

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Mark Schemes for the Units

January 2008

J641/MS/R/08J

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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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
(1)	=	separates marking points
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
allow	=	answers that can be accepted
()	=	words which are not essential to gain credit
<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	allow line/arrow touching nucleus with no label (1) ignore labels on other parts of cell unless nucleus is used twice
b	ring around cytoplasm (1)	1	allow any other correct indication of cytoplasm
c	DNA/deoxyribonucleic acid (1)	1	ignore protein
d	any one from: to repair (damaged)tissue (1) replace (worn out) cells (1) to form gametes/sex cells/sperm/egg (1)	1	ignore repair cells allow make more cells (1) allow for reproduction (1) allow higher level answers eg. correct references to immunity (1)
e i	enzyme(s)(1)	1	
ii	to digest egg membrane/penetrate egg (1)	1	allow to get through the cell membrane (1) allow to get inside the egg (1) reject to get through or digest the (cell) wall reject fertilise the egg
	Total	6	

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	allow +/- 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	not 2 lines or a “shaded” line not 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	allow not growing at the same rate (1) allow developing slower/problem with development (1) allow (Gary) is lighter (than Peter) (1)
	Total	6	

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	not just pump oxygen, but 'pump oxygen and blood' = (1)
	c	i veins/capillaries (1)	1	allow higher level answers eg venule/arteriole (1)
		ii carbon dioxide (1)	1	
Total			4	

4	a	any three from: 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	not just put in light allow marks when clearly shown on a diagram ignore references to how plant responds to light
	b	flowering/fruit ripening/control dormancy (1)	1	allow abscission or description eg losing leaves or fruit drop (1) ignore reproduction ignore references to types of growth eg apical dominance allow germination (1) allow references to preventing seed formation (1)
Total			4	

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	allow correct formulae or mixture of correct formulae and words allow $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ (1) allow = instead of → not copper carbonate + heat → copper oxide + carbon dioxide allow heat only above the arrow
	c	turns cloudy / milky / white (precipitate) / AW (1)	1	ignore fizzing/bubbles ignore colour change unqualified allow substances react (1)
		Total	4	

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

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

8	a	<p>chlorine - (pale) green (1)</p> <p>bromine - liquid (1)</p>	2	<p>allow yellow / green but not just yellow not green / any other colour ie not green/blue or bluey green</p>
	b	fluorine (1)	1	allow F/F ₂ (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 1 or 2 correct = 1 if more than 1 line from box that response does not score</p>
		Total	5	

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

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

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	allow cushions (occupant) (1) ignore absorbs shock ignore absorbs pressure ignore moving / lurching forward allow 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	allow damage to anchor points (1) allow will not stretch again (1) allow broke / torn (1) ignore weakened
	c	cruise control/adjustable or electric seating or adjustable or electric steering wheel/paddle shift (to change radio etc) (1)	1	ignore child lock / automatic locking not ABS / traction control not safety cage / crumple zone not head rest / seat belts not power steering
		Total	3	

Question			Gd	Expected Answers	Marks	Rationale
12	a	i	F	A (1)	1	accept one answer only allow ringed / underlined answers if no answer on the answer line
		ii	GG	A (1) C (1)	2	any order acceptable allow ringed / underlined answers if no answer on the answer line
		iii	D	E (1)	1	accept one answer only allow ball (rolling downhill) allow correct answer underlined, circled or ticked in list if answer line is blank
		iv	C	E (1)	1	allow ball (rolling downhill) allow D / parachute (falling steadily) (1) allow 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	allow higher level answers eg forces balance (1) not merely no forces but 'no force so not moving' = 1
				Total	8	

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

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	allow +/- 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	not 2 lines or a “shaded” line not 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	allow not growing at the same rate (1) allow developing slower/problem with development (1) allow (Gary) is lighter (than Peter) (1)
			Total	4	

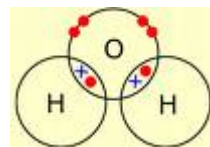
2	a		large surface area / many branched blood vessels / thin membrane / foetal and mother’s blood are close together / short diffusion pathway / good blood supply / diffusion gradient maintained (1)	1	allow capillaries permeable for 1 mark ignore wider allow wall is 1 cell thick (1) allow thin wall/thin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

Question			Expected Answers	Marks	Rationale												
3	a	i	enzyme(s) (1)	1													
		ii	to digest egg membrane/penetrate egg (1)	1	allow to get through the cell membrane (1) allow to get inside the egg (1) reject to get through or digest the (cell) wall reject fertilise the egg												
	b		respiration (1)	1	allow aerobic or anaerobic respiration (1) allow oxidative phosphorylation (1)												
	c		<p>any two from:</p> <table border="0"> <tr> <td>mitosis diploid cells/2n</td> <td>meiosis 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>	mitosis diploid cells/2n	meiosis 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	<p>answer must involve comparison</p> <p>allow mitosis involves 46 chromosomes but meiosis involves 23 chromosomes (1)</p> <p>ignore references to mitosis producing body cells and meiosis producing sex cells or gamete formation (in stem of question)</p>
mitosis diploid cells/2n	meiosis 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)																
Total				5													

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	any two from: 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	allow 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)
Total			3	

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

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

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

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>allow glass rod / metal rod (1)</p> <p>not incorrect use of splint, eg lighted splint</p> <p>allow spray chemical (1) into flame (1)</p> <p>allow burn it (1)</p>
	b	i	1	<p>hydrogen (1)</p> <p>allow $H_2/H/H^2/H2$ not $h_2/h/h^2/h2$</p>
		ii	1	<p>sodium hydroxide (1)</p> <p>allow NaOH (1)</p> <p>not sodium oxide</p>
	c	potassium loses electrons more easily (1)	1	<p>not loses electrons faster</p> <p>ignore potassium is further down the group</p> <p>allow 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>
		Total	5	

