OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Mark Schemes for the Units

January 2010

J641/MS/R/10J

Oxford Cambridge and RSA Examinations

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GCSE Gateway Additional Science B J641

MARK SCHEMES FOR THE UNITS

Mark Scheme Guidance

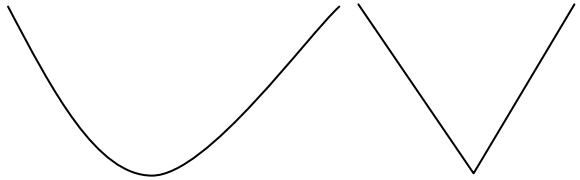
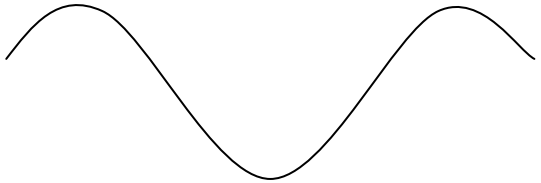
Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/ = 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			Gd	Expected Answers	Marks	Additional Guidance
1	(a)	(i)	G	vacuole (1)	1	
		(ii)	F	support (1)	1	**allow** transport of substances/water **ignore** water uptake/wilting/any reference to whole plant **allow** keeps cell rigid/correct shape **allow** stores water/mineral salts/dissolved substances/nutrients **Not** food **Not** sap as in stem of question
	(b)		F	DNA (1)	1	
	(c)		G	cell differentiation (1)	1	**allow** correct answer indicated in any other way eg underlined or ticked. more than one answer = 0
	(d)		E	move/grows towards light/responds to light/attracted to sun/light (1)	1	**allow** to get light / for photosynthesis **allow** high level answers eg positively phototropic / negative geotropic / correct reference to auxin such as auxin causes cells not exposed to light to grow.
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
2	(a)		GDG	lungs (1) arteries (1) high (1)	3	**allow** arrow between answer and answer line **not** answers circled or underlined in list
	(b)		D	**any one from:** idea of rejection (1) need for power supply (1)	1	**allow** will not suit everyone's body / body won't accept it / body may not respond well to it **allow** difficult to attach to blood vessels / blood can leak difficult to change rate of beating / different sizes needed / noisy / heavy **ignore** lots of drugs need to be taken unless linked to rejection **ignore** may not work unless qualified e.g. **allow** may stop working if battery is faulty **allow** it will only last for a set amount of time **allow** needs to be recharged **allow** the mechanics could get faulty / it will wear out **ignore** unreliable
	(c)		E	genetic engineering / genetic modification (1)	1	**allow** GM **ignore** cloning
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
3	(a)	(i)	G	20 (1)	1	**Correct answer only**
		(ii)	D	7 (1)	1	**allow** any value in range 6.9 -7.1 **allow** neutral
	(b)		CC	peak or trough between 35ºC and 45ºC (1) graph correct way up (u or v shaped) (1) e.g. 	2	**allow** correctly plotted points not joined with a line **allow** unsymmetrical u and v **but**  scores 1 provided peak or trough is between 35ºC and 45ºC
	(c)		C	digest egg membrane / breakdown egg membrane / allows sperm to penetrate egg (1)	1	**allow** egg wall **not** cell wall **ignore** egg shell **ignore** digest the egg **allow** enzymes digest the outside of the egg **allow** to break through the egg **allow** breaks down the outer layer of the egg **allow** eats into the egg / pushes through the egg
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
4	(a)		EE	**any two from:** old potato has food reserves (1) new shoot /stem/ roots grow/form (1) from buds / eyes (1) leaves develop / grow (1) involves cell division (1)	2	**allow** high level answers eg cells divide by mitosis (1) cells specialise / differentiate (1) **ignore** direction of growth **ignore** function of parts **not** just plants grow
	(b)		F	asexual (1)	1	
	(c)		G	tick in 4th box	1	More than 1 tick = 0
	(d)		F	prevent water loss	1	**allow** keep them warm / keep pests away/stops them being eaten **allow** let light in **ignore** ref. to infection and disease
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
5	(a)		G	lithium / potassium / rubidium / caesium / francium (1)	1	**allow** Li / K / Rb / Cs / Fr if symbol used it must be correct with capital first letter and lower case second letter. If in doubt eg Cs give BoD This is because they were asked to write down the **name** but chose to use a symbol **not** sodium/Na – in stem of question
	(b)		E	alkali metals (1)	1	both words needed **not** alkaline metals
	(c)		FG	**any two from** (stops)reaction / contact with air / Sodium reacts with oxygen /air (1) (stops) reaction /contact with water / Sodium reacts with water /(vapour)/moisture (1) very reactive (1)	2	**allow** reacts with moist air (2) **allow** reacts violently with water (2) **allow** reacts quickly with oxygen (2) **ignore** does not react with oil
	(d)		CD	hydrogen (1) sodium hydroxide (1)	2	**allow** H_2 **not** H^2 / H2 / H **allow** NaOH order of products unimportant
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
6	(a)		G	iron (1)	1	**allow** Fe symbols must be correct
	(b)		F	zinc (1)	1	**allow** Zn symbols must be correct
	(c)		CD	idea that density too high (so wires would sag) (1) idea that silver and copper are too expensive (1)	2	**allow** because of density and cost (1) if no other mark scored **ignore** any comments about corrosion **allow** they have too high a density (1) they are too expensive (1) **allow** wires are heavy **allow** reference to just one metal e.g. silver is expensive **allow** reverse argument for aluminium
	(d)		E	(good) conductor **of heat** / shiny or lustrous / hard / **high** tensile strength / strong / **high** boiling point / sonorous / malleable / ductile (1)	1	**allow** chemical properties of metals eg forms **positive** ions / forms **basic** oxides / reacts with acids **not** how strong / how malleable etc
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
7	(a)	(i)	G	Cu	1	**allow** copper / CU **Only allow answers from the table for the whole question**
		(ii)	E	K	1	**allow** potassium
		(iii)	F	C*l*	1	**allow** chlorine / CL
		(iv)	D	Ar	1	**allow** argon / AR
	(b)	(i)	E	C*l* and Br / Ba and Sr	1	**allow** chlorine and bromine / barium and strontium / CL and BR / BA and SR . This is because the question is testing groups and periods.
		(ii)	F	Cl and Ar / K and Cu / K and Br / Cu and Br (1)	1	**allow** correct names. Allow all upper case letters
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
8	(a)		G	nucleus (1)	1	
	(b)		G	negative (1)	1	**allow** - / -ve / minus **allow** correct answer underlined or circled if answer line blank
	(c)		C	number of protons (in the nucleus) (1)	1	**allow** number of electrons **allow** number of protons **or** electrons **allow** no of 'protons/electrons' **not** number of protons **and** electrons unless qualified e.g. it has 8 protons and 8 electrons
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
9	**(a)**	**(i)**	F	C (1)	1	**allow** correct answer circled or underlined if answer line is blank
		(ii)	G	D (1)	1	**allow** correct answer circled or underlined if answer line is blank
	(b)		G	distance (1)	1	**not** metres, centimetres etc but **allow** how many metres the car travels **allow** how far car travels/length
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
10	**(a)**		G	increases / gets more / accelerates (1)	1	**allow** gets faster **allow** increased acceleration
	(b)		E	decreases / gets less / lower/ slower / less than 160(km/h)(1)	1	**not** deceleration
	(c)		F	decreases / gets less (1)	1	**allow** gets slower/takes longer to reach top speed takes longer to accelerate **not** decelerate
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
11	(a)		C	(√) ; ; ; ; √ √ ; ; √ ; ; (1)	1	**Need all** correct for 1 mark if any tick in the wrong box score 0
	(b)		D	; ; (√) √ ; ; ; ; √ √ ; ; (1)	1	**all** correct (1) if any tick in the wrong box score 0
				Total	**2**	

