



GCSE

Science B J640

Gateway Science Suite

General Certificate of Secondary Education

Mark Scheme for the Units

January 2008

J632/MS/R/08J

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

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

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

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GCSE Gateway Science B J640

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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
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
<u>ecf</u>	= error carried forward
<u>AW</u>	= alternative wording
<u>ora</u>	= or reverse argument

B621/01 Unit 1: Modules B1, C1 and P1 Foundation Tier

Question		Expected Answers	Marks	Rationale
1	a	(clinical) thermometer / (electronic) probe (1) in mouth / in anus / under armpit / in ear (1) or (sensitive) strip (1) on forehead (1)	2	to get two marks the type of device must be correctly linked to where it is used mouth / anus / armpit / ear on their own cannot score a mark but in mouth etc will score a mark allow (strip) thermometer for your forehead (2)
	b	37(°C) (1)	1	allow 36.5 – 37.5
	c	sweating / more blood flow close to skin / blood vessels dilate / blood vessels widen / blood vessels open (1)	1	not drinking water / go outside / take off clothes not blood vessels move closer to the surface
		Total	4	

2	a	DNA (1)	1	
	b	gene (1)	1	
	c	protein (1)	1	ignore peptide / enzyme / named protein
		Total	3	

3	a	arthritis / heart disease / diabetes / cancer (1)	1	allow high blood pressure / heart attack / heart damage / heart problems / heart failure / die earlier / high cholesterol / clogging up arteries / stroke (1) ignore harder to breathe / obesity
	b	i dinner (1)	1	allow ham salad and ice cream / ham salad / ice cream / 2(mg) (1)
		ii breakfast (1)	1	allow grapefruit and toast / grapefruit / toast / 70 (mg) (1)
		iii 40% (1)	1	allow other unambiguous ways of indicating 40% two answers scores zero
		Total	4	

Question		Expected Answers	Marks	Rationale
4	a	oestrogen / progesterone (1)	1	ignore female hormone / sex hormone do not penalise incorrect spelling unless it is a combination of the two hormones e.g. progesterogen / oesterone
	b i	immune system (1)	1	allow other unambiguous ways of indicating correct answer two answers scores zero
	ii	white blood cells (1)	1	allow lymphocyte not red blood cell / blood cell / white cells
	c i	identify possible (side) effects / see if it works / find correct dose (1)	1	allow see if it safe / check if it causes harm / see if there is any reaction / so it will not harm humans / see if it harms animals (1) allow animals and humans have similar systems / animals and humans have similar genetic make-up / works in the same way as in humans (1) allow human life more valuable than animal life (1)
	ii	(human) tissue / computer (models) (1)	1	allow human cells / (growing or using) skin cells / blood cells / named cells / named tissue (1) ignore skin / blood on their own not dead tissue / artificial tissues / fake bodies unless qualified as a computer simulation for example / plants / human volunteers
		Total	5	

Question		Expected Answers	Marks	Rationale
5	a	electrical impulses (1)	1	allow other unambiguous ways of indicating correct answer two answers scores zero
	b	brain / spinal cord (1)	1	allow relay neurones (1) not spine / spinal system / spinal column
	c	motor neurone (1)	1	allow other unambiguous ways of indicating correct answer two answers scores zero
	d	no receptors in the arm / sensory neurons not connected up (1)	1	allow no nerves in arm / no neurones in arm / no nerve endings in arm / no sensors / no senses / does not feel it (1) allow no reflex action / no impulse in arm but not no impulses in arm to go the brain ignore it is artificial / it is plastic Since it is a reflex action then the brain is not involved so if the brain is mentioned then do not award mark
		Total	4	

6	a	i	fractional distillation (1)	1	allow distillation (1) allow other unambiguous ways of indicating correct answer but mark answer on answer line to start with and ignore any comments on the list two answers scores zero
		ii	diesel (1) petrol (1)	2	if three ticks are written then one mark can only be scored if both petrol and diesel are ticked, if four or five ticks 0 marks
	b	i	coal (1)	1	
		ii	coal (1)	1	
			Total	5	

Question		Expected Answers	Marks	Rationale
7	a	bread (1)	1	
	b	fish / chicken (1)	1	ignore meat
	c	any two from: give a better taste (1) better flavour (1) kills microbes / kills bacteria / kills a named bacteria e.g. salmonella / kills virus (1) stops food poisoning (1) improve the texture / description of change of texture (1) easier to digest (1) denatures the protein / denatures toxins (1)	2	allow change taste (1) allow change flavour (1) ignore kills germs allow to stop getting salmonella (1) allow symptoms of food poisoning (1) ignore it is safer / so you do not get ill or sick allow the texture changes (1) ignore easier to eat / to make it edible ignore denatures food ignore improves or changes appearance
Total		4		

