

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Mark Schemes for the Units

January 2009

J641/MS/R/09J

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Mark Scheme Guidance

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

/ = alternative and acceptable answers for the same marking point

(1) = separates marking points

not = answers which are not worthy of credit

reject = answers which are not worthy of credit

ignore = statements which are irrelevant

allow = answers that can be accepted

() = words which are not essential to gain credit

= underlined words must be present in answer to score a mark

ecf = error carried forward

AW = alternative wording

ora = or reverse argument

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

Question		Expected Answers	Marks	Additional Guidance
1	(a)	sperm (1)	1	
	(b)	fertilisation / fertilise an egg / join with an egg / carries genes / chromosomes / DNA to the egg (1)	1	allow carries genes & swims to the egg (1) fertilisation on its own is worth credit but ignore fertilise unless qualified ignore swim to the egg ignore carries genes/ chromosomes / DNA ignore reproduction / break into egg
	(c)	any two from tail for swimming / tail for moving (1) nucleus to carry genes / nucleus to carry chromosomes / nucleus to carry DNA (1)	2	allow mitochondria for energy (1) allow acrosome or head to produce enzymes that digest into the egg (1) allow produced in large numbers (1) allow streamlined (aerodynamic) shape for swimming (1)
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	oxygen (1) food (1) oxygen (1)	3	allow O ₂ (1) if two answers on one line, no mark
	(b)	(cell) membrane (1)	1	not (cell) wall
		Total	4	

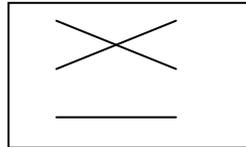
3	(a)	asexual (1)	1	allow cloning / vegetative propagation
	(b)	mitosis (1)	1	allow phonetic spellings eg mytosis, meitosis not meiosis / meiotsis
	(c)	(i)	1	goldrush (1)
		(ii)	1	Yukon gold and asterix (1) either way round both required for one mark
		(iii)	2	breed the two types together (1) then choose the offspring that are most yellow and give the highest yield (1) allow idea of pollination ignore putting together / reference to genetic engineering allow choose best or most suitable offspring (1) allow choose the best, breed them together and repeat this many times = 2 marks
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	cholesterol (1)	1	allow any other indication that it is cholesterol e.g tick or underline
	(b)	aorta (1)	1	ignore left or right allow aortic arch if answer line blank allow answer written on diagram
	(c)	cells that have not differentiated / can produce different types of cells (1)	1	allow unspecialised cells / no specific job / can form any type of cell / cells of no particular type ignore embryo cells / immature cells
		Total	3	

5	(a)	nucleus (1)	1	allow mitochondria / chromosomes / genes
	(b)	enzymes (1)	1	
	(c)	a persons DNA is unique / everybody has different DNA / AW(1)	1	allow they don't have an identical twin ignore everyone is different unless qualified
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	magnesium (1)	1	allow correct symbol Mg answer must be on list
	(b)	sodium/magnesium (1)	1	allow correct symbol Na, Mg both answers, in any order, are required for the mark answer must be on list
	(c)	neon (1)	1	allow correct symbol, Ne answer must be on list
	(d)	chromium (1)	1	allow correct symbol Cr answer must be on list
		Total	4	