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

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	allow 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	allow examples of distractions inside car eg mobile phones, music, children in car, insects in car, eating, drinking, smoking (1) ignore external distractions not conditions relating to stopping distances eg weather conditions/road conditions not factors that increase the stopping distance
		ii	1	allow no ABS / poor brakes / poor suspension / going downhill / more passengers (1) not merely 'speed' ignore road conditions, tyre conditions – must be qualified eg road conditions scores 0 but wet road conditions scores 1 ignore 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	this is a level of response mark scheme 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
		Total	9	

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

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	not cell membrane
		Total	3	

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

3	a	enters through roots / root hairs (1) lost from leaves (1) by evaporation / transpiration (1)	3	allow 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	allow green parts / parts with chlorophyll (1) allow higher level answers: eg palisade cells / chloroplasts (1) green stem scores (1) but just stem scores (0)
		Total	4	

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	allow bacteria, fungi, microbes ignore sunlight / sun ignore insects
		ii	warmer / bacteria are more active / bacteria multiply faster / more bacteria present (1)	1	allow more heat / higher temperature allow microbes / fungi multiple faster ignore sunnier / more light not heat dries them up not just high temperature
	c		respiration / bacteria / fungi / saprophytes / decomposers / micro-organisms / microbes (1)	1	ignore insects, worms not just decomposition/rots /decays not photosynthesis
Total				4	
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 allow off centre pyramids
	b		wood / alcohol / ethanol / biogas / methane / charcoal / peat (1)	1	allow gasohol / oil / bio-diesel (1)
Total				5	

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

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

Question		Expected Answers	Marks	Rationale
8	a	natural gas (1)	1	
	b	reversible reaction (1)	1	allow goes both ways / backwards and forwards (1) allow higher level answers eg dynamic equilibrium
	c	recycled (1)	1	allow goes round again / goes back (to the start) (1) allow reused (1)
	d	any two from: 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	allow a correct cost (1) plus explanation (1) allow ingredients ignore insurance / packaging / storage / R and D / advertising allow cost of factory itself not just the process
	e	continuous (1)	1	
		Total	6	

Question		Expected Answers	Marks	Rationale
9	a	P is phosphorus (1) K is potassium (1)	2	not phosphates
	b	to increase crop yield / to improve crop quality / to speed up crop growth (1)	1	ignore to get better crops not 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) allow am/pm x 100
		Total	7	

10	a	i	attracted to / move towards the rod (1)	1	allow 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	allow spraying / dust precipitation (1) allow restarting hearts (1) ignore make your hair stick up / lightning
		Total		5	

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	allow 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)
			Total	7	

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

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

			Overall Total	60	
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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	allow more heat / higher temperature allow microbes / fungi multiple faster ignore sunnier / more light not heat dries them up not just high temperature
	b	respiration / bacteria / fungi / saprophytes / decomposers / micro-organisms / microbes (1)	1	ignore insects, worms not just decomposition/rots /decays not photosynthesis
	c	any two from: increase surface area (1) increase rate of decay (1) digestion / breakdown with enzymes (1) aeration / allow oxygen in / churning / to make holes(1)	2	allow more respiration / more decomposition ignore just helps it decay ignore just eat / feed allow mixing
Total			4	
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 allow off centre pyramids
Total			4	

Question		Expected Answers	Marks	Rationale
3	a	<p>advantage: no run off / no washing off / no leaching / no eutrophication (1)</p> <p>disadvantage: 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>ignore stays put ignore natural / organic ignore just cost</p> <p>allow cannot grow more valuable crops all the time allow reduces biodiversity allow cannot control / know the amount of nitrate added to soil (1) ignore yield less / grow less ignore affect on food chain</p>
	b	producing as much food as possible / AW (1)	1	<p>allow small space with a large number of animals (1) allow a lot of one type of crop in a small area (1) allow descriptions of named examples ignore use of herbicides/pesticides/fertilisers not just produces more food not over farming</p>
	c	i	1	<p>ignore chlorophyll not contain protein/amino acids/enzymes</p>
		ii	2	<p>allow uses carrier molecules (1) allow use of diagram</p>
		iii	1	<p>any one from:</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>allow more water is transported (1) not just more nitrates transported not nitrates evaporating</p> <p>not just more energy ignore rate of photosynthesis is greater</p>
		Total	7	

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

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

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

7	a	recycled (1)	1	allow goes round again / goes back (to the start) (1) allow reused (1)
	b	i	1	increases / AW (1)
		ii	1	decreases / AW (1)
	c	i	1	allow to speed up the process / reaction (1) allow reduce activation energy (1) allow iron is a transition element (1) ignore lower production costs
		ii	1	any one from: optimum temperature (1) to give a fast reaction with a reasonable percentage yield / AW (1)
Total			5	

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) allow 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	any three from: 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) final marking point is dependent on oxygen being used up living organisms die (1)	3	ignore 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
		Total	9	

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)
Total				4	

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

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

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

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
B623/01	Raw	60	-	-	-	37	30	24	18	12	0
	UMS	69	-	-	-	60	50	40	30	20	0
B623/02	Raw	60	48	40	30	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0
B624/01	Raw	60	-	-	-	35	29	23	17	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B642/02	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

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