8	a	11 (1)	1	ignore C_3H_8
	b	3 (1)	1	not carbon, hydrogen and oxygen
	c	A / D (1)	1	allow A and D / propane / C_3H_8 / ethene / C_2H_4 (1) not A and B etc.
	d	D (1)	1	allow ethene / C_2H_4 (1)
	e	E (1)	1	allow poly(chloroethene) / polyvinyl chloride / pvc / $(-C_2H_3Cl-)_n$ (1)
Total		5		

Question		Expected Answers	Marks	Rationale
9	a	oxygen (1)	1	allow O ₂ (1) ignore O or O ²
	b	because carbon dioxide is made / AW (1)	1	allow carbon dioxide is in the equation (1) ignore references to water not carbon dioxide reacts
	c i	soot / carbon (1)	1	allow C (1) not ash / charcoal
	ii	toxic / poisonous (1)	1	allow kills you (1) allow high level answers such as reacts with haemoglobin to give carboxyhaemoglobin (1) ignore it is harmful / it is highly explosive
		Total	4	

10		solvent (1) insoluble (1)	2	
		Total	2	

11	a	degrees Celsius / °C (1)	1	not merely C / merely degrees allow degrees centigrade / Kelvin / K (1)
	b i	block is a different substance / has a different s.h.c. / has a different (specific) heat capacity (1)	1	allow it is not aluminium / it is steel not aluminium (1) ignore it is made of steel ignore it heats up quicker / any reference to conductivity
	ii	C has a greater mass / AW (1)	1	allow heavier / more of it / bigger / it has a mass of 2 kg (1) ignore it is taller
	c	conduction foam radiation convection	2	one correct scores 0 marks two or three correct scores 1 mark all four correct scores 2 marks
		Total	5	

Question		Expected Answers	Marks	Rationale
12	a	conductors metal joules	3	one or two correct scores 1 mark three or four correct scores 2 marks all five correct scores 3 marks
	b	efficiency = $6000 / 10\ 000 \times 100$ (1) 0.6 / 60 (%) (2)	2	no mark for equation in words or symbols correct answer alone gains full marks either 0.6 or 60 is the correct answer mark the answer line first and if correct give 2 marks and ignore any working out
Total		5		

13	a	no wiring needed (1) idea of portability (1)	2	allow available all the time as a separate mark allow can be used anywhere (1) ignore does not need to be plugged in allow two answers in line 1 or line 2
	b	digital signals can carry better quality information (1)	1	allow other unambiguous ways of indicating correct answer two answers scores zero
	c	i infrared / IR (1)	1	allow other unambiguous ways of indicating correct answer The answer on the answer line takes priority . two answers scores zero
		ii mobile phones / PIR / remote controls / heating / cooking / thermal imaging (1)	1	allow movement sensors / burglar alarms / night vision goggles / thermal camera / treating sports injuries / missile guidance systems / television remote (1) allow transfer data but not transfer data between phones not television on its own / phone on its own / remote on its own ignore bluetooth
Total		5		

Question		Expected Answers	Marks	Rationale
14	a	sunburn / skin cancer / eye damage (1)	1	allow excessive sun tan / kills skin cells / burns skin / damage to skin (1) not cancer on its own
	b	i 75 (minutes)	1	allow 1 hr 15 minutes / 1.25 hours / 1 hr 15 / 1:15 hr (1) must have units unless in minutes, answer with no units is assumed to be in minutes
	ii	any three from: (high factors or Bronze Blush) reduce <u>risk</u> (from Sun more) (1) (high factors or Bronze Blush) allow longer exposure (1) because time is doubled (1) so can have (exposure) time of 150 minutes (1) (high factors or Bronze Blush) reduces burning / reduces harm to skin / reduces cancer (1)	3	there is no alternative word for risk (exposure) time is doubled scores 2 marks (because it will include the longer exposure mark) (exposure) time of 150 minutes scores 3 marks (because it will include the longer (exposure) time and the time is doubled) since the effects of UV have already been tested less precise effects are allowed here
		Total	5	

		Overall Total	60	
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B621/02 Unit 1: Modules B1, C1 and P1 Higher Tier