7	(a)	electrical (1)	1	allow electricity ignore 36%
	(b)	(copper) conducts heat / good thermal conductor (1)	1	not any reference to electricity ignore good conductor unless referenced to heat ignore reference to melting point / reactivity
	(c)	(i) blue (1)	1	allow light or pale blue not dark blue or blue / purple or blue / green
		(ii) precipitate (1)	1	allow copper hydroxide or copper (II) hydroxide or $\text{Cu}(\text{OH})_2$
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
8	(a)	(i)	Cl ₂ (1)	1	allow symbol Cl allow name chlorine
		(ii)	H ₂ SO ₄ (1)	1	allow sulfuric acid
	(b)	sodium, oxygen and hydrogen (1)	1	must get all 3 correct, in any order, for 1 mark ignore symbols	
			Total	3	
9	(a)	(i)	(group) 1 (1)	1	
		(ii)	(stop) reaction with oxygen / air (1) (stop) reaction with water (1)	2	allow doesn't react with oil (1) allow reactive metal (1) only if no other mark scored
	(b)	sodium: yellow potassium: lilac lithium: red	2	all three correct (2) marks two correct (1) mark	one or
			Total	5	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	aluminium oxide → aluminium + oxygen (1)	1	allow correct formulae and mixture of words and correct formulae / products in either order ignore molten not oxide for oxygen ignore balancing if formulae used $\text{Al}_2\text{O}_3 \rightarrow \text{Al} + \text{O}_2$
	(b)	bauxite (1)	1	allow alumina
	(c)	any two from: anode wears away (1) anode is oxidised / reacts with oxygen (1) carbon dioxide/carbon monoxide formed (1)	2	allow anode is destroyed / burns away / disintegrates / breaks down / breaks up / erodes / corrodes (1) ignore dissolves / melts / breaks not reference to heating effect allow anode reacts with air (1)
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	Sam (1)	1	Mark the line first more than one answer on the line scores (0) allow any other indication of answer e.g. circled, underlined or ticked, if no answer on line
	(b)	Daly (1)	1	Mark the line first more than one answer on the line scores (0) allow any other indication of answer e.g. circled, underlined or ticked, if no answer on line
	(c)	Daly (1)	1	Mark the line first more than one answer on the line scores (0) allow any other indication of answer e.g. circled, underlined or ticked, if no answer on line
	(d)	1.25 (2) BUT 25 / 20 scores (1) award unit mark independently for m/s (1)	3	allow metres per second, m per s, metres per s, m per second, mps (1) not m/ps only look for correct working mark if answer is incorrect allow conversion to cms if units stated anywhere
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
12	(a)	4x4 (1)	1	Mark the line first more than one answer on the line scores (0) allow any other indication of answer e.g. circled, underlined or ticked, if no answer on line
	(b)	any two from car has less drag / less air resistance AW (1) car more streamlined / AW (1) drag acts against movement / AW (1)	2	assume answer refers to car unless van clearly stated allow reverse arguments eg van has more drag (1) allow more aerodynamic / wedge-shaped (1) not better shape must be idea of comparison for streamlined / aerodynamic and also for air resistance / drag
	(c)	petrol / diesel / LPG (1)	1	allow Derv not merely oil not biofuel or gas
	(d)	any two from use (energy from) sun / sunlight / light (1) electricity (produced) / electric motor (used) (1) battery charged (1)	2	but sunlight changed to electricity scores (2) not heat from sun
		Total	6	

Question			Expected Answers	Marks	Additional Guidance
13	(a)	(i)	9 (1)	1	
		(ii)	increases / AW (1)	1	allow longer to stop assume answer refers to distance unless time is specified but allow the car takes a longer time to stop so the distance is longer
		(iii)	(driver) tiredness / alcohol (intake) / drugs / distracted / lack of concentration (1)	1	allow older driver / driver has been drinking / is drinking (1) allow specific examples - mobile phone use, adjusting radio / using sat nav / distraction must be inside the car if more than one reason then any incorrect reason negates the mark eg drinking alcohol and bald tyres
	(b)		8000 scores (2) but 2000 x 4 scores (1)	2	only look for correct working mark if answer is incorrect allow 2000 x 400 (cm) for 1 mark
	(c)		(temperature) increases / AW (1)	1	allow heats up / gets hotter / gets hot
	(d)	(i)	may be damaged / will not stretch again / elastic limit reached (1)	1	allow dangerous / not safe / weakened / anchorage damaged ignore don't work unless qualified
		(ii)	ABS / crumple zone / side impact bars or protection / safety cage / air bag (1)	1	any reasonable safety feature scores (1) allow passive safety features such as 'electric windows', cruise control, paddle shift, adjustable seating, child lock, side/wing mirrors
			Total	8	