Question			Gd	Expected Answers	Marks	Additional Guidance
12	(a)		C	increased engine size gives more CO_2 / AW (1)	1	**allow** reverse argument **allow** more emissions / more pollution for idea of more CO_2 **ignore** bigger car
	(b)	(i)	D	190 +/- 5	1	
		(ii)	C	65 +/- 5	1	if answer outside range check their graph to see if correct value taken in which case correct value gains the mark **allow** any sensible extrapolation **allow** answer written on graph if answer line is blank
				Total	**3**	

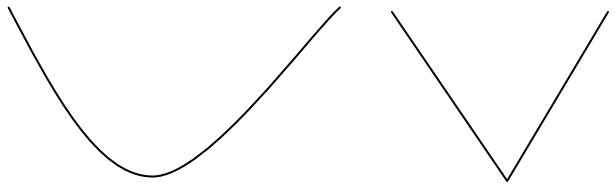
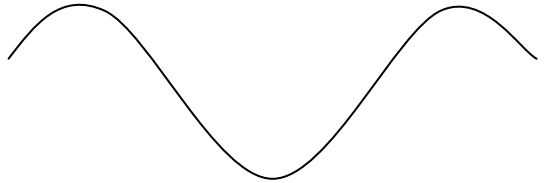
Question			Gd	Expected Answers	Marks	Additional Guidance
13	(a)		G	loads the most / 120 bricks / AW(1)	1	**ignore** any reference to time
	(b)		E	**Idea that** takes least time / shortest time / less time AW / 20 seconds (1)	1	**Ignore** any mention of bricks **allow** higher level answers in terms of bricks loaded per second e.g. loads 0.5 bricks per second
				Total	**2**	

Question			Gd	Expected Answers	Marks	Additional Guidance
14	(a)		G	Petrol / Diesel (1)	1	**allow** LPG/propane/butane **not** just oil/gas
	(b)		EE	ideas: **batteries** needed to store energy/supply energy (1) need to be **recharged/charged/plugged in** (1)	2	**allow** ideas about solar power: e.g. mention of solar cells/panel/use of sunlight (1)
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
15	(a)		F	air bags / seat belts (1)	1	**allow** bumper **allow** padded steering wheel etc **not** safety cage
	(b)		F	heat (1)	1	**allow** thermal **ignore** sound **ignore** potential
	(c)		D	does not need to use hand to turn window handle / AW (1) easier to open or close window (1) quicker to open or close window (1)	1	**allow** only needs to push a button **allow** less distraction / better concentration **allow** hand off steering wheel for less time **allow** prevents children from opening them / can be controlled or locked by the driver **ignore** mention of crash
	(d)		G	it has become stretched / damaged / may not work next time /broken / torn (1)	1	**allow** possible damage to anchor points / become loose
				Total	**4**	