Question		Expected Answers	Marks	Rationale	
1	a	motor neurone (1)	1	more than one answer = 0	
	b	no receptors / neurones / nerves / nerve endings (in the arm) / sensory neurones not connected up (1)	1	allow no feelings / senses (in the arm) / reflex not working (1) ignore its plastic / artificial not any reference to the brain	
		Total	2		
2	a	i gene (1)	1	not genetic (code) / codes / allele(s)	
		ii protein (1)	1	ignore peptide / enzyme / named protein	
	b	alleles (1) heterozygous (1) dark (1)	3	ignore carrier allow black / brown (1) not dark blonde / darker / any other colour	
		Total	5		
3	a	oestrogen / progesterone (1)	1	ignore sex hormone / female hormone allow estrogen (1)	
	b	antibodies / they are specific (for a particular antigen) / antibodies / they only recognise / bind / have a complementary shape / fit with these proteins / antigens ORA (1)	1	reject they have the same shape ignore selective / attracted to	
	c	i identify possible (side) effects / see if it is harmful / see if it works / see if it is safe / find correct dose / have similar systems / work in the same way / genetic similarities (1)	1	allow human life is more valuable (1)	
		ii (human) cells or tissues / computer (models) (1)	1	not artificial / dead / plant tissues ignore named tissues unless qualified eg test it on skin = 0 test on skin cells = 1 ignore any human trials /volunteers	
		Total	4		

Question		Expected Answers	Marks	Rationale
4	a	two from: (drug) fits / blocks the receptor (site / molecule) (1) stops the neurotransmitter getting into receptor (site / molecule) (1) receptor is on the membrane (of next neurone) (1)	2	allow compete for receptor site = 2 ignore blocks messages / blocks nerves ignore stops neurotransmitter working / passing messages
	b	addicted to nicotine / dependency on nicotine / contain nicotine (1)	1	ignore reference to it is addictive / contains an addictive chemical unless refers to nicotine not a list unless specifies that it is nicotine that is addictive
	c	calculation: 34.6 (1) is obese because (BMI) over 30 (1)	2	allow 35 (1) not 34 or 35.0 allow above threshold / figure for obese person (1) not above any specific number other than 30 ECF / answer to second mark must be consistent with answer to calculation If no answer to calculation, zero marks for question
Total		5		

5	a	prostate (cancer) (1) (female) breast (1)	2	
	b	malignant tumours / they grow or reproduce faster / more aggressive ORA (1) malignant tumours / they spread ORA (1)	2	allow more likely to kill / lower survival rate (1) ignore fatal / can kill on its own ignore more harmful / dangerous / comments about risk not tumours move or travel allow spread more aggressively / faster = 2
Total		4		

Question			Expected Answers		Marks	Rationale
6	a		cross inside the column between bottom dotted line and bitumen (the bottom) outlet (1)		1	look for centre of cross allow on the line is in not in bottom pipe
	b		stronger (1) boiling temperature (1)		2	allow boiling point (1) not just boiling or temperature
	c		to make substances that are more useful / make substances that are in more demand (1)		1	must be comparative allow alkenes are needed for polymerisation / plastics poly(ethene) (1) not cracking makes polymers
Total				4		

7	a		bread (1)	1		
	b		fish / chicken (1)	1	ignore meat	
	c		any two from: give a better taste (1) better flavour (1) kills microbes (1) stops food poisoning (1) improve the texture (1) easier to digest (1) denatures the protein / toxins (1)	2	allow change (1) ignore kills germs allow virus / named bacteria eg <i>Salmonella</i> (1) ignore stops you feeling sick / allow vomiting / diarrhoea (1) allow change (1) ignore makes it look better / more edible ignore easier to eat	
Total				4		

8	a		D (1)	1	allow ethene / C_2H_4 / H_4C_2 (1)	
	b		E (1)	1	allow PVC / polyvinylchloride / poly(chloroethene) / $(C_2H_3Cl)_n$ (1)	
	c		A (1)	1	allow propane / C_3H_8 / H_8C_3 (1)	
	d		C_3H_8 (1)	1	allow H_8C_3 numbers must be subscript (1)	
Total				4		

Question	Expected Answers		Marks	Rationale
9 a	CH ₄ + 2O ₂ → CO ₂ + 2H ₂ O: formulae (1) balancing (1)		2	allow correct multiples / = balancing mark is conditional on correct formulae not + heat ignore heat over the arrow + signs must be present
b	any two from: carbon / soot is made (1) carbon monoxide (CO) is made (1) poisonous / toxic gas is made (1)		2	ignore smoke ignore kills / dangerous / harmful carbon monoxide is poisonous = 2
c	it has a (carbon to carbon) double (covalent) bond (1)		1	ignore it does not hold the maximum number of hydrogen atoms ignore reference to single bonds ignore ref. to alkane / alkene
Total		5		

