

# **Additional Science B J641**

**Gateway Science Suite**

General Certificate of Secondary Education

## **Mark Schemes for the Units**

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**January 2008**

**J641/MS/R/08J**

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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.

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## General advice to Assistant Examiners

- 1 Correct answers to calculations always gain full credit even if no working is shown. (The 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
- 2 Some questions may have a 'Level of Response' mark scheme. Any details about these will be in the rationale.
- 3 If an answer has been crossed out and no alternative answer has been written then mark the answer crossed out.
- 4 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

## B623/01 Unit 1: Modules B3, C3 and P3 Foundation Tier

Question	Expected Answers	Marks	Rationale
1 a	nucleus labelled (1)	1	<b>allow</b> line/arrow touching nucleus with no label (1) <b>ignore</b> labels on other parts of cell unless nucleus is used twice
b	ring around cytoplasm (1)	1	<b>allow</b> any other correct indication of cytoplasm
c	DNA/deoxyribonucleic acid (1)	1	<b>ignore</b> protein
d	<b>any one from:</b> to repair (damaged)tissue (1) replace (worn out) cells (1) to form gametes/sex cells/sperm/egg (1)	1	<b>ignore</b> repair cells <b>allow</b> make more cells (1) <b>allow</b> for reproduction (1) <b>allow</b> higher level answers eg. correct references to immunity (1)
e i	enzyme(s)(1)	1	
ii	to digest egg membrane/penetrate egg (1)	1	<b>allow</b> to get through the cell membrane (1) <b>allow</b> to get inside the egg (1) <b>reject</b> to get through or digest the (cell) wall <b>reject</b> fertilise the egg
	<b>Total</b>	<b>6</b>	

2 a	identical (1) clones (1)	2	must be in correct order
b i	all points plotted correctly = 2 marks deduct 1 mark for each point plotted incorrectly	2	<b>allow</b> +/- ½ square eg the acceptable tolerance for 18 months is 9.9 to 10.1 deduct a mark for each point not plotted points must be visible point or cross
ii	smooth curve through at least 5 points within +/- 1 square of the centre of the crosses (1)	1	<b>not</b> 2 lines or a “shaded” line <b>not</b> dot to dot
c	idea that there is a problem with the mass, size or growth (of Gary) ie underweight/weight or mass not increasing as fast as Peter/stopped growing (1)	1	<b>allow</b> not growing at the same rate (1) <b>allow</b> developing slower/problem with development (1) <b>allow</b> (Gary) is lighter (than Peter) (1)
	<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Rationale
3	a	tick/other indication in 3rd box (1) passes oxygen from the mother to the foetus.	1	
	b	(acts as a) pump (1) moves blood/AW (around the body) (1)	1	<b>not</b> just pump oxygen, but 'pump oxygen and blood' = (1)
	c	i	1	<b>allow</b> higher level answers eg venule/arteriole (1)
		ii	1	
		<b>Total</b>	<b>4</b>	

4	a	<b>any three from:</b> idea of starting with 2 similar/same (types of) plant (1) idea of placing one plant in unidirectional light eg putting one in box with hole/putting near window/lamp (1) idea of putting (other) plant in dark/box with no hole/hole in different place (1) leave for same length of time (1) plant in dark grows straight (1)	3	<b>not</b> just put in light <b>allow</b> marks when clearly shown on a diagram  <b>ignore</b> references to how plant responds to light
	b	flowering/fruit ripening/control dormancy (1)	1	<b>allow</b> abscission or description eg losing leaves or fruit drop (1) <b>ignore</b> reproduction <b>ignore</b> references to types of growth eg apical dominance <b>allow</b> germination (1) <b>allow</b> references to preventing seed formation (1)
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Rationale
5	a	broken down (1) heat (1)	2	must be in correct order
	b	copper carbonate → copper oxide + carbon dioxide (1)	1	<b>allow</b> correct formulae or mixture of correct formulae and words <b>allow</b> $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ (1) <b>allow</b> = instead of → <b>not</b> copper carbonate + heat → copper oxide + carbon dioxide <b>allow</b> heat only above the arrow
	c	turns cloudy / milky / white (precipitate) / AW (1)	1	<b>ignore</b> fizzing/bubbles <b>ignore</b> colour change unqualified <b>allow</b> substances react (1)
		<b>Total</b>	<b>4</b>	