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

Question		Expected Answers	Marks	Additional Guidance
1	(a)	<p>any two from: forms plaques / fatty deposits / builds up / blocks or furs up arteries / reduces the size of the lumen (1)</p> <p>restricts / stops blood flow / oxygen or glucose supply (1)</p> <p>(blood) clots form (1)</p>	2	<p>allow blood vessels not veins</p> <p>allow blood flow is not smooth / increases blood pressure</p>
	(b)	aorta (1)	1	<p>ignore left or right allow aortic arch if answer line blank allow answer written on diagram</p>
	(c)	cells that have not differentiated / can produce different types of cells (1)	1	<p>allow unspecialised cells / no specific job / can form any type of cell / cells of no particular type (1) ignore embryo cells / immature cells</p>
	(d)	<p>any two from: state that it is ethically or morally wrong / against religious beliefs / against nature (1)</p> <p>may involve the death / destruction / harm of the embryo (1)</p> <p>believe that the embryo has a right to live / is a potential person (1)</p> <p>possible unknown risks / side effects (1)</p> <p>limitations on use of resources (1)</p>	2	<p>mark both answers together eg 'playing God' not just 'it is wrong'</p> <p>allow embryo is a living thing and this could kill it = 2 marks</p> <p>allow creating a life for spare parts but ignore it is being made for spare parts</p> <p>not just scared of where it may lead</p> <p>allow reference to large cost or limited availability</p>
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	mitosis (1)	1	allow phonetic spellings eg mytosis, meitosis not meiosis / meiotics
	(b)	(i) asterix and Yukon gold (1)	1	either way round both required for one mark
		(ii) breed the two types together (1) then choose the offspring that are most yellow and give the highest yield (1)	2	allow idea of pollination (1) ignore putting together not reference to genetic engineering allow choose best or most suitable offspring (1) allow choose the best, breed them together and repeat this many times = 2 marks
		(iii) inbreeding / accumulation of harmful recessive characteristics / reduction in variation / less variety / reduced gene pool (1)	1	ignore pass the mutation down allow an example eg may all die of a particular disease allow loss of a particular variety not no variation (within the variety selected) / higher risk of disease / all have the same genes allow slow process / labour intensive / needs several generations / may produce changes in other characteristics (allow examples eg taste / colour might be effected)
		Total	5	

Question		Expected Answers	Marks	Additional Guidance	
3	(a)	mitochondria (1)	1	if answer line blank allow answer indicated on diagram	
	(b)	get back to (the) diploid (number) / correct number of chromosomes after fertilisation / so they don't have double the number of chromosomes (1)	1	allow so they only have one chromosome from each pair from each parent allow half chromosomes come from father / sperm and half come from mother / egg allow so that $23 + 23 = 46$ / $23 + 23 = 23$ pairs	
	(c)	(i)	change in the sequence of bases (1)	1	allow example of base change allow section of DNA or chromosome missing, repeated or in the wrong place not change in the structure of DNA
		(ii)	code for a different amino acid / may stop the production or change the shape of the protein (1)	1	allow change the sequence of amino acids
		(iii)	cannot (produce enzymes to) digest /eat egg membrane / get into egg (1)	1	allow egg wall not egg shell / egg cell wall / digest the egg
Total			5		

Question		Expected Answers	Marks	Additional Guidance
4	(a)	carbon dioxide / urea / ammonia (1)	1	ignore waste allow correct formulae
	(b)	diffusion (1)	1	
	(c)	any two from large surface area (1) thin wall / wall one cell thick (1) permeable wall (1) good blood supply (1) concentration / diffusion gradient maintained (1)	2	allow villi (1) not thin cell wall allow small distance to diffuse (1) ignore little holes ignore just two arteries / more arteries
		Total	4	

5	(a)	neon (1)	1	allow correct symbol, Ne answer must be on list
	(b)	sodium (1)	1	allow correct symbol, Na answer must be on list
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>any two from:</p> <p>strong attraction / bonds / forces (1)</p> <p>between positive / Na⁺ ions and negative / Cl⁻ ions / ionic bonds / electrostatic attraction (1)</p> <p>giant lattice / giant ionic lattice (1)</p> <p>therefore more energy needed to break bonds (1)</p>	2	<p>ignore just attraction / links</p> <p>strong ionic bonds / strong electrostatic attractions = (2)</p> <p>need reference to breaking bonds</p> <p>more heat / energy to melt it is insufficient</p> <p>covalent bonds or intermolecular bonds = (zero for whole question)</p>
	(b)	ions / particles do not move / no free ions (1)	1	<p>ignore no free electrons</p> <p>ignore no charged particles / ions</p>
		Total	3	