10		12600 J (3) 100 x 4.2 x 30 (2) indication of temperature change = 30 (°C) / 2 x 4.2 x 30 / 252J (1)	3	if calculated energy given out per gram (6300 J) with clear working allow 3 marks correct answer alone gains full marks only look at working if answer is incorrect
		Total	3	

Question			Expected Answers	Marks	Rationale
11	a		heat / energy (1) 1°C / 1K / degree C or K (1)	2	allow (the number of) joules (1) not J mark independently
	b		Temperature for steel / B has risen twice as much / temperature for Al / A / it has risen half as much (1)	1	answer must refer to temperature rise ignore ref to energy requirements allow correct reference to C ie twice mass has $\frac{1}{4}$ temperature rise
	c		conduction foam radiation convection	2	all 4 correct = (2) 2 or 3 correct = (1) 0 or 1 correct = (0) any order for last two
Total			5		

12	a		60 (%) / 0.6 (2) 6000 / 10 000 (x 100) (1)	2	allow 0.6 on answer line (2) no mark for equation correct answer alone gains full marks only look at working if answer is incorrect
	b		any two from: stops or reduces conduction / air is a poor conductor (of heat) / air is an insulator / less (kinetic) energy transferred to glass (1) (air) particles (in the gap) are far apart / no air particles in gap (1) less (kinetic) energy transferred to outside / air particles (1) idea that convection is reduced in gap / outside (the window) (1)	2	ignore reference to radiation / to convection unless qualified not reference to heat particles ignore reference to vacuum unless related to absence of particles allow no convection in the gap (1)
Total			4		

Question			Expected Answers		Marks	Rationale
13	a	i	75 (minutes) (1)			
		ii	any three from: <p>reference to stay in the sun thirty times as long as no sun cream / 150 minutes (1)</p> <p>higher SPF / it / bronze blush allows her to stay in the sun longer / the factor or SPF indicates length of time can stay (safely) in the sun (1)</p> <p>but reference to can stay in the sun twice as long as golden glow (2)</p> <p>reference to sun cream absorbing UV (1)</p>	3	allow 1 hour 15 (mins) / 1.25 or 1 ¼ hours / 1:15 (1) not 1.15 hours need correct units if not minutes	ignore more protection / reference to skin cancer / sunburn / skin damage
	b		her / lighter skin absorbs less <u>UV</u> / more <u>UV</u> damages / reaches (underlying) body tissue (1)	1	ignore suns rays allow higher level answers involving less melanin (absorbing UV) or dark skin has more melanin	
	c		two from : ozone layer <u>absorbs</u> (UV / radiation) (1) (ozone) layer is being depleted / getting thinner / hole(s) developing (1) from <u>CFCs</u> (1)	2	ignore damaged ignore reference to global warming / greenhouse gases	
			Total	7		

Question		Expected Answers	Marks	Rationale
14	a	outer /surface / upper / outside / top water kinetic conduction convection	3	ignore moisture ignore heat / total (last two any order) 5 correct = 3 marks 3 or 4 correct = 2 marks 1 or 2 correct = 1 mark
	b	frequency / wavelength (1)	1	allow amplitude / intensity ignore ref. to increase / decrease /size not speed not just ref to longer / shorter
Total			4	
Overall Total			60	

B622/01 Unit 2: Modules B2, C2 and P2 Foundation Tier

Question		Expected Answers	Marks	Rationale
1	a	fossil fuels (1) minerals (1)	2	
	b	human population is increasing / humans produce more waste (allow specific examples e.g. more fuels / more cars / more buildings) (1)	1	must be a comparison e.g. <u>more</u> not just "lots of people"
Total			3	

2	a	sharp teeth / sharp claws / large size / eyes on top of head / AW (1)	1	allow big teeth / binocular vision / AW (1) feature must be qualified in some way e.g not teeth
	b	reptiles (1) vertebrates (1)	2	
	c	cleaner species / remove food / clean teeth / clean mouth / mutualism / symbiosis (1)	1	ignore reference to birds not being prey
Total			4	