6	a	covalent (1)	1	<b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank <b>multiple answers = 0</b>
	b	gas (1)	1	
	c	poor conductor or non-conductor of electricity / poor conductor or non-conductor of heat / low boiling point (1)	1	<b>ignore</b> gas <b>allow</b> colourless (1), but <b>ignore</b> transparent/clear <b>allow</b> more dense <b>than air</b> / heavier <b>than air</b> (1) <b>allow</b> low density (1) <b>allow</b> it sublimates / changes straight from solid to gas (1) <b>allow</b> soluble in water (1)
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Rationale
7	a	<p><b>up to two from:</b></p> <p>use of a (moistened) flame test wire/splint/spatula (1)</p> <p>dip wire in acid (1)</p> <p>dip wire/splint in solid sample (1)</p> <p>place solid/wire/splint in Bunsen flame (1)</p> <p><b>up to two from:</b></p> <p>sodium chloride - yellow/orange (1)</p> <p>potassium - lilac/pink/purple (1)</p> <p>lithium - red (1)</p>	3	<p><b>all marks can be scored from a labelled diagram</b></p> <p><b>allow</b> glass rod/metal rod (1)</p> <p><b>not</b> incorrect use of splint, eg lighted splint</p> <p><b>allow</b> spray chemical (1) into flame (1)</p> <p><b>allow</b> burn it (1)</p>
	b	alkali metals (1)	1	<p>if answer line blank, allow ringed/underlined/correctly indicated answer on list</p> <p><b>allow</b> alkali on its own but <b>not</b> metal</p>
		<b>Total</b>	<b>4</b>	

8	a	<p>chlorine - (pale) green (1)</p> <p>bromine - liquid (1)</p>	2	<p><b>allow</b> yellow / green but not just yellow</p> <p><b>not</b> green / any other colour ie not green/blue or bluey green</p>
	b	fluorine (1)	1	<b>allow</b> F/F <sub>2</sub> (1)
	c	<p>chlorine - to make pesticides and plastics</p> <p>iodine - to sterilise wounds</p> <p>sodium chloride - to flavour food</p>	2	<p>3 correct = 2</p> <p>1 or 2 correct = 1</p> <p>if more than 1 line from box that response does not score</p>
		<b>Total</b>	<b>5</b>	



Question		Expected Answers	Marks	Rationale
9	a	11 / eleven (1)	1	
	b	chlorine (1)	1	<b>allow</b> Cl / Cl <sub>2</sub> (1)
	c	potassium (1) bromine (1)	2	<b>ignore</b> K or Br <b>reject</b> bromide any order
<b>Total</b>			<b>4</b>	

10	a	i	measure distance / AW (1)	1	<b>allow</b> how far (travelled) (1)
		ii	measure time (between camera flashes) / AW (1)	1	<b>ignore</b> how long <b>allow</b> how long it takes (1) <b>allow</b> (legal) confirmation of car caught speeding (1)
	b	i	the distance the car moves / travels / AW (1)  before the driver reacts / puts foot on break / breaks / AW (1)	2	<b>allow</b> how far (1) <b>not</b> time <b>ignore</b> 'how long', but <b>allow</b> 'how long it takes'  <b>not</b> just 'thinks' eg time taken to react✓ = 1 eg distance✓ travelled while he thinks = 1
		ii	<b>any two from</b> drugs / alcohol (1)  distraction inside car / lack of concentration (1)  illness/tiredness / AW (1)  older / AW (1)	2	<b>allow</b> examples of distractions inside car e.g. mobile phones, music, children in car, insects in car, eating, drinking, smoking (1) <b>ignore</b> external distractions  <b>not</b> factors that increase the stopping distance
<b>Total</b>			<b>6</b>		

Question		Expected Answers	Marks	Rationale
11	a	absorb energy / change shape / AW (1) OR stops (passenger or driver) hitting hard parts of car (eg windscreen/steering wheel etc) / reduces impact (on passenger or driver) / AW (1)	1	<b>allow</b> cushions (occupant) (1) <b>ignore</b> absorbs shock <b>ignore</b> absorbs pressure <b>ignore</b> moving / lurching forward <b>allow</b> higher level answers eg increase stopping time or distance (1) reduces acceleration / force (1)
	b	damaged / will not work again / already stretched / AW (1)	1	<b>allow</b> damage to anchor points (1) <b>allow</b> will not stretch again (1) <b>allow</b> broke / torn (1) <b>ignore</b> weakened
	c	cruise control/adjustable or electric seating or adjustable or electric steering wheel/paddle shift ( to change radio etc) (1)	1	<b>ignore</b> child lock / automatic locking <b>not</b> ABS / traction control <b>not</b> safety cage / crumple zone <b>not</b> head rest / seat belts <b>not</b> power steering
		<b>Total</b>	<b>3</b>	

Question			Gd	Expected Answers	Marks	Rationale
12	a	i	F	A (1)	1	accept one answer only <b>allow</b> ringed / underlined answers if no answer on the answer line
		ii	GG	A (1) C (1)	2	any order acceptable <b>allow</b> ringed / underlined answers if no answer on the answer line
		iii	D	E (1)	1	accept one answer only <b>allow</b> ball (rolling downhill) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
		iv	C	E (1)	1	<b>allow</b> ball (rolling downhill) <b>allow</b> D / parachute (falling steadily) (1) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
	b		CC	40 (W) scores (2) but (P) = 4000/100 (1)	2	correct answer = 2 only look at working if answer incorrect
	c		G	no movement/AW (1)	1	<b>allow</b> higher level answers eg forces balance (1) <b>not</b> merely no forces but 'no force so not moving' = 1
				<b>Total</b>	<b>8</b>	