7	(a)	blue (1)	1	<p>allow light or pale blue</p> <p>not dark blue or blue / purple or blue / green</p>
	(b)	precipitate (1)	1	allow copper hydroxide or copper (II) hydroxide or Cu(OH) ₂
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	aluminium oxide → aluminium + oxygen (1)	1	allow correct formulae and mixture of words and correct formulae / products in either order ignore molten not oxide for oxygen ignore balancing if formulae used $\text{Al}_2\text{O}_3 \rightarrow \text{Al} + \text{O}_2$
	(b)	any two from: anode wears away (1) anode is oxidised / reacts with oxygen (1) carbon dioxide/carbon monoxide formed (1)	2	allow anode is destroyed / burns away / disintegrates / breaks down / breaks up / erodes / corrodes (1) ignore dissolves / melts / breaks not reference to heating effect of electrolysis ignore production of oxygen at anode allow anode reacts with air (1)
	(c)	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ (1)	1	allow 3e not e ³⁻ allow = instead of → / $\text{Al}^{3+} \rightarrow \text{Al} - 3\text{e}^-$ allow correct multiples
	(d)	use a lot of electricity (1)	1	not just uses electricity allow uses a lot of energy ignore expensive equipment
	(e)	reduces melting point of aluminium oxide / less energy / electricity required (1)	1	allow to reduce the (operating) temperature needed ignore reduces the temperature ignore reduce the melting point not it is a catalyst
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
9	(a)	decreases (1)	1	allow reduces / goes down allow fluorine most reactive in group
	(b)	iodine less reactive than bromine / ora (1)	1	allow iodine below bromine in the group allow bromide / iodide allow higher level answers in terms of ease of electron gain not just iodine is less reactive / sodium bromide is more reactive
	(c)	electron(s) / e ⁻ gained (1)	1	ignore gaining a negative charge ignore just OIL RIG
		Total	3	

10	(a)	increases (1) alkaline (1)	2	
	(b)	2Na + 2H ₂ O → 2NaOH + H ₂ formulae (1) balancing (1)	2	allow multiples balancing dependent on correct formulae
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
11	(a)	(i)	<p>max 2 marks</p> <p>drives within thinking distance scores (2)</p> <p>drives within stopping distance scores (1)</p> <p>risk of collision / might crash (1)</p>	2	<p>not just thinking distance = 10 metres</p> <p>not just stopping distance = 26 metres allow needs more than 3 metres to stop (1)</p> <p>allow idea of not stopping in time (1)</p> <p>ignore reference to braking distance</p>
		(ii)	increases / AW (1)	1	<p>allow longer to stop (1) assume answer refers to distance unless time is specified but allow the car takes a longer time to stop so the distance is longer</p>
		(iii)	(driver) tiredness / alcohol (intake) / drugs / distracted / lack of concentration (1)	1	<p>allow older driver / driver has been drinking / is drinking (1)</p> <p>allow specific examples - mobile phone use, adjusting radio / using sat nav / distraction must be inside the car</p> <p>if more than one reason then any incorrect reason negates the mark eg drinking alcohol and bald tyres</p>
	(b)		<p>8000 scores (2)</p> <p>but 2000 x 4 scores (1)</p>	2	<p>only look for correct working mark if answer is incorrect</p> <p>allow 2000 x 400 (cm) for 1 mark</p>
			Total	6	

Question		Expected Answers	Marks	Additional Guidance	
12	(a)	2.2 scores (2) but evidence of area under graph identified (in written answer or on graph) / 1.1 x 4 x 0.5 (1)	2	allow triangle under graph up to 4 secs shaded	
	(b)	(i)	swimming force greater (than drag force) (1)	1	allow the (forces) both increase / drag force increases not just swimming force increases / drag force greater than swimming force
		(ii)	(forces) equal (in opposite directions) / balance / the same (1)	1	not just in opposite directions not stay the same but allow stay balanced / stay equal
	(c)	1.25 (2) but 25 / 20 scores (1)	2	only look for correct working mark if answer is incorrect	
		Total	6		