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

Question			Gd	Expected Answers	Marks	Additional Guidance
1	(a)		DD	backflow (1) arteries (1)	2	**allow** arrow between answer and answer line
	(b)		D	**any one from:** idea of rejection (1) idea of need for power supply (1)	1	**allow** will not suit everyone's body / body won't accept it / body may not respond well to it **allow** difficult to attach to blood vessels / blood can leak difficult to change rate of beating / different sizes needed / noisy / heavy **ignore** lots of drugs need to be taken unless linked to rejection **ignore** may not work unless qualified e.g. **allow** may stop working if battery is faulty **allow** it will only last for a set amount of time **allow** needs to be recharged **allow** the mechanics could get faulty / it will wear out **ignore** unreliable
	(c)		B	restricts blood flow (in arteries) / restricts oxygen supply (to heart) / causes high blood pressure (1)	1	**allow** (coronary) artery blocked / heart muscle receives too little oxygen **allow** stops blood flow (in arteries) **allow** lumen reduced / blood vessels are narrowed **ignore** restricts blood flow in veins or capillaries e.g. restricts blood flow = 1 but restricts blood flow in veins = 0 **ignore** risk of heart attack **ignore** heart beats faster **ignore** makes the blood thicker and so restricts the flow
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
2	(a)	(i)	D	7 (1)	1	**allow** 6.9 -7.1 **allow** neutral
		(ii)	AA*	**any two from:** enzymes react fastest or best at pH 7 / pH 7 is optimum pH / enzymes work less well below or above pH 7 (1) **at extreme pH or pH 5 or pH 9;** active site changes shape (1) enzyme denatured (1) enzyme and hydrogen peroxide cannot join (1) lock and key mechanism will not work (1)	2	**USE TICKS IN THIS QUESTION** **allow** enzymes work fastest at neutral pH **allow** enzymes react fastest at optimum pH if pH 7 is correctly identified in (a)(i) **allow** reverse argument e.g. at pH 7 the shapes of hydrogen peroxide and the enzyme fit together perfectly (1)
	(b)		CC	peak or trough between 35ºC and 45ºC (1) graph correct way up (u or v shaped) (1) e.g. 	2	**allow** correctly plotted points not joined with a line scores 2 **allow** unsymmetrical 'u' and 'v' **but**  scores 1 provided peak or trough is between 35ºC and 45ºC
	(c)		C	digest egg membrane / breakdown egg membrane / allows sperm to penetrate egg (1)	1	**allow** egg wall **not** cell wall **ignore** egg shell **ignore** digest the egg **allow** enzymes digest the outside of the egg **allow** to break through the egg **allow** breaks down the outer layer of the egg **allow** eats into the egg / pushes through the egg
				Total	**6**	