Question			Gd	Expected Answers	Marks	Rationale
13	a	i	F	not aerodynamic or streamlined / more air resistance/more drag (on shuttlecock) (1)	1	<b>allow</b> (feathers) stick out (1) <b>allow</b> more surface area (1) <b>ignore</b> just wind but <b>allow</b> wind resistance (1) <b>ignore</b> mass / weight <b>not</b> merely 'shape'
		ii	E	remove feathers / AW (1)	1	<b>allow</b> increased mass/make it heavier (1) <b>allow</b> shorten feathers / AW (1) <b>allow</b> cover holes (1) <b>allow</b> reduce surface area (1)
	b		E	no drag / no air or wind resistance / no friction / AW (1)	1	<b>ignore</b> no atmosphere / air / wind <b>allow</b> higher (average) speed (1) <b>ignore</b> references to gravity/weight <b>not</b> less / more mass
				<b>Total</b>	<b>3</b>	
				<b>Overall Total</b>	<b>60</b>	

## B623/02 Unit 1: Modules B3, C3 and P3 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a	i	all points plotted correctly = 2 marks deduct 1 mark for each point plotted incorrectly	2	<b>allow</b> +/- ½ square eg the acceptable tolerance for 18 months is 9.9 to 10.1 deduct a mark for each point not plotted points must be visible point or cross
		ii	smooth curve through at least 5 points within +/- 1 square of the centre of the crosses (1)	1	<b>not</b> 2 lines or a “shaded” line <b>not</b> dot to dot
	b		idea that there is a problem with the mass, size or growth (of Gary) ie underweight / weight or mass not increasing as fast as Peter / stopped growing (1)	1	<b>allow</b> not growing at the same rate (1) <b>allow</b> developing slower/problem with development (1) <b>allow</b> (Gary) is lighter (than Peter) (1)
			<b>Total</b>	<b>4</b>	

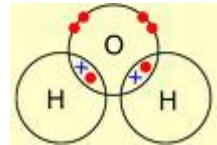
2	a		large surface area / many branched blood vessels /  thin membrane / foetal and mother’s blood are close together / short diffusion pathway /  good blood supply / diffusion gradient maintained (1)	1	<b>allow</b> capillaries permeable for 1 mark <b>ignore</b> wider  <b>allow</b> wall is 1 cell thick (1) <b>allow</b> thin wall/thin membrane (1) <b>ignore</b> cell wall is thin
		b	i	B (1)	1
		ii	prevent backflow / AW (1)	1	<b>allow</b> to stop the blood flowing from the (right) ventricle to (right) atrium (1) <b>allow</b> to make the blood flow in the right direction / ora (1) <b>not</b> stopping backflow in veins
	c		has to pump blood at higher pressure / further (1)	1	<b>allow</b> has to pump blood around (the whole) body (1) <b>ignore</b> to withstand high pressure <b>allow</b> pumps blood with more force (1)
			<b>Total</b>	<b>4</b>	

Question			Expected Answers	Marks	Rationale												
3	a	i	enzyme(s) (1)	1													
		ii	to digest egg membrane/penetrate egg (1)	1	<b>allow</b> to get through the cell membrane (1) <b>allow</b> to get inside the egg (1) <b>reject</b> to get through or digest the <b>(cell) wall</b> <b>reject</b> fertilise the egg												
	b		respiration (1)	1	<b>allow</b> aerobic or anaerobic respiration (1) <b>allow</b> oxidative phosphorylation (1)												
	c		<p><b>any two from:</b></p> <table border="0"> <tr> <td><b>mitosis</b> diploid cells/2n</td> <td><b>meiosis</b> haploid cells/n (1)</td> </tr> <tr> <td>produces identical cells</td> <td>different cells produced (1)</td> </tr> <tr> <td>only chromosomes separate</td> <td>pairs separate (1)</td> </tr> <tr> <td>involves only one division</td> <td>two divisions (1)</td> </tr> <tr> <td>makes 2 daughter cells</td> <td>makes 4 daughter cells (1)</td> </tr> <tr> <td>no crossing over</td> <td>crossing over occurs (1)</td> </tr> </table>	<b>mitosis</b> diploid cells/2n	<b>meiosis</b> haploid cells/n (1)	produces identical cells	different cells produced (1)	only chromosomes separate	pairs separate (1)	involves only one division	two divisions (1)	makes 2 daughter cells	makes 4 daughter cells (1)	no crossing over	crossing over occurs (1)	2	<b>answer must involve comparison</b>  <b>allow</b> mitosis involves 46 chromosomes but meiosis involves 23 chromosomes (1)  <b>ignore</b> references to mitosis producing body cells and meiosis producing sex cells or gamete formation (in stem of question)
<b>mitosis</b> diploid cells/2n	<b>meiosis</b> haploid cells/n (1)																
produces identical cells	different cells produced (1)																
only chromosomes separate	pairs separate (1)																
involves only one division	two divisions (1)																
makes 2 daughter cells	makes 4 daughter cells (1)																
no crossing over	crossing over occurs (1)																
<b>Total</b>				<b>5</b>													

