Rationale	
3	a	(they have different levels of) <u>purity / quality</u> ; (1)	1	<b>not</b> any other terms (eg. amount, grade, concentration)	
	b	i	0.5 kg = 500 g / £9.36 ÷ 500 / 936 p ÷ 500 (=1.87 p for 1 g); (1) (1.87 x 66) = <u>£1.23 / 123</u> p; (1)	2	correct answer gets both marks. <b>allow</b> £1.24 or 124 p
		ii	they make it in larger quantities / chemicals cost less when bought in larger amounts / he needs to buy more than he needs (owtte); (1)	1	<b>allow</b> it is a bulk chemical
	c	any two from: baking powder; cement power; indigestion tablets; pain relief tablets; dry cake mix; sherbert; talcum powder; (2)	2	any two different answers for 1 mark each <b>allow</b> packet cake mix <b>allow</b> other correct answers	
<b>Total</b>			<b>6</b>		

Question		Expected Answers	Marks	Rationale
4	a	formation of a <u>solid</u> ; (1) from two soluble salts / forms in a solution (in a chemical reaction); (1)	2	must describe the process
	b	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">copper carbonate</div> <input type="checkbox"/> </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">lead sulfate</div> <input checked="" type="checkbox"/> (1)         </div> <div style="display: flex; align-items: center;"> <input checked="" type="checkbox"/> (1)         </div> <div style="display: flex; align-items: center;"> <input type="checkbox"/> </div>	2	
	c	i	1	
		ii	1	
		iii	2	correct answer gets both marks
		iv	1	
		v	2	<b>not</b> 'to purify' or 'to clean'
<b>Total</b>			<b>11</b>	
<b>Paper Total</b>			<b>36</b>	

# A336/01 Foundation

Question		Expected Answers	Marks	Rationale
1	a		3	
	b	B, C, A - in this order	2	all correct scores 2 marks one or two correct scores 1 mark
	c		2	mark from left box to right box, if two lines from left box then this box is incorrect. all correct scores 2 marks. one or two correct scores 1 mark.
<b>Total</b>			<b>7</b>	



2	a	i	← arrow pointing to left / away from tin / towards hand; (1)	1	if blank then check diagram for answer
		ii	does not move; (1)	1	
		iii	<p>wood</p> <p>metal</p> <p>low thermal conductance</p> <p>high thermal expansion</p> <p>high thermal conductance</p>	2	wood- low thermal conductance; metal - high thermal conductance;
	b		high thermal conductance/conductivity/ lets heat through better/good conductor; (1) low density/ light (owtte); (1)	2	eg. conducts quicker, heats up quicker, conducts more heat. if number from table given then it must be a comparison between Al and steel. <b>not</b> 'attracts more heat' watch out for incorrect reasoning eg. 'It has less tensile strength so it is lighter' is zero
			<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Rationale
3	a	safe bus windows– toughened glass; (1) flower vase – lead glass; (1) sunglasses – photochromic; (1)	3	
	b	lenses – transparent; (1) bathroom window- translucent; (1) mirror – reflective; (1)	3	<b>allow</b> transparent for mirror
		<b>Total</b>	<b>6</b>	
4	a	any three from: sensible set up which will compress mortar; method to increase compression; method to take a numerical measurement at failure point; repeat (for reliability); (3)	3	eg. squash mortar between hands = 1 mark place mortar in a G clamp and tighten = 2 marks add weights on top of mortar until mortar crumbles and take final weight = 3 marks if no compression then zero i.e. knocking over, breaking, beams between supports, cantilevers all zero
	b	steel-reinforced concrete; (1)	1	
	c	example of composite; (1) valid example of use of a composite material; (1)	2	use of the material must be correct for material given if material is not a composite then zero eg. carbon fibre composite in racing cars; fibre reinforced plastic in canoes; laminated glass in car windows; plywood/chip board in furniture; reinforced glass in door windows; not concrete, brick, gravel, cement, lead glass
		<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Rationale
5	a	real; (1) inverted; (1)	2	<b>allow</b> upright (on screen), upside down
	b	i	1	if no response check diagram
		ii	1	if no response check diagram
	c	i	1	
		ii	1	<b>allow</b> D, m <sup>-1</sup> , allow phonetic spelling eg. diobters
		<b>Total</b>	<b>6</b>	
6	a	i	1	<b>allow</b> elasticated, elastically, elasticity <b>not</b> flexible
		ii	1	<b>allow</b> plastically. <b>not</b> non-elastic or inelastic
	b	i	1	<b>allow</b> 114 – 126 (N)
		ii	1	<b>allow</b> 1.1(%) to 1.3(%) ecf, answer must be consistent with answer to 6b(i)
		iii	1	if (ii) is less than 1% then answer to (iii) must be 'no because it is permanently stretched'  eg. yes because it is a straight line, yes because graph shows a steady increase, yes because answer is less than answer 6b(ii) <b>allow</b> poor English but give for sensible reference to less than 1.2%/120N
		<b>Total</b>	<b>5</b>	
		<b>Paper Total</b>	<b>36</b>	