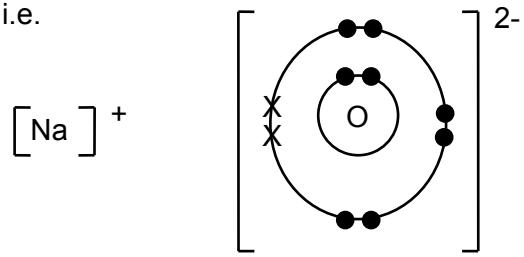
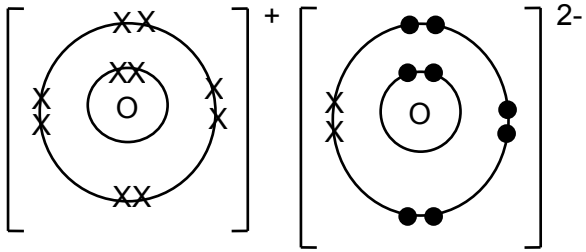
Question			Gd	Expected Answers	Marks	Additional Guidance
3	(a)		DD	**advantage any one from :** idea of are the same (as parent) in any inherited characteristic / genetically identical (1) faster than growing from seed (1) **disadvantage any one from :** idea that if one (cloned) plant gets a disease all plants may all get the disease (1) no (genetic) variation (in clones) (1) reduces gene pool / reduction in variation (in potatoes as a whole) / less variety (in potatoes as a whole) (1)	2	e.g. produce exact copy of plant / you have lots of the same plants **ignore** references to cost must have a comparison with growth from seed eg grows quick = 0 **ignore** disease passed from parent **ignore** less genetic variation **allow** no variety
	(b)		BA	**any two from :** use (large numbers) of small pieces / shavings / scrapings (1) use aseptic techniques (1) use suitable growth medium / agar gel / nutrients (1) control temperature / control pH (1) use hormones (1) stir / shake (to aerate) (1) propagate the explants (1)	2	**if the answer refers to taking cuttings or genetic engineering or growing the original plant then scores 0** **allow** examples eg use sterile water **ignore** soil **allow** propagate the plantlets
	(c)		B	(variation) true and (mutation) false (1)	1	both correct for one mark
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
4	(a)		C	diffusion (1)	1	**not** respiration
	(b)		B	(air) spaces (allow ease of movement) / (air) spaces (allow diffusion through leaf) (1)	1	**allow** have a large surface area (to release or exchange more gas) **allow** spongy layer has large surface area (for gas exchange) **allow** (large) holes / gaps
	(c)		A*	plant cells **retain the ability** to differentiate / animal cells **lose the ability** to differentiate (1)	1	assume referring to plants unless otherwise stated **ignore** animal cells don't differentiate **allow** once animal cells have specialised they cannot change **allow** in animals **only** stem cells can differentiate **but** only stem cells in animals can differentiate scores 0
	(d)	(i)	A	tips (1)	1	**allow** meristem **not** any reference to roots **allow** arrow to tip on diagram **ignore** top
		(ii)	C	(positive) phototropism (1)	1	**allow** tropism
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
5	(a)		CD	hydrogen (1) sodium hydroxide (1)	2	**allow** H_2 **not** H^2 / H2 / H **allow** NaOH order of products unimportant
	(b)		D	have same number of electrons in outer shell / one electron in their outer shell (1)	1	**not** has 2 or more electrons in outer shell **allow** all form a 1+ ion **allow** they lose one electron **allow** same number in outer shell if clear it is referring to electrons e.g. same number of atoms in outer shell scores 0 **ignore** same or similar electronic structure
	(c)		AB	oxidation (1) loss of electrons (1)	2	**allow** answer ticked, circled or underlined if answer line left blank mark independently
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
6	(a)		CD	idea that density too high (so wires would sag) (1) idea that silver and copper are too expensive (1)	2	**allow** because of density and cost (1) if no other mark scored **ignore** any comments about corrosion **allow** they have too high a density (1) they are too expensive (1) **allow** wires are heavy **allow** reference to just one metal e.g. silver is expensive **allow** reverse argument for aluminium
	(b)		CD	copper and then **any two from** it has a high density / it is dense (1) it is lustrous / shiny / attractive (1) it is relatively cheap (1) it does not rust (1)	2	no mark for name of metal but metal must come from table to score any marks **allow** metal is heavy **allow** iron (no mark) because it has a high density (1) and is cheap / cheapest (1) **allow** silver (no mark) because it has a high density (1) but no other mark
	(c)		A*A	electrons move / delocalised or free or sea of electrons (1) **BUT** delocalised electrons move / free electrons move / sea of electrons move (2)	2	free electrons and ions move scores 1 only for idea of free electrons **allow** electrons free to move scores 1 **but** free electrons move scores 2
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
7	(a)		D	Ar (1)	1	**allow** argon /AR
	(b)		C	Br (1)	1	**allow** bromine / BR **not** bromide
	(c)		D	Cu (1)	1	**allow** copper / CU
	(d)		B	Sr (1)	1	**allow** strontium / SR
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
8	(a)		C	number of protons (in the nucleus) (1)	1	**allow** number of electrons **allow** number of protons **or** electrons **allow** number of 'protons / electrons' **not** number of protons **and** electrons unless qualified e.g. it has 8 protons and 8 electrons
	(b)		A*A	sodium ion drawn with either a full outer shell or an empty one and charge of +1 (1) one oxide ion drawn with 8 electrons in outer shell and charge of -2 (1) i.e.  **or** structure of sodium ion showing complete electron shells:  (2)	2	alternatively mark as below to give the candidate the best mark (do not mix and match two mark schemes) **allow** correct electronic structure of sodium ion and oxide ion (1) **allow** correct charges on ions – this is independent of the electronic structures drawn (1) **ignore** inner shells **not** $[Na_2]^{2+}$ or $[Na]_2^{2+}$ **allow** $2[Na]^+$ **allow** electrons drawn as all dots or all crosses the electrons lost by sodium atoms must only be drawn **once** e.g. either on the oxide ion outer shell or on the sodium atom(s) with an arrow showing it/them is being transferred to the oxygen atom **if a covalently bonded structure is shown in the diagram answer scores 0 but if covalent in the writing and correct diagram then ignore writing**
	(c)		BB	number of neutrons = 20 (1) electronic structure = 2.8.7. (1)	2	
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
9	(a)	(i)	B	C (1)	1	if answer line is blank, allow correct answer ticked, circled or underlined in list
		(ii)	B	D (1)	1	if answer line is blank, allow correct answer ticked, circled or underlined in list
	(b)	(i)	C	(✓) | | | | ✓ ✓ | | ✓ | | (1)	1	need all correct for 1 mark if more than one tick on any line score 0
		(ii)	D	| | (✓) ✓ | | | | ✓ ✓ | | (1)	1	need all correct for 1 mark if more than one tick on any line score 0
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
10			BAA*	2 = (3) **BUT** if answer is incorrect, $\frac{3200}{1600}$ = (2) **BUT** 3200 = (1)	3	**allow** 2.6 or 2.63 or 2.625 (2) or (4200/1600) (1) if no other marks awarded, **allow** evidence of 4200 - 1000 (1)
				Total	**3**	