Question		Expected Answers	Marks	Rationale
4	a	one or more of the shoots starts with any length of straight section before bending towards the light (1)	1	diagram may be drawn in box B or at the bottom of the page if in doubt about straight section, award the mark
	b	<b>any two from:</b> auxin (made or found) in tip or top (1) light cannot reach the tip or auxin (1) auxin levels equal on both sides (1) both sides grow at the same rate (1)	2	<b>allow</b> tip covered so does not receive light (1) tip synthesises or makes auxin when it receives light (1) no response because tip does not synthesise auxin (1)
<b>Total</b>			<b>3</b>	

5	a	DNA cut into fragments / AW (1)  DNA fragments separated / electric current applied / electrophoresis (1)	2	<b>allow</b> DNA is separated into sections / DNA is broken up / DNA is chopped up (1) <b>ignore</b> DNA is separated  <b>allow</b> electricity is passed through it (1)
	b	i	3 (1)	1
		ii	CATGAGACT (1)	1
<b>Total</b>			<b>4</b>	

6	a	copper carbonate → copper oxide + carbon dioxide (1)	1	<b>allow</b> correct formulae or mixture of correct formulae and words <b>allow</b> $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ (1) <b>allow</b> = instead of → <b>not</b> copper carbonate + heat → copper oxide + carbon dioxide <b>allow</b> heat only above the arrow
	b	blue (1)	1	<b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
	c	precipitate (1)	1	<b>allow</b> precipitation (reaction) (1) <b>allow</b> metal hydroxide (1), but <b>not</b> copper hydroxide (given in stem)
<b>Total</b>			<b>3</b>	

Question		Expected Answers	Marks	Rationale
7	a	covalent (1)	1	<b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank <b>multiple answers = 0</b>
	b	poor conductor or non-conductor of electricity/poor conductor or non-conductor of heat / low boiling point (1)	1	<b>ignore</b> gas <b>allow</b> colourless (1), but <b>ignore</b> transparent / clear <b>allow</b> more dense <b>than air</b> / heavier <b>than air</b> (1) <b>allow</b> low density (1) <b>allow</b> it sublimes / changes straight from solid to gas (1) <b>allow</b> soluble in water (1)
	c	at least one pair of shared electrons between hydrogen and oxygen (1) rest of diagram correct (1)	2	<b>ignore</b> inner shell of electrons for oxygen <b>allow</b> diagrams using all dots or all crosses circles need not be drawn 
		<b>Total</b>	<b>4</b>	



Question		Expected Answers	Marks	Rationale
8	a	<p>any two from:</p> <p>use of a (moistened) flame test wire / splint / spatula (1)</p> <p>dip wire in acid (1)</p> <p>dip wire / splint in solid sample (1)</p> <p>place solid / wire / splint in Bunsen flame (1)</p>	2	<p>all marks can be scored from a labelled diagram</p> <p><b>allow</b> glass rod / metal rod (1)</p> <p><b>not</b> incorrect use of splint, eg lighted splint</p> <p><b>allow</b> spray chemical (1) into flame (1)</p> <p><b>allow</b> burn it (1)</p>
	b	i	1	<b>allow</b> H <sub>2</sub> /H/H <sup>2</sup> /H <sub>2</sub> <b>not</b> h <sub>2</sub> /h/h <sup>2</sup> /h <sub>2</sub>
		ii	1	<b>allow</b> NaOH (1) <b>not</b> sodium oxide
	c	potassium loses electrons more easily (1)	1	<p><b>not</b> loses electrons faster</p> <p><b>ignore</b> potassium is further down the group</p> <p><b>allow</b> higher level answers referring to greater distance of (outer) electron from nucleus / weaker force between outer electron and nucleus / more shielding</p> <p>eg outer electron in potassium is a long way from the nucleus</p> <p>scores 1</p>
		<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Rationale
9	a	chlorine - (pale) green (1) bromine - liquid (1)	2	<b>allow</b> yellow / green but not just yellow <b>not</b> green / any other colour ie not green / blue or bluey green
	b	fluorine -80 to -200 (1) astatine 200 to 250 (1)		<b>allow</b> answers given as a range if it falls within the stated values
	c	$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ / correct formulae (1) balancing (1)	2	<b>balancing mark is conditional on correct formulae</b> $\text{Na}_2 + \text{Cl}_2 \rightarrow 2\text{NaCl}$ scores 0 $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$ scores 0 $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$ scores 1 (correct formulae) <b>allow</b> = instead of $\rightarrow$ <b>allow</b> correct multiples
		<b>Total</b>	<b>6</b>	
10		number of neutrons = 16 (1) number of electrons = 15 (1)	2	
				<b>Total</b>