Question		Expected Answers	Marks	Additional Guidance
13	(a)	66 (1)	1	
	(b)	<p>any 2 from</p> <p>drive at different speeds (1)</p> <p>different driving styles / AW (1)</p> <p>different road conditions / AW (1)</p> <p>different loads / AW (1)</p> <p>different journey types (1)</p> <p>different use of heater / radio / air conditioning (1)</p> <p>reference to different air resistance due to windows open or roof rack (1)</p>	2	<p>mark both answers together</p> <p>eg accelerating or braking hard</p> <p>eg hills, town v country</p> <p>eg van makes many short journeys</p>
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
14	(a)	<p>any 2 from</p> <p>greater distance (when colliding) (1)</p> <p>greater time (1)</p> <p>less acceleration (1)</p> <p>less force (1)</p>	2	<p>mark both answers together</p> <p>ignore references to energy (in stem of question)</p> <p>allow the crumple zone has shortened ignore crashes / bends</p> <p>ignore stopping / braking distance of car</p> <p>allow stops slower / prevents a sudden stop</p> <p>allow slows down slower (1)</p> <p>ignore reference to absorbing impact or pressure</p>
	(b)	<p>idea that energy needs to be absorbed in a crash /AW (1)</p> <p>when speed increases, KE increases (1)</p> <p>BUT</p> <p>either when speed doubles KE quadruples / 4 x KE</p> <p>or KE proportional to speed² or velocity² (2)</p>	3	<p>simply stating the KE equation on its own scores 0</p> <p>when speed doubles, 4 x kinetic energy needs to be absorbed = 3 marks</p> <p>allow correct use of figures eg if speed increases from 2 to 4 then KE goes from 5 to 20</p>
		Total	5	

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

Question		Expected Answers	Marks	Additional Guidance
1	(a)	cooking foil (1) glass bottles (1)	2	
	(b)	contains <u>microorganisms</u> (1)	1	any mention of sand scores 0
		Total	3	

2	(a)	petal / flower (1) root (1)	2	allow root hairs (1) not hairs
	(b)	leaves (1) temperature / humidity (1)	2	allow stomata (1) allow heat (1) not Sun allow leaf area / number of stomata / presence of hairs / thickness of cuticle / wax on cuticle (1)
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	makes its own food / photosynthesises / uses the energy from sunlight to make food (1)	1	allow produces food reject start / bottom / base of food chain
		(ii)	the sun / sunlight / light (1)	1	ignore photosynthesis
	(b)		diagram or explanation showing a tapering pyramid with four trophic levels (1)	1	allow triangle with four segments do not measure size of blocks in pyramid – look for largest at bottom tapering to smallest at top look at diagram first, ignore writing unless direct contradiction
	(c)		(stop them) eating / spoiling their crops (1) so that they can produce more (1)	2	
	(d)	(i)	as the amount of pesticide has gone up, so has the death rate (1)	1	must link increase in pesticide with increased death rate ignore reference to years
		(ii)	any one from inexpensive / cheaper / ora (1) self-perpetuating / organisms spread on their own / continue to reproduce (1) little or no further action needed (1) usually low impact on environment (1)	1	reject free / no cost allow no need to renew (1) allow better for environment / ecosystem (1) allow does not affect food chain / specific examples in food chain (1) ignore unqualified reference to pollution ignore reference to taste ignore reference to natural way of control / organic farming
			Total	7	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	cell wall anywhere before cell membrane (1) cell membrane anywhere before cytoplasm (1)	2	
	(b)	allows some substances / molecules through (not others) / ora (1)	1	allow lets water through not sugar / glucose (1) must make reference to both water and sugar / glucose allow lets small molecules through (not large) / ora (1)
Total			3	

5	(a)	1 = photosynthesis 2 = respiration / respiring 3 = decomposition / decomposing (2)	2	two or three correct = 2 one correct = 1
	(b)	nitrogen (1)	1	allow oxygen / phosphorus / sulfur / magnesium / iron / sodium / potassium / chlorine / calcium / iodine ignore nitrates
Total			3	