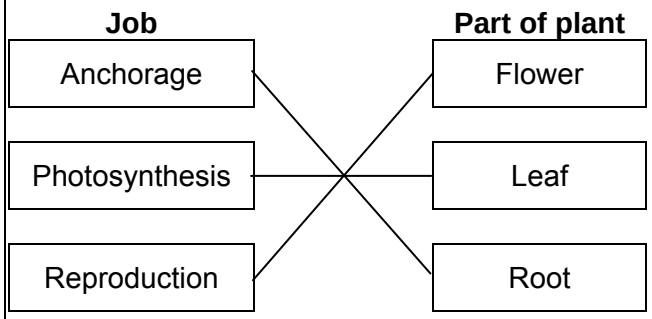
Question			Gd	Expected Answers	Marks	Additional Guidance
11	(a)		C	increased engine size gives more CO_2 / AW (1)	1	**allow** reverse argument **allow** more emissions / more pollution for idea of more CO_2 **ignore** bigger car
	(b)	(i)	D	190 +/- 5 (1)	1	
		(ii)	C	65 +/- 5 (1)	1	if answer outside range check their graph to see if correct value taken in which case correct value gains the mark **allow** any sensible extrapolation **allow** answer written on graph if answer line is blank
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
12	(a)	(i)	D	gravity or weight acts more (than air resistance or drag) / gravity or weight greater (than air resistance) (1)	1	references to forces do not balance is insufficient **ignore** references to energy **allow** idea that gravity or weight pulls it to earth / idea that gravity or weight pulls it down
		(ii)	D	idea of balance of forces (1)	1	**allow** higher level answers eg weight / gravity = drag / (air) friction or e.g. potential energy is converted to heat or sound
	(b)		D	5 (N) (1)	1	
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
13	(a)		C	(Helen) (no mark) most km for each litre / most distance for each litre / AW (1)	1	**ignore** incorrect driver **allow** more distance, less fuel used **allow** greatest distance on the same amount of fuel
	(b)		B	mark for factor, but no mark for explanation **any one from:** driving at higher speeds (1) example of different driving styles / AW (1) example of different road conditions / AW (1) increased loads / AW (1) example of different journey types (1) use of heater or radio or lights or windscreen wipers (1) (reference to different air resistance due to) windows open or roof rack (1)	1	if the comparison is not clear in the factor, then read the explanation e.g. accelerating or braking hard, incorrect gear, stopping and starting e.g. hills, town v country e.g. many short journeys

Question			Gd	Expected Answers	Marks	Additional Guidance
	(c)	(i)	C	(kinetic) energy (1)	1	**ignore** references to force or impact **allow** KE if energy type specified must be kinetic or movement
		(ii)	AAA*	the stopping time is increased / the stopping time is longer / AW (1) idea of decreased acceleration / AW (1) the stopping distance is increased / AW (1)	3	**USE TICKS IN THIS QUESTION** must be clear it is not the car **allow** slows down the collision (between air bag and passenger) (1) **allow** slows down the deceleration (1) **ignore** any reference to forwards acceleration **allow** mention of F = ma or work = force x distance (1) **ignore** cushions impact or force or collision **allow** greater time for KE to be dissipated (2)
	(d)		C	does not need to use hand to turn window handle / AW (1) easier to open or close window (1) quicker to open or close window (1)	1	**allow** only needs to push a button **allow** less distraction / better concentration **allow** hand off steering wheel for less time **allow** prevents children from opening them / can be controlled or locked by the driver **ignore** mention of crash
				Total	**7**	

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

Question			Gd	Expected Answers	Marks	Additional Guidance
1	(a)	(i)	G	roots / root hairs (1)	1	**ignore** from soil
		(ii)	G	leaf / leaf pores (1)	1	**allow** higher level answer: stomata
	(b)		F	oxygen / O_2 / glucose / sugar (1)	1	if formula given, must be correct **allow** starch
	(c)		FG	three correct (2) BUT one/ two correct (1) 	2	
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
2	(a)		E	(piece of) fruit (1)	1	
	(b)		EFG	**any three from:** temperature (1) BUT more decay at higher temperature / warmer (2) ora oxygen / O_2 (1) BUT more decay with more oxygen (2) ora water / moisture / damp (1) BUT more decay with more water (2) ora micro-organisms / decomposers / bacteria / fungi / microbes (1) ora BUT more decay with more bacteria / etc (2) ora	3	**ignore** heat / warm conditions but **allow** how warm or cold together **allow** mouldy for decay **allow** air for oxygen **allow** humid conditions **not** germs **allow** composition of bread / AW (1)
				Total	**4**	