Question		Expected Answers	Marks	Rationale
11	a	distance between lines = 2 (3) BUT (D =) 14 scores (2) OR (D =) 28 x 0.5 scores (1)	3	<b>allow</b> ecf from distance calculation to distance between each line calculation eg 28m/s x 0.5s = 140m (incorrect) then 140 ÷ 7 = 20m scores 2
	b	i	2	<b>allow</b> examples of distractions inside car eg mobile phones, music, children in car, insects in car, eating, drinking, smoking (1) <b>ignore</b> external distractions <b>not</b> conditions relating to stopping distances eg weather conditions/road conditions <b>not</b> factors that increase the stopping distance
		ii	1	<b>allow</b> no ABS / poor brakes / poor suspension / going downhill / more passengers (1) <b>not</b> merely 'speed' <b>ignore</b> road conditions, tyre conditions – must be qualified eg road conditions scores 0 but wet road conditions scores 1 <b>ignore</b> fog
	c	as speed or KE increases braking distance increases / $KE = \frac{1}{2}mv^2$ (1) KE is absorbed in braking (1) BUT as speed doubles, braking distance or KE quadruples (2) BUT KE is proportional to $v^2$ /braking distance is proportional to $v^2$ (3)	3	<b>this is a level of response mark scheme</b> one mark for the lowest level of response ie 'as the speed increases the braking distance increases' two marks is for an answer involving a numerical relationship eg 'as the speed increases the kinetic energy quadruples' three marks is for an answer that shows the proportionality eg 'kinetic energy is proportional to $v^2$ ' the first mark can be awarded separately and can be scored alongside the one or two mark responses  assume longer refers to distance if not qualified
		<b>Total</b>	<b>9</b>	

Question		Expected Answers	Marks	Rationale	
12		absorbed (1) increased / AW (1) increased / AW (1) reduced / AW (1)	4		
<b>Total</b>			<b>4</b>		
13	a	i	E (1)	1	accept one answer only <b>allow</b> ball (rolling downhill) (1) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
		ii	E (1)	1	<b>allow</b> ball (rolling downhill) (1) <b>allow</b> D / parachute (falling steadily) (1) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
	b		40 (W) scores (2) BUT (P =) 4000/100 (1)	2	correct answer scores 2 only look at working if answer is incorrect
<b>Total</b>			<b>4</b>		
14	a		high drag / more area / more air resistance / AW (1)	1	<b>allow</b> shuttlecock is lighter or tennis ball is heavier (1) <b>ignore</b> shuttlecock has a parachute shape
	b		drag or air resistance and weight balance / AW (1)	1	<b>not</b> upthrust <b>allow</b> forces are balanced <b>allow</b> gravity instead of weight
	c		drag reduced / less area / less air resistance (1)	1	<b>allow</b> higher level answers: eg longer time to reach terminal speed (1) <b>ignore</b> less mass or more streamlined <b>not</b> shuttlecock is lighter
<b>Total</b>			<b>3</b>		
<b>Overall Total</b>			<b>60</b>		

## B624/01 Unit 2: Modules B4, C4 and P4 Foundation Tier

Question		Expected Answers	Marks	Rationale
1		X = nucleus (1) Y = chloroplast (1) Z = (cell) wall (1)	3	<b>not</b> cell membrane
		<b>Total</b>	<b>3</b>	

2	a	insecticide (1)	1	more than one ringed answer scores (0) <b>allow</b> any correct indication eg underline
	b	idea that you use other living things / predators / to eat them / named example eg ladybirds (1)	1	<b>allow</b> use a disease organism / organism which harms them (1) <b>allow</b> named organisms eg pathogen / fungus / parasite <b>allow</b> living things that kill them <b>not</b> just kill them, must be a living things that kills them <b>not</b> things that are harmful <b>ignore</b> natural control <b>not</b> man made <b>not</b> in a controlled area/away from other organisms
	c	hydroponics (1)	1	
	d	root(s) / root hairs (1)	1	<b>allow</b> hairs on the root
		<b>Total</b>	<b>4</b>	

3	a	enters through roots / root hairs (1) lost from leaves (1) by evaporation / transpiration (1)	3	<b>allow</b> higher level answers as additional marking points: enters by osmosis (1) move through xylem (1) capillary action (1) root pressure (1) lost through stomata / stoma (1) lost through stomata in leaves scores (2)
	b	leaf / leaves (1)	1	<b>allow</b> green parts / parts with chlorophyll (1) <b>allow</b> higher level answers: eg palisade cells / chloroplasts (1) green stem scores (1) but just stem scores (0)
		<b>Total</b>	<b>4</b>	

Question			Expected Answers	Marks	Rationale
4	a		potato / peelings (1)	1	if answer line is blank look for correct indication eg ring on diagram
	b	i	(allow in) oxygen / (allow in) air / drainage / let heat escape / allow in decomposers (or eg) / allow in detritivores (or eg) (1)	1	<b>allow</b> bacteria, fungi, microbes <b>ignore</b> sunlight / sun <b>ignore</b> insects
		ii	warmer / bacteria are more active / bacteria multiply faster / more bacteria present (1)	1	<b>allow</b> more heat / higher temperature <b>allow</b> microbes / fungi multiple faster <b>ignore</b> sunnier / more light <b>not</b> heat dries them up <b>not</b> just high temperature
	c		respiration / bacteria / fungi / saprophytes / decomposers / micro-organisms / microbes (1)	1	<b>ignore</b> insects, worms <b>not</b> just decomposition/rots /decays <b>not</b> photosynthesis
<b>Total</b>				<b>4</b>	
5	a	i	2000 (1) 1 (1)	2	
		ii	correct lengths (1) correct sequence and labelled (1)	2	hawk – 4 little squares thrush – 8 little squares caterpillar – 16 little squares <b>allow</b> off centre pyramids
	b		wood / alcohol / ethanol / biogas / methane / charcoal / peat (1)	1	<b>allow</b> gasohol / oil / bio-diesel (1)
<b>Total</b>				<b>5</b>	