## A336/02 Higher

Question			Expected Answers	Marks	Rationale
1	a		real; (1) inverted; (1)	2	<b>allow</b> upright (on screen), upside down
	b	i	E; (1)	1	if no response check diagram
		ii	B; (1)	1	if no response check diagram
	c	i	shorter; (1)	1	
		ii	diopres; (1)	1	<b>allow</b> D, m <sup>-1</sup> , allow phonetic spelling eg. diobters
			<b>Total</b>	<b>6</b>	
2	a	i	elastic; (1)	1	<b>allow</b> elasticated, elastically, elasticity <b>not</b> flexible
		ii	plastic; (1)	1	<b>allow</b> plastically. <b>not</b> non-elastic or inelastic
	b	i	120 (N);	1	<b>allow</b> 114 – 126 (N)
		ii	1.2 (%); (1)	1	<b>allow</b> 1.1(%) to 1.3(%) ecf answer must be consistent with answer to 2b(i)
		iii	(yes) because returns to original shape up to 1.2 / answer to (ii); (1)	1	if (ii) is less than 1% then answer to (iii) must be no, because it is permanently stretched  eg. yes because it is a straight line, yes because graph shows a steady increase, yes because answer is less than answer 2b(ii) <b>allow</b> poor English, but give for sensible reference to less than 1.2%/120N
			<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Rationale
3	a	a solid solution; (1)	1	
	b	i	1	
		ii	1	<b>not</b> just 'heated'
		iii	1	
	c	i	1	<b>allow</b> National Tennis Federation, European Committee, FSA (Food Standards Agency), British Standards <b>reject</b> ISO
		ii	1	eg. bridge tested beyond normal load, appliance switched on for much longer than normal, overloaded climbing frame, food edible well beyond 'use by' date. <b>reject</b> simply a 'safety' test
		<b>Total</b>	<b>6</b>	

Question			Expected Answers	Marks	Rationale
4	a	i	add struts or supports/ improve shape / increase thickness / use stiffer or stronger materials/triangulation; (1)	1	<b>reject</b> named material without justification
		ii	one mark for each material/component with clear description of property and function	2	must have two materials/components for example: cycle helmet: rigid outer layer spreads force; lining crumples so absorbs energy; conductor & insulator examples acceptable
	b	i	reduced force; (1) increased time of collision; (1) same (change in) momentum; (1)	3	mark each point separately <b>allow</b> increased stopping distance
		ii	force x 0.3 = 1100 x 13.5; (1) force = 1100 x 13.5/0.3 or 14,850/0.3 ecf; (1) 49500 ecf; = (1)  accept -49,500 N	3	one mark each for substitution, rearrangement and evaluation <b>allow</b> one mark for evaluating 1100 x (their $\Delta v$ ) eg. 1100 x (13.5-0.3) = 14250 (bare 14250 worth 1 mark)
<b>Total</b>				<b>9</b>	

Question		Expected Answers	Marks	Rationale
5	a	polymer + example ) metals (and alloys) + example ) any 2 ceramics + example ) woods (and wood products) + example )	2	<b>reject</b> alloys as a class <b>reject</b> plastic as an example <b>allow</b> alloys as example of metals
	b	useful property of one component material; (1) drawback of one material; (1) useful property added by second component to overcome drawback; (1)	3	example must be a composite material otherwise zero for example: <i>concrete</i> strong in compression ( <b>not</b> low density); but weak in tension; steel wires add tensile strength ( <b>not</b> simply stronger); <i>fibres</i> strong in tension; but brittle; set in tough ( <b>not</b> strong) matrix;
	c	one mark for each property <b>with justification</b>	2	a context must be given for two marks answers should refer to <b>one</b> material with <b>two</b> properties - a composite is regarded as one material (ignore comments relating to components of composite) for one mark accept one property of one material cost acceptable if given clear context
	d	i	1	<b>allow</b> references to melting
		ii	2	no marks for simply mentioning expansion <b>reject</b> references to brittleness
		<b>Total</b>	<b>10</b>	
		<b>Paper Total</b>	<b>36</b>	

# Grade Thresholds

## General Certificate of Secondary Education

### Additional Applied Science (Specification Code J632)

June 2009 Examination Series

#### Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A324/01	Raw	36				22	18	15	12	9	0
	UMS	34				30	25	20	15	10	0
A324/02	Raw	36	31	26	21	17	13	11			
	UMS	50	45	40	35	30	25	23			
A325/01	Raw	36				25	21	17	14	11	0
	UMS	34				30	25	20	15	10	0
A325/02	Raw	36	31	26	21	17	11	8			
	UMS	50	45	40	35	30	25	23			
A326/01	Raw	36				21	18	15	12	9	0
	UMS	34				30	25	20	15	10	0
A326/02	Raw	36	29	23	17	12	8	6			
	UMS	50	45	40	35	30	25	23			
A334/01	Raw	36				23	19	15	11	7	0
	UMS	34				30	25	20	15	10	0
A334/02	Raw	36	23	19	15	12	8	6			
	UMS	50	45	40	35	30	25	23			
A335/01	Raw	36				20	17	14	11	8	0
	UMS	34				30	25	20	15	10	0
A335/02	Raw	36	28	22	16	10	7	5			
	UMS	50	45	40	35	30	25	23			
A336/01	Raw	36				21	18	16	14	12	0
	UMS	34				30	25	20	15	10	0
A336/02	Raw	36	27	21	15	10	7	5			
	UMS	50	45	40	35	30	25	23			
A337	Raw	96	91	83	74	66	56	46	36	26	0
	UMS	150	135	120	105	90	75	60	45	30	0

A337 - The grade thresholds have been decided on the basis of the work that was presented for award in June 2009. The threshold marks will not necessarily be the same in subsequent awards.



## Specification Aggregation Results

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

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

The cumulative percentage of candidates awarded each grade was as follows:

	<b>A*</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>U</b>	<b>Total No. of Cands</b>
<b>J632</b>	0.03	0.8	7.6	33.9	64.2	83.1	92.8	97.4	100.0	27177

For a description of how UMS marks are calculated see:

[http://www.ocr.org.uk/learners/ums\\_results.html](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.

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