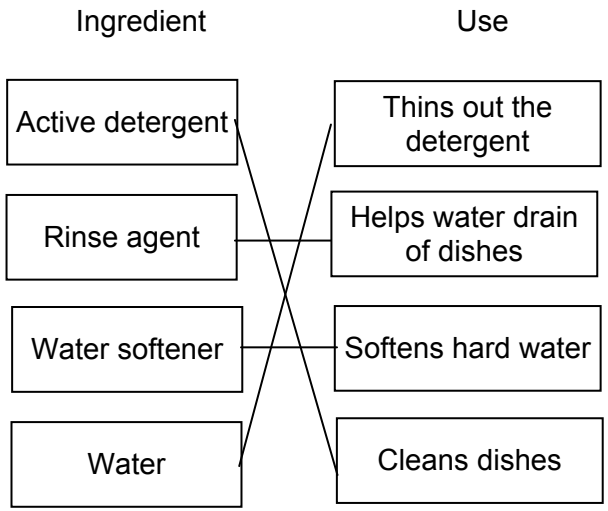
Question			Gd	Expected Answers	Marks	Additional Guidance
3	(a)		EF	no herbicides / weedkillers (1) no pesticides / fungicides / insecticides (1) uses biological control (1)	2	**allow** 1 mark for no chemicals used if no other mark given **allow** crop rotation **ignore** 'is natural' idea **allow** more labour intensive If the candidate does not qualify the type of farming that they are referring to, assume organic farming
	(b)	(i)	G	smaller a.w. (1)	1	**allow** higher level answers: deficiency disease / yellow leaves / etc
		(ii)	G	roots / root hairs (1)	1	**ignore** from soil **allow** higher level answer: dissolved in water / as a solution / active transport / active uptake / carrier molecules
	(c)		E	less food produced (1)	1	**allow** more pest damage / pests eat them **allow** costs more **ignore** all references to speed of growth **ignore** all references to time management
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
4	(a)		D	photosynthesis (1)	1	
	(b)	(i)	CC	16/400 x 100 (1) BUT 4 (%) (2)	2	correct answer with no working scores both marks
		(ii)	D	(lost as) heat / respiration / movement / egestion (1)	1	**allow** not all (parts of) grass eaten / digested by mice / not all (parts of) mice eaten / digested by hawks e.g. bones of mice not eaten (1) **allow** faeces / excretion / urine **ignore** growth **ignore** reference to not eating all the energy
		(iii)	C	hard**er** to digest the grass / **more** inedible parts in grass / **more** energy lost through egesting (1)	1	**allow** less of grass digested e.g. can't digest (cellular) cell wall (1) **ignore** less is eaten
	(c)		D	less grass (no mark) more mice (eating grass) (1) OR no change (no mark) other things eat grass / mice (1)	1	one mark for change **and** explanation together **allow** less mice eaten (1)
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
5	(a)		G	measuring cylinder (1)	1	**not** 'measuring tube / beaker / 'jug'
	(b)		CD	salt (1) water (1)	2	**ignore** named salt **allow** H_2O any order
	(c)		G	13 (1)	1	**allow** answer ticked or circled but answer line takes precedence
	(d)		G	2 (1)	1	**allow** answer ticked or circled but answer line takes precedence
	(e)		D	potassium nitrate (1)	1	**allow** KNO_3
	(f)		F	phosphorous (1)	1	**allow** 'P'
				Total	**7**	

Question			Gd	Expected Answers	Marks	Additional Guidance
6	(a)		E	88 (1)	1	
	(b)		E	8.8(g)	1	
	(c)		CD	80% (2) **but** actual mass x 100 predicted mass (1) **or** 7.2 x 100 9.0 (1)	2	**allow** am x 100 pm (1)
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
7	(a)		F	continuous (1)	1	
	(b)		F	batch (1)	1	
	(c)		GG	**any two from** energy costs (1) starting materials, ingredients or chemicals (1) equipment costs (1) cost of catalyst (1) research costs (1) cost of testing (1) rent or rates or taxes (1) legal costs (1) maintenance costs (1) marketing (1)	2	**allow** packaging **allow** extra qualification of costs e.g. 1 mark for cost and 1 mark for why it is so expensive e.g. testing is expensive because it takes many years to ensure medicine is safe **allow** specified energy costs e.g. electricity
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
8			EFG		3	all correct scores 3 three correct scores 2 one or two correct scores 1
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
9	(a)		E	N_2 / H_2 (1)	1	**allow** $3H_2$ / hydrogen / nitrogen
	(b)		C	high pressure / (temperature) of 350 - 500^{o}C (1)	1	**allow** anything above atmospheric pressure e.g. above1 atm / 100 kPa / 760 mmHg / 1000 millibars **allow** correct pressure even if temperature is incorrect **ignore** just pressure **ignore** under pressure **ignore** high temperature
				Total	**2**	

Question			Gd	Expected Answers	Marks	Additional Guidance
10	**(a)**		G	incomplete circuit / bulb not connected (1)	1	**allow** complete loop needed / wire not attached owtte ignore there is a gap
	(b)	**(i)**	E	reduces / smaller / lower / decreases (1)	1	**ignore** weaker / goes slower
		(ii)	E	dimmer / less bright (1)	1	**allow** decreases / fainter
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
11	(a)	(i)	G	A	1	
		(ii)	E	B and C (1)	1	**both** needed any order
	(b)		G	sound / ultrasound (1)	1	**allow** p-waves **not** seismic wave
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
12	(a)		GG	positive (1) negative (1)	2	**allow** +ve, -ve any order
	(b)		C	same charge on each rod (1)	1	**allow** both positive / +ve **or** both negative / -ve **allow** like charges **ignore** like forces
	(c)		FF	**any two from** paint spraying (1) defibrillator (1) dust precipitator (1) crop spraying (1)	2	 **not** just painting **allow** painting cars **allow** references to (equipment used in) resuscitation e.g. heart paddles **allow** duster **ignore** sticking balloons to wall / ceiling **ignore** hair stands on end
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
13	**(a)**		GD	nucleus (1) unstable (1)	2	
	(b)	**(i)**	E	any graph that has a constantly negative gradient (1)	1	**must** start from / when extrapolated meet y-axis may touch but not go below x-axis
		(ii)	F	decays / emissions / disintegrations / named radioactive (alpha, beta of gamma) emissions (1)	1	**allow** waves for gamma radiation **allow** electrons for beta **ignore** counts / beeps
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
14	**(a)**		DD	beta (1) gamma (1)	2	**allow** symbols for beta and gamma any order
	(b)	**(i)**	F	in the core of a nuclear reactor (1)	1	more than one answer ticked scores 0
		(ii)	CC	**any two from** radiation / alpha / americium – 241 ionises the air (particles) (1) ions/ ionised air particle move (between charged plates) (1) causes current / completes circuit (1) smoke (particles) absorb radiation / alpha (1) therefore less ionisation (1) reduced current / incomplete circuit sounds alarm (1)	2	**allow** mention of just oxygen or just nitrogen or just particles **allow** smoke stops / blocks radiation **not** smoke (particles)react with radiation **ignore** slows down ionisation
				Total	**5**	