Question		Expected Answers	Marks	Rationale
6	a	Buckminster fullerene (1)	1	<b>allow</b> bucky ball (1) <b>not</b> just fullerene or just Buckminster
	b	<b>any two from:</b> lustrous / shiny / AW(1) transparent / clear (1) colourless (1)	2	<b>allow</b> glittery / sparkles / reflects light (1) <b>allow</b> see through (1) <b>allow</b> correct reference to colour (1) <b>ignore</b> shape due to cutting <b>ignore</b> glimmer
	c	cutting tools / jewellery (1)	1	<b>allow</b> named examples eg drill piece / glass cutter
<b>Total</b>			<b>4</b>	

7	a	detergent (1)	1	<b>not</b> bleach
	b	optical brighteners (1)	1	
	c	saves energy / allows more delicate clothes to be washed / enzyme would denature at higher temperatures (1)	1	<b>allow</b> less electricity used (1) <b>allow</b> colours will not run / does not lose colour (1) <b>allow</b> clothes do not shrink (1) <b>allow</b> reduces carbon dioxide emissions / reduces global warming (1) <b>ignore</b> costs less / cheaper <b>ignore</b> just better for the environment/less pollution <b>not</b> enzymes die
<b>Total</b>			<b>3</b>	

Question		Expected Answers	Marks	Rationale
8	a	natural gas (1)	1	
	b	reversible reaction (1)	1	<b>allow</b> goes both ways / backwards and forwards (1) <b>allow</b> higher level answers eg dynamic equilibrium
	c	recycled (1)	1	<b>allow</b> goes round again / goes back (to the start) (1) <b>allow</b> reused (1)
	d	<b>any two from:</b> salaries / wages / labour / worker / AW (1) raw materials / starting materials (1) transport of materials to plant (1) electricity / energy / heating / lighting / cost of pressure / AW (1) maintenance of plant / safety (1) pollution controls (1) rates / taxes / rent (1)	2	<b>allow</b> a correct cost (1) plus explanation (1) <b>allow</b> ingredients <b>ignore</b> insurance / packaging / storage / R and D / advertising <b>allow</b> cost of factory itself <b>not</b> just the process
	e	continuous (1)	1	
		<b>Total</b>	<b>6</b>	



Question		Expected Answers	Marks	Rationale
9	a	P is phosphorus (1) K is potassium (1)	2	<b>not</b> phosphates
	b	to increase crop yield / to improve crop quality / to speed up crop growth (1)	1	<b>ignore</b> to get better crops <b>not</b> just to help plants / crops grow, must be faster idea
	c	burette (1)	1	
	d	80 (1)	1	
	e	80% scores (2)  $\frac{\text{actual yield}}{\text{predicted yield}} \times 100$  or  $(20/25) \times 100$ (1)	2	look for correct answer first, 80% on own scores (2)  <b>allow</b> am/pm x 100
		<b>Total</b>	<b>7</b>	

10	a	i	attracted to / move towards the rod (1)	1	<b>allow</b> stick to rod / picked up by the rod (1)
		ii	positive    negative (1)	1	both needed for mark, either order
		iii	ideas of: any valid method of charging / mention of friction / AW (1) discharge through body/connected to earth (1)	2	eg walking on nylon carpet (1) touching a radiator (1) playing on synthetic pitch (1) touching goal post (1)
	b		spray painting / photocopiers / printers / dusters / defibrillators (1)	1	<b>allow</b> spraying / dust precipitation (1) <b>allow</b> restarting hearts (1) <b>ignore</b> make your hair stick up / lightning
		<b>Total</b>		<b>5</b>	

Question			Expected Answers	Marks	Rationale
11	a	i	D (1)	1	
		ii	A (1)	1	
	b	i	<p>earth — blue live — brown neutral — yellow/green (2)</p>	2	one correct = 1 mark all correct = 2 marks
		ii	earth (1)	1	<b>allow</b> yellow and green wire (1)
	c		2.5 (2) but 5/2 (1)	2	look for correct answer first 2.5 on own scores (2)
<b>Total</b>				<b>7</b>	

12	a		beta (1)	1	<b>allow</b> symbol $\beta$ (1)
	b		x-ray (1)	1	
	c		treat cancer / tracers / non-destructive testing / sterilization / thickness control (1)	1	<b>allow</b> radiotherapy (1) <b>not</b> cleaning equipment, must be idea of sterile equipment
<b>Total</b>				<b>3</b>	

13	a	i	<u>background</u> (1)	1	
		ii	<u>nucleus</u> (1)	1	
	b	i	uranium (1)	1	<b>allow</b> plutonium (1) <b>allow</b> correct symbol (U or Pu)
		ii	energy source / fuel source / boiler / reactor (1) turbine / generator / steam produced (1)	2	<b>allow</b> named fuel eg coal, uranium (1) <b>allow</b> steam produce for first marking point, in this case second marking point must be turbine or generator (1) <b>not</b> wind turbine
<b>Total</b>				<b>5</b>	