6	(a)	(i)	neutral (1)	1	
		(ii)	acidic / acid (1)	1	ignore named acid
	(b)		carbon dioxide (1)	1	ignore formula
	(c)		hydrochloric acid (1)	1	ignore formula
	(d)		any one from making fertiliser (1) car battery acid (1) preparing / cleaning metal surfaces (1)	1	reject batteries reject cleaning allow making detergents (1)
Total			5		

Question			Expected Answers	Marks	Additional Guidance
7	(a)	(i)	air / atmosphere (1)	1	reject soil / fertilisers / plants
		(ii)	oil / natural gas / methane (1)	1	allow water / steam / H ₂ O / sea water (1) not sea
	(b)		reversible reaction (1)	1	allow can go backwards and forwards / equilibrium / can go in opposite / both directions (1)
	(c)		any two from price of energy / electricity / fuel (1) wages / owtte (1) (cost / maintenance of) equipment / plant / machinery (1) cost of catalyst (1) pollution controls / safety / security (1) rates / taxes / rent (1)	2	allow premises costs (1) ignore unqualified running cost ignore raw materials ignore transport / packaging / advertising / R&D
			Total	5	

Question		Expected Answers	Marks	Additional Guidance	
8	(a)	diamond (1)	1		
	(b)	any two from black (1) opaque (1) slippery (1) conducts electricity (1) high melting point (1)	2	ignore lustrous allow grey (1) ignore lubricant ignore reference to intermolecular bonds reject smooth reject reference to pencil / writing	
	(c)	(i)	C_{60} (1)	1	allow circled / underlined / ticked correct answer if nothing written on answer line allow 60
		(ii)	any one from semiconductors (1) catalysts (1) reinforcement (of carbon fibres) (1) carries drugs around body (1)	1	allow increased surface area of catalyst allow specific examples e.g. tennis rackets / golf clubs / cycles
		Total		5	

Question			Expected Answers	Marks	Additional Guidance
9	(a)	(i)	3 (1)	1	ignore named elements reject 3 oxygens
		(ii)	5 (1)	1	
	(b)		101 (1)	1	
	(c)		4.8/6.0 x 100 (1) or correct formula 80 (1)	2	correct answer = 2 only look at working if answer incorrect
			Total	5	

10	(a)		Jamie becomes charged (1) The vinyl floor is an insulator (1) The water pipes are connected to the earth (1)	3	if additional boxes ticked, -1 mark for each additional, minimum 0
	(b)	(i)	negative (1)	1	allow -ve
		(ii)	unlike / opposite charges (attract) / AW (1)	1	ignore different charges allow negative water attracted to positive rod ignore unqualified water negative / rod positive allow higher level answer e.g. polarisation of water molecules
			Total	5	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	blue (1)	1	
	(b)	brown (1)	1	
	(c)	earth (1)	1	allow green <u>and</u> yellow (1)
	(d)	current too large / surge (1) melts / breaks circuit / blows (1)	2	allow power too large / surge (1) reject electricity too large / voltage too large ignore short circuit reject blows up / snaps / burns / breaks / explodes reject trips
		Total	5	

12	(a)	radiographer (1)	1	
	(b)	gamma (1)	1	allow any em wave i.e. ir / uv / visible / microwaves / radio reject sound / ultrasound / X-rays
	(c)	(i) longitudinal (1)	1	
		(ii) any two from scans / pregnancy scan / AW (1) blood flow measurements (1) breaking (kidney) stones (1)	2	allow look for / treat tumours (1) allow cleaning delicate equipment (1) allow to treat muscle injury (1)
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	uranium (1)	1	
	(b)	become radioactive (1)	1	allow gain / absorb neutrons
	(c)	(i) nuclear reaction / fission (1)	1	allow splitting atom
		(ii) makes steam / boils water (1)	1	look at parts ii and iii to see where marks have been scored award mark in appropriate place even is scored in other part
		(iii) turbine (1)	1	
		Total	5	