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

Question			Gd	Expected Answers	Marks	Additional Guidance
1	(a)		D	photosynthesis (1)	1	
	(b)	(i)	CC	16/400 x 100 (1) BUT 4 (%) (2)	2	correct answer with no working scores both marks
		(ii)	D	(lost as) heat / respiration / movement / egestion (1)	1	**allow** not all (parts of) grass eaten / digested by mice / not all (parts of) mice eaten / digested by hawks e.g. bones of mice not eaten (1) **allow** faeces / excretion / urine **ignore** growth **ignore** reference to not eating all the energy
		(iii)	C	hard**er** to digest the grass / **more** inedible parts in grass / **more** energy lost through egesting (1)	1	**allow** less of grass digested e.g. can't digest (cellular) cell wall (1) **ignore** less is eaten
	(c)		D	less grass (no mark) more mice (eating grass) (1) OR no change (no mark) other things eat grass / mice (1)	1	one mark for change **and** explanation together **allow** less mice eaten (1)
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
2	(a)		B	gas exchange / diffusion (between stomata and cells) (1)	1	**allow** easier for oxygen to enter **and** carbon dioxide leave **ignore** so gas can move easier
	(b)	(i)	A	palisade (layer) (1)	1	
		(ii)	B	magnesium (1)	1	more than one answer ringed scores 0
		(iii)	B	active transport / active uptake (1)	1	
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
3	(a)		C	respiration (1)	1	**ignore** burning / decay
	(b)		D	feeding / eating / as food / ingestion (1)	1	**allow** digestion **ignore** food chain
	(c)		C	decomposers / micro-organisms / microbes / bacteria / fungi (1)	1	**not** germs **allow** detritivores / saprophytes **ignore** decomposed / decayed
	(d)		D	burning / combustion (1)	1	**allow** higher level answers: volcanic eruption / volcanoes / weathering **ignore** pollution
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
4	(a)		D	transpiration (1)	1	**allow** evaporation / diffusion **not** osmosis
	(b)		A*AB	(warmer so) **more** / fast**er** evaporation / **more** / fast**er** diffusion (1) **more** light so stomata open (1) **less** humid so evaporation / diffusion occurs more easily (1)	3	**ignore** more transpiration **allow** more stomata open because it is light (1) **ignore** photosynthesis humid must be linked to explanation e.g. less humid (0) e.g. less humid water lost quicker (0) e.g. less humid concentration gradient higher (1) e.g. less humid higher concentration gradient so easier evaporation (2) **allow** greater concentration / diffusion gradient (1)
	(c)		A*A	smaller vacuole drawn but must be labelled 'vacuole' (1) cell / membrane drawn detached from wall **and** labelled 'membrane / cell comes away' /AW(1)	2	 **allow** a label 'lower / less / no **turgor** pressure' (1)
				Total	**6**	

Question			Gd	Expected Answers	Marks	Additional Guidance
5	(a)		CD	salt (1) water (1)	2	**ignore** named salt **allow** H_2O any order
	(b)		D	potassium nitrate (1)	1	**allow** KNO_3
	(c)	(i)	CD	acid used - sulphuric acid (1) alkali used - ammonium hydroxide / ammonia (1)	2	**allow** H_2SO_4 **allow** NH_4OH / NH_3 **ignore** just 'ammonium'
		(ii)	BB	use an indicator (1) **add** alkali (dropwise) to acid until (appropriate) colour (just) changes / becomes neutral / becomes pH 7 (1)	2	**allow** named indicator e.g. universal indicator / litmus / (screened) methyl orange / phenolphthalein (1) **allow** acid **added** to alkali until colour changes/ becomes neutral / becomes pH 7 (1) **ignore** acid reacts with alkali
		(iii)	B	evaporation / heat the solution (1)	1	**allow** leave to crystallise / leave to stand (in a warm place) **allow** boil off the water **ignore** just remove water
	(d)		A*	$H^+ + OH^- \rightarrow H_2O$ (1)	1	**allow** correct multiples **allow** = for arrow
				Total	**9**	