<b>Overall Total</b>				<b>60</b>	
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## B624/02 Unit 2: Modules B4, C4 and P4 Higher Tier

Question		Expected Answers	Marks	Rationale
1	a	warmer / bacteria are more active / bacteria multiply faster / more bacteria present (1)	1	<b>allow</b> more heat / higher temperature <b>allow</b> microbes / fungi multiple faster <b>ignore</b> sunnier / more light <b>not</b> heat dries them up <b>not</b> just high temperature
	b	respiration / bacteria / fungi / saprophytes / decomposers / micro-organisms / microbes (1)	1	<b>ignore</b> insects, worms <b>not</b> just decomposition/rots /decays <b>not</b> photosynthesis
	c	<b>any two from:</b> increase surface area (1) increase rate of decay (1)  digestion / breakdown with enzymes (1) aeration / allow oxygen in / churning / to make holes(1)	2	<b>allow</b> more respiration / more decomposition <b>ignore</b> just helps it decay <b>ignore</b> just eat / feed <b>allow</b> mixing
<b>Total</b>			<b>4</b>	
2	a	2000 (1) 1 (1)	2	
	b	correct lengths (1) correct sequence and labelled (1)	2	hawk – 4 little squares thrush – 8 little squares caterpillar – 16 little squares <b>allow</b> off centre pyramids
<b>Total</b>			<b>4</b>	

Question		Expected Answers	Marks	Rationale
3	a	<p><b>advantage:</b> no run off / no washing off / no leaching / no eutrophication (1)</p> <p><b>disadvantage:</b> rotation of crops required or only peas and beans could be grown / only provides nitrates but other minerals may be needed / may build up pest or weed problem (1)</p>	2	<p><b>ignore</b> stays put <b>ignore</b> natural / organic <b>ignore</b> just cost</p> <p><b>allow</b> cannot grow more valuable crops all the time <b>allow</b> reduces biodiversity <b>allow</b> cannot control / know the amount of nitrate added to soil (1) <b>ignore</b> yield less / grow less <b>ignore</b> affect on food chain</p>
	b	producing as much food as possible / AW (1)	1	<p><b>allow</b> small space with a large number of animals (1) <b>allow</b> a lot of one type of crop in a small area (1) <b>allow</b> descriptions of named examples <b>ignore</b> use of herbicides/pesticides/fertilisers <b>not</b> just produces more food <b>not</b> over farming</p>
	c	i	1	<p><b>ignore</b> chlorophyll <b>not</b> contain protein/amino acids/enzymes</p>
		ii	2	<p><b>allow</b> uses carrier molecules (1) <b>allow</b> use of diagram</p>
		iii	1	<p><b>any one from:</b></p> <p>increased water evaporated (from leaves) / increased transpiration / increased water flow through plant</p> <p>increased active transport of nitrate / increased respiration (1)</p> <p><b>allow</b> more water is transported (1) <b>not</b> just more nitrates transported <b>not</b> nitrates evaporating</p> <p><b>not</b> just more energy <b>ignore</b> rate of photosynthesis is greater</p>
		<b>Total</b>	<b>7</b>	

Question		Expected Answers	Marks	Rationale
4	a	transport / carry sugar (from leaves) / carry water (to leaves) / support leaf / AW (1)	1	<b>allow</b> named sugar being carried eg glucose <b>allow</b> carry nutrients / minerals or corrected named examples <b>not</b> just to carry substances
	b	transparent / let light into leaf / contain no chloroplasts (1)	1	<b>allow</b> see through / clear (1) <b>allow</b> cells are thin / only one cell thick (1) <b>ignore</b> large surface area <b>ignore</b> waterproof/waxy <b>not</b> absorb / trap light
	c	(air) spaces / short distances (1)	1	<b>not</b> just leaves are thin <b>not</b> just spongy on its own <b>ignore</b> large surface area
	d	drawing to show membrane separated from cell wall (1)	1	
	e	no cell wall (1)	1	
		<b>Total</b>	<b>5</b>	

5	a	Buckminster fullerene (1)	1	<b>allow</b> bucky ball (1) <b>not</b> just fullerene or just Buckminster
	b	allotropes (1)	1	
	c	<b>any one from:</b>  weak forces / bonds between layers (1)  weak forces / bonds to allow layers to slide over one another (1)	1	<b>not</b> just weak forces / bonds on own <b>allow</b> weak intermolecular forces / bonds (1)  <b>allow</b> to allow layers to slide over one another (1)
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Rationale
6	a	saves energy/allows more delicate clothes to be washed/enzyme would denature at higher temperatures (1)	1	<b>allow</b> less electricity used <b>allow</b> colours will not run/does not lose colour <b>allow</b> clothes do not shrink <b>allow</b> reduces carbon dioxide emissions/reduces global warming <b>ignore</b> costs less/cheaper <b>ignore</b> just better for the environment/less pollution <b>not</b> enzymes die
	b	hydrophilic (head) (1) hydrophobic (tail) (1)	2	<b>ignore</b> water loving <b>ignore</b> water hating
<b>Total</b>			<b>3</b>	