B624/02 Unit 2: Modules B4, C4 and P4 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	diagram or explanation showing a tapering pyramid with four trophic levels (1)	1	allow triangle with four segments do not measure size of blocks in pyramid – look for largest at bottom tapering to smallest at top look at diagram first, ignore writing unless direct contradiction
	(b)	(i) as the amount of pesticide has gone up, so has the death rate (1)	1	must link increase in pesticide to increase in death rate ignore reference to years
		(ii) there is a dip (in the middle) in death rate when pesticide is increasing / when pesticide dips the death rate increases (1)	1	must link death rate with pesticide use not just it falls in 1994
		(iii) any one from inexpensive / cheaper / ora (1) self-perpetuating / organisms spread on their own / continue to reproduce (1) little or no further action needed (1) usually low impact environment (1)	1	reject free / no cost allow no need to renew allow better for environment / ecosystem allow does not affect food chain / specific examples in food chain ignore unqualified reference to pollution ignore reference to taste ignore reference to natural way of control / organic farming
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	osmosis (1)	1	not diffusion
		(ii)	allows some substances / molecules through (not others) / ora (1)	1	allow lets water through not glucose / sugar must make reference to both water and sugar / glucose allow lets small molecules through (not large) / ora
	(b)		turgor / osmotic / wall (1) plasmolysed (1)	2	not turgid not crenation
			Total	4	

3	(a)		<p>any two from feed on / digest dead material / compost / decaying material / detritus (1)</p> <p>increases surface area (1) (more area) for decomposers / microorganisms to work on better / faster (1)</p> <p>aerates the compost / lets oxygen in (1) improves drainage (1) mixes up the layers (1)</p> <p>increases respiration in microbes (1)</p>	2	<p>mark both parts of the question together allow break down</p> <p>allow bacteria / fungi / saprophytic for decomposers ignore small particles</p> <p>allow lets air in (1)</p>
	(b)		<p>any two from microorganisms will decompose / work faster / better if it is warmer (1)</p> <p>microorganisms will reproduce faster (1)</p> <p>their rate of respiration / enzyme action will increase (1)</p>	2	ignore any reference to temperature on its own decay faster when warmer score 0 but microorganisms decay the waste faster when warmer score 1
			Total	4	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	1 = photosynthesis 2 = respiration / respiring 3 = decomposition / decomposing (2)	2	two or three correct = 2 one correct = 1
	(b)	nitrifying bacteria (1) convert ammonia (1) to nitrates (1) OR denitrifying bacteria (1) convert nitrates (1) to nitrogen gas (1) OR nitrogen fixing bacteria (1) convert nitrogen gas (1) into nitrates / nitrogen compounds (1)	3	allow word equations allow correctly named bacteria e.g. nitrobacter is a nitrifying bacteria name of bacteria scores 1 in spite of incorrect description if no bacteria named score 0 allow returns nitrogen gas to atmosphere (1)
		Total	5	

5	(a)	respiration / release energy (1) active transport / against a concentration gradient (1)	2	ignore oxygen supplies or for energy
	(b)	any one from can adjust the balance of the minerals (1) better control of disease / better control of weeds (1) saves land mass / space (1)	1	allow less competition for minerals (1) ignore mineral deficiency allow avoids soil born diseases (1) allow can grow in barren conditions / AW (1)
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	add universal indicator (1) changes colour (1)	2	allow use pH meter (1) and observe display (1)
	(b)	hydrochloric acid (1)	1	ignore formula
	(c)	carbon dioxide (1)	1	ignore formula
	(d)	copper oxide + sulfuric acid → copper sulfate + water (1)	1	reactants any order products any order allow = allow correct formula / mix of formula and names not and instead of +
		Total	5	

7	(a)	(i)	delocalised electrons (1)	1	allow free electrons / sea of electrons / moving electrons
		(ii)	(large numbers of) strong covalent bonds (1)	1	allow intramolecular for covalent not intermolecular bonds ignore strong bonds
	(b)	(i)	C ₆₀ (1)	1	allow circled / underlined / ticked correct answer if nothing on answer line allow 60
		(ii)	any one from semiconductors (1) catalysts (1) reinforcement (of carbon fibres) (1) carrying drugs around the body (1)	1	allow increased surface area of catalyst (1) allow specific examples e.g. tennis rackets / golf clubs / cycles
	(c)		allotropes (1)	1	
		Total	5		