Question			Gd	Expected Answers	Marks	Additional Guidance
6	(a)		CD	80% (2) **but** $\frac{\text{actual mass}}{\text{predicted mass}} \times 100$ (1) **or** $\frac{7.2}{9.0} \times 100$ (1)	2	**allow** $\frac{\text{am}}{\text{pm}} \times 100$ (1)
	(b)		A* A	8.8(g) (1) 3.2(g) (1)	2	**allow** ecf from incorrect 8.8g
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
7			AACD	**any four from** more labour intensive (1) **because** making medicines is normally batch process (1) you need highly qualified / paid scientists / staff need to be (specially) trained (1) R and D takes a long time (1) **because** it requires a lot of testing / repeat testing (1) legal requirements must be met (1) raw materials can be expensive / rare (1) **because** they are difficult to extract / locate (1) long payback time / need to guarantee a payback (1)	4	must have at least one **because** statement to gain maximum marks **ignore** more labour costs unless qualified **allow because** there is a lot of trial and error (1) **allow** a reason for testing e.g. require a lot of testing to see if they have side effects (2) **ignore** just testing must be idea of the testing taking a long period of time **allow** cost of obtaining a licence (1) **allow because** plants found in remote parts of the world (1) **allow** may not get much payback **because** only treating a rare condition / AW (2) **allow** cost of patent (1) **because** you need to protect product name / brand (1) **ignore** reference to marketing
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
8	(a)	(i)	C	**high** pressure / (temperature of) 350 - 500^{o}C (1)	1	**allow** anything above atmospheric pressure e.g. above1 atm / 100 kPa / 760 mmHg / 1000 millibars **allow** correct pressure even if temperature is incorrect **ignore** just pressure **ignore** under pressure **ignore** high temperature
		(ii)	B	speed up the reaction (but does not change % yield) (1)	1	
	(b)		D	8 (1)	1	
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
9	(a)		DD	beta (1) gamma (1)	2	**allow** symbols for beta and gamma any order
	(b)	(i)	CC	**any two from** radiation / alpha / americium – 241 ionises the air (particles) (1) ions/ ionised air particle move (between charged plates) (1) causes current / completes circuit (1) smoke (particles) absorb radiation / alpha (1) therefore less ionisation (1) reduced current / incomplete circuit sounds alarm (1)	2	**allow** mention of just oxygen or just nitrogen or just particles **allow** smoke stops / blocks radiation **not** smoke (particles) react with radiation **ignore** slows down ionisation
		(ii)	C	absorbs **neutron** / bombarded by **neutrons** (1)	1	**allow** gains **neutron** / **neutron** fired at it
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
10	**(a)**		DD	unstable (1) nucleus (1)	2	
	(b)	**(i)**	B	lead (1)	1	**allow** Pb
		(ii)	AA	(Pb) 205 82 (1) (alpha) 4 2 (1)	2	marks are for correctly calculating the mass number and the atomic number, correct symbol not needed any order
				Total	**5**	

Question			Gd	Expected Answers	Marks	Additional Guidance
11	(a)		C	same charge on each rod (1)	1	**allow** both positive / +ve **or** both negative / -ve **allow** like charges **ignore** like forces
	(b)		DD	**any two from** refuelling (cars / aircraft) (1) cleaning out tankers (1) lightning (1) flour mills / fine dust around machines (1) gas leaks / near flammable gas / liquid (1)	2	**allow** petrol stations / garages **allow** (using a) defibrillator (1) **ignore** references to computer
	(c)		B	anti-static mat / rubber soles (1)	1	**allow** earthing **allow** rubber gloves / non conductive gloves **allow** rubber mat / insulating mat / insulating soles **ignore** antistatic strap **ignore** do not touch the machine
				Total	**4**	

Question			Gd	Expected Answers	Marks	Additional Guidance
12	(a)		C	dog horse (1)	1	any order both needed
	(b)		BB	reflected by soft tissue as well as bone (1) no cell / tissue damage to mother / foetus (1)	2	**allow** shows whole (unborn) baby not just skeleton / bones (1) **ignore** 3D image / easier to see **allow** not ionising / does not cause cancer (1) **ignore** safer **allow** reverse argument e.g. X rays cause cancer (1) **allow** moving images e.g. see (unborn) baby's heart beating (1)
				Total	**3**	

Question			Gd	Expected Answers	Marks	Additional Guidance
13	(a)		A	prevents the **flex** overheating / **flex** melting / prevent (further) damage to the **lamp** (1)	1	**allow** cable / insulated wire for flex **allow** prevent plug damage as long as it is clear it is not the fuse in the plug **allow** stops appliance / lamp over heating (due to increase in current) **ignore** damage to user / electric shock **ignore** damage to bulb
	(b)		A*A*	0.5 (amps) (2) **but** if answer incorrect 230/460 (1)	2	**ignore** units only look at workings if calculation incorrect
				Total	**3**	

Grade Thresholds

General Certificate of Secondary Education
Additional Science B (Specification Code J641)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B623/01	Raw	60	-	-	-	38	31	24	17	10	0
	UMS	69	-	-	-	60	50	40	30	20	0
B623/02	Raw	60	48	40	31	23	18	15	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B624/01	Raw	60	-	-	-	36	28	21	14	7	0
	UMS	69	-	-	-	60	50	40	30	20	0
B642/02	Raw	60	48	39	29	20	14	11	-	-	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	1.2	8.3	42.9	85.7	100.0	100.0	100.0	100.0	100.0	84

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums/index.html

Statistics are correct at the time of publication.

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