7	a	recycled (1)	1	<b>allow</b> goes round again / goes back (to the start) (1) <b>allow</b> reused (1)
	b	i	1	increases / AW (1)
		ii	1	decreases / AW (1)
	c	i	1	<b>allow</b> to speed up the process / reaction (1) <b>allow</b> reduce activation energy (1) <b>allow</b> iron is a transition element (1) <b>ignore</b> lower production costs
		ii	1	<b>any one from:</b> optimum temperature (1) to give a fast reaction with a reasonable percentage yield / AW (1) <b>ignore</b> make the reaction take place quicker / increases rate of reaction <b>ignore</b> compromise between cost and yield <b>ignore</b> more efficient
<b>Total</b>			<b>5</b>	

Question		Expected Answers	Marks	Rationale
8	a	neutralisation (1)	1	
	b	80 (1)	1	
	c	80% scores (2)  $\frac{\text{actual yield}}{\text{predicted yield}} \times 100$ or $(20/25) \times 100 (1)$	2	look for correct answer first, 80% on own scores (2)  <b>allow</b> am/pm x 100
	d	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$ formulae (1) balancing (1)	2	balancing mark is dependent on correct formulae
	e	<b>any three from:</b>  increase nitrate / phosphate levels in water (1) promote plant growth / promote algal growth / produce algae bloom (1) no photosynthesis / blocks off light (1) (aerobic) bacteria use up oxygen (1)  <b>final marking point is dependent on oxygen            being used up</b>  living organisms die (1)	3	<b>ignore</b> just uses up oxygen, must be idea of microbes using up oxygen   if no other marking point awarded allow (1) for idea of living organisms die
		<b>Total</b>	<b>9</b>	

Question			Expected Answers	Marks	Rationale
9	a	i	D (1)	1	
		ii	A (1)	1	
	b		2.5 (2) but 5/2 (1)	2	Look for correct answer first, 2.5 on own scores (2)
<b>Total</b>				<b>4</b>	

10			particles vibrate (back and forth / forwards and backwards) (1)	2	<b>allow</b> answers from a diagram <b>allow</b> particles move back and forth, not just particles move  <b>allow</b> particles move / travel in same direction as wave / causes rarefactions and compression points (1)
			parallel to / along wave direction / AW (1)		
<b>Total</b>				<b>2</b>	

11	a	i	refuelling aircraft / refuelling tankers / any explosive atmosphere / lightning (1)	1	<b>allow</b> named examples eg petrol stations / flour mills / coal mines (1) <b>ignore</b> just explosives / can cause explosions
		ii	good electrical contact / AW (1)		
	b	i		1	<b>allow</b> good skin contact (1) <b>allow</b> no moisture to conduct electricity (across chest) (1) <b>allow</b> hair is an insulator (1) <b>not</b> so pads stick to chest
		ii	avoiding shock to operators / AW (1)		
		iii	idea of recharging paddles (1)	1	<b>allow</b> to reset the machine (1) <b>ignore</b> references to heart
<b>Total</b>				<b>4</b>	



Question		Expected Answers	Marks	Rationale
12	a	beta (1)	1	<b>allow</b> symbol $\beta$ (1)
	b	x-ray (1)	1	
	c	120 (1)	1	
		<b>Total</b>	<b>3</b>	
13	a	helium nucleus (1)	1	<b>allow</b> 2 neutrons + 2 protons <b>not</b> just helium/helium atom/helium particle/helium ion
	b	unstable (1)	1	<b>allow</b> higher level answers eg larger ratio of neutrons to protons
	c	idea that cannot penetrate skin / absorbed by skin (1)	1	<b>allow</b> cannot penetrate the body / escape from the body (1) <b>allow</b> cannot be detected outside the body (1) <b>not</b> just can be blocked easily
	d	high speed electrons hitting metal (target) (1)	1	<b>allow</b> fast / high energy / fired electrons hitting metal <b>allow</b> suitable named metal in answer eg tungsten <b>not</b> highly charged electrons
		<b>Total</b>	<b>4</b>	
14	a	rods / boron / cadmium / graphite (1) absorb / slow down neutrons (1)  <b>but</b> absorb <u>some</u> neutrons / AW / ora (2)	2	second mark clear indication that only some neutrons are absorbed  <b>allow</b> absorbs the excess neutrons for (2) marks
	b	absorbs neutrons (1)	1	<b>allow</b> gains neutrons <b>not</b> absorbs radiation / nuclear / atoms
		<b>Total</b>	<b>3</b>	
		<b>Overall Total</b>	<b>60</b>	

# Grade Thresholds

General Certificate of Secondary Education  
Additional Science B (Specification Code J641)  
January 2008 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
<b>B623/01</b>	Raw	60	-	-	-	37	30	24	18	12	0
	UMS	69	-	-	-	60	50	40	30	20	0
<b>B623/02</b>	Raw	60	48	40	30	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0
<b>B624/01</b>	Raw	60	-	-	-	35	29	23	17	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
<b>B642/02</b>	Raw	60	47	38	29	21	14	10	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0

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)

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