3	a	Z (1)	1	allow ringed answer
	b	too soft / decayed (quickly) (1)	1	allow was eaten / broken down / biodegrade / rot / no bones / not hard / decompose (1) ignore disintegrate
	c	replaced with minerals / (empty) shell filled with deposits (1)	1	allow covered in sediment / buried / leaves impression / leaves imprint / pressure ignore heat / turn into rock / replaced by rock
	d	have died out / are no longer living (1)	1	allow animals no longer living / does not exist / AW (1)
Total			4	

Question		Expected Answers	Marks	Rationale
4	a	max 3 for question to include: max 2 from: (plants) use carbon dioxide / water / chlorophyll / (sun)light (2) max 2 from (plants) make glucose / oxygen (2)	3	read whole question but mark as two parts – part 1 is what is used, part 2 is what is made each part has max 2 marks, overall total 3 award 1 mark for each correct, deduct 1 mark for each incorrect minimum 0/2 for each part e.g. uses carbon dioxide (1) water (1) and oxygen (-1) scores 1 allow correct formulae or mix of correct formulae and words ignore incorrect balancing carbon dioxide + water → glucose + oxygen ignore CO^2 not Sun allow starch / carbohydrate as alternative to glucose
	b	(release) energy / ATP (1)	1	ignore make / create / produce / reference to photosynthesis
		Total	4	

5	a	pit-fall trap (1)	1										
	b	ground beetle (1)	1	allow ringed answer									
	c	average per quadrat = 2 (1) total number of quadrats = 80 000 (1) 160 000 (1) OR total of 4 quadrats = 8 (1) multiply by 20 000 (1) 160 000 (1)	3	look for 160 000 with or without working for 3 marks marks for working must not be awarded for numbers ON ANSWER LINE <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33.33%; padding: 5px;">160 000 (3)</td> <td style="width: 33.33%; padding: 5px;">160 000 (3)</td> <td style="width: 33.33%; padding: 5px;">160 000 (3)</td> </tr> <tr> <td>80 000 × 2 (2)</td> <td>8 × 20 000 (2)</td> <td>20 000 ÷ 0.25 × 2 (2)</td> </tr> <tr> <td>2 OR 8 ÷ 4 (1)</td> <td>8 OR 5 + 1 + 2 (1)</td> <td>20 000 ÷ 0.25 (1)</td> </tr> </table>	160 000 (3)	160 000 (3)	160 000 (3)	80 000 × 2 (2)	8 × 20 000 (2)	20 000 ÷ 0.25 × 2 (2)	2 OR 8 ÷ 4 (1)	8 OR 5 + 1 + 2 (1)	20 000 ÷ 0.25 (1)
160 000 (3)	160 000 (3)	160 000 (3)											
80 000 × 2 (2)	8 × 20 000 (2)	20 000 ÷ 0.25 × 2 (2)											
2 OR 8 ÷ 4 (1)	8 OR 5 + 1 + 2 (1)	20 000 ÷ 0.25 (1)											
		Total	5										

Question			Expected Answers		Marks	Rationale
6	a	i	strong / malleable / less likely to rust than iron / cheap / AW (1)		1	allow flexible / bendable / easily pressed into shape (1) ignore hard / tough / ductile / magnetic / hardwearing / moulding / reference to crushing / other irrelevant properties ignore does not rust – MUST be comparison with iron
		ii	copper / aluminium / glass / plastics / named plastic / fibres / rubber / alloy / leather / wood / carbon fibre / named fibre (1)		1	not oil / petrol / water
	b		oxygen (1)		1	any two answers (0) allow ringed answer
	c		saves (natural) resources / uses less energy (1)		1	allow less derelict cars / cheaper / can use parts again / reuse (1) allow <u>idea of reducing</u> carbon footprint / pollution / global warming (1) not vague references to helping the environment not stops filling up landfill or any other reference to disposal as in question stem
			Total		4	

7	a		all correct scores (2) one or two correct scores (1)		2	N.B. this is a two mark question
	b		volcanoes / earthquakes (1)		1	allow tsunami (1) allow higher level answers e.g. idea of subduction / mountain building / folding
	c		<u>oceanic</u> (plate) (1)		1	allow phonetic spelling
			Total		4	

Question		Gd	Expected Answers		Marks	Rationale
8	a	D	zinc + hydrochloric acid \rightarrow zinc chloride + hydrogen (1)		1	allow correct formulae or mix of correct formulae and words $Zn + (2)HCl \rightarrow ZnCl_2 + H_2$ allow = IN PLACE OF \rightarrow not and IN PLACE OF + ignore incorrect balancing not Zn^2 or $H^2 ZN$ etc.
	b	i	G	4 (minutes) (1)		1
		ii	F	acid runs out (1)		1
		iii	EFG	any three from: increase concentration of acid / less dilute (1) more crowded particles (1) more (frequent) collisions (1) increase temperature (1) particles move faster or have more energy (1) more (frequent or effective) collisions (1) use powdered zinc (1) more (surface) area (1) more (frequent) collisions (1) stir / shake (1)		3 marks can be awarded for three methods of speeding up the reaction and / or for explanations of method any explanation MUST relate to method e.g. increase concentration (1), more collisions(1), stir(1) increase concentration (1), particles move faster (0) shake (1) allow less water / stronger acid (1) not use more acid
				Total	6	

Question		Expected Answers	Marks	Rationale
9	a	sulfur dioxide - sulfur impurities in fossil fuels burn carbon monoxide - incomplete combustion of petrol AND/OR made in an internal combustion engine (1)	1	both required any incorrect line (0)
	b	kills plants / erosion (of stonework) / corrosion (of metals) / breathing problems (1)	1	If more than one response, ignore any incorrect allow dissolve / disfigures stonework (1) allow pollute lakes / rivers etc (1) not unqualified pollution / air pollution
Total			2	

10	a	i	electrolysis (1)	1	
		ii	copper sulfate (solution) (1)	1	allow ringed answer
		iii	impure copper anode (1)	1	allow ringed answer N.B. look for both impure AND anode
	b		brass (1)	1	
Total			4		

11	a		beta / β (1) gamma / γ (1)	2	any order
	b		damages living cells / tissue / specific examples (1)	1	allow causes cancer / mutation / damages DNA / <u>radiation</u> poisoning / burns / hair loss / insanity / reduction in white blood cell count / kills (1) not changes cell
	c		wear protective clothing e.g. gloves , lab coat, goggles / do not touch / use tongs / keep distance / use for short time / shielded storage / safety screen / do not let students use (1)	1	ignore mask not vague references to poor health
Total			4		

Question		Expected Answers	Marks	Rationale
12	a	light electricity current	2	3 correct = 2 1 or 2 correct = 1
	b	reading goes down / AW (1)	1	allow halved / strength decreases / weaker (1) not slows down
	c	= 0.25 (2) = 2.5×0.1 (1) watts / W (1)	3	correct answer with no working and without unit gains 2 marks
Total		6		

13	a	i	(electromagnetic) field (1)	1	allow force field / magnetic force (1) not electric field / magnetism
		ii	(plotting) compass (1)	1	not magnet
	b	i	poles (1)	1	not positive OR negative / N S / magnetic charges / charges
		ii	any two from: use stronger / more powerful / more / magnets / AW (1) use a coil with more turns (1) coils closer together (1) move the magnet / coil faster (1) put an iron core in the coil (1)	2	ignore bigger / closer magnet allow more coils / more turns (1) allow tighter coils (1) ignore longer coil / larger coil allow steel / magnetic material for core mark
Total			5		

Question		Expected Answers	Marks	Rationale
14	a	Sun (1)	1	
	b	i Mars (1)	1	allow correct label on diagram
		ii rock (1)	1	allow dust (1) not ice AND rock / dust not molten rock / meteor / meteorite / comet
	c	i comet (1)	1	allow meteorite / meteor / shooting star (1) not Moon / any planet / Sun / UFO / satellite
		ii (optical) telescope (1)	1	allow radio telescope / Hubble (telescope) / space telescope (1) ignore satellite
		Total	5	

			Overall Total	60	
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B622/02 Unit 2: Modules B2, C2 and P2 Higher Tier

Question		Expected Answers	Marks	Rationale
1	a	too soft / decayed (quickly) / decompose (1)	1	allow was eaten / broken down / biodegrade / rot / no bones / not hard / decompose (1) ignore disintegrate
	b	replaced with minerals / (empty) shell filled with deposits (1)	1	allow covered in sediment / buried / (leaves) impression / (leaves) imprint / pressure (1) ignore heat / turn into rock / replaced by rock
	c	no spine / backbone / ORA (1)	1	assume unqualified answer refers to invertebrates allow vertebrae (column) ignore no internal skeleton
	d	other / different types of fossils known / know about extinction / have ideas or evidence how fossils form / no evidence for snakes turning to stone (1)	1	allow less educated / believed in magic / wider fossil record (1) allow ideas of more knowledge / more evidence / more research (1) ignore reference