Question		Expected Answers	Marks	Additional Guidance
8	(a)	$\text{KOH} + \text{HNO}_3 \rightarrow \text{KNO}_3 + \text{H}_2\text{O}$ (1)	1	reactants either order products either order allow = allow correct multiples
	(b)	$4.8/6.0 \times 100$ (1) or correct formula 80 (1)	2	correct answer = 2 only look at working if answer is correct
	(c)	number of atoms stays the same (1)	1	allow atoms cannot be made / destroyed
Total			4	

9	(a)	(i)	speeds up the reaction (1)	1	allow process for reaction ignore is not used up
		(ii)	higher temperature decreases yield / ora (1) low temperature means reaction is slow / ora (1)	2	ignore cost high percentage yield scores 0 allow a fast rate of reaction (1) that gives a reasonable yield (1)
		(iii)	increased cost (1)	1	allow reference to high tech equipment allow reference to safety
	(b)		any one from improved growth (1) more healthy plants (1) increase yield (1) to provide minerals (1)	1	allow make more profit (1) ignore faster growth
	(c)		dissolve (in water) (1)	1	allow must be soluble
Total			6		

Question			Expected Answers	Marks	Additional Guidance
10	(a)	(i)	electrons removed (1)	1	allow moved / lost
		(ii)	unlike / opposite charges (attract) / AW (1)	1	ignore different charges allow negative water attracted to positive rod ignore water negative / rod positive allow higher level answer e.g. polarisation of water molecules
	(b)	(i)	flour becomes charged (as it flows through pipe) / AW (1)	1	ignore references to static allow electrons transferred to plastic pipe / ora
		(ii)	any one from different voltage / potential to lorry (1) (possible spark) could cause flour to explode (1) stops build up of charge (1)	1	allow prevents sparks (1) allow different charge to container (1) ignore catch fire not electricity flows to ground not lorry becomes live allow flow of charge / electrons to ground (1)
			Total	4	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	casing made of insulator (1) no current can pass through casing (1)	2	allow no metal parts exposed / double cased / idea of two layers of metal with insulation between (1) allow casing cannot become live (1) ignore so no one can become electrocuted
	(b)	current too large / surge (1) melts / breaks circuit / blows (1)	2	allow power too large / surge (1) reject electricity too large / voltage too large ignore short circuit ignore blows up / snaps / burns / breaks / explodes / reject trips
	(c)	5 (2) but $230 \div 46$ scores (1)	2	correct answer = 2 only look at working if answer incorrect
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
12	(a)	firing electrons at metal targets (1)	1	ignore bounce / reflect
	(b)	have similar wavelengths (1)	1	
	(c)	easier to control / AW (1)	1	ignore reference to safety
	(d)	any one from treat / detect cancer / tumours (1) tracer (1) sterilisation of equipment (1)	1	
	(e)	any one from scan / pregnancy scan / AW (1) breaking (kidney) stones (1)	1	allow look for / treat tumours allow cleaning delicate equipment allow to treat muscle injury allow blood flow measurements
		Total	5	

Question			Expected Answers	Marks	Additional Guidance
13	(a)	(i)	nuclear reaction / fission (1)	1	allow splitting atoms
		(ii)	turbine (1)	1	ignore steam
	(b)		713 (2) but evidence of finding half life from graph or calculation scores 1	2	allow answer in range 690 - 730
	(c)		lead-209 has one more neutron in nucleus / ora (1)	1	allow lead-209 has different number of neutrons / ora (1) allow different mass numbers / different numbers of protons plus neutrons / different number of nucleons if not specified they or it refers to lead-208
			Total	5	

Grade Thresholds

General Certificate of Secondary Education
Additional Science B (Specification Code J641)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B623/01	Raw	60	-	-	-	36	29	22	16	10	0
	UMS	69	-	-	-	60	50	40	30	20	0
B623/02	Raw	60	46	37	28	20	13	9	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B624/01	Raw	60	-	-	-	30	23	17	11	5	0
	UMS	69	-	-	-	60	50	40	30	20	0
B624/02	Raw	60	48	39	30	22	12	7	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0

Specification Aggregation Results

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

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J641	300	270	240	210	180	150	120	90	60	0

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

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J641	0.0	10.5	21.1	47.4	94.7	100.0	100.0	100.0	100.0	19

For a description of how UMS marks are calculated see:

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

Statistics are correct at the time of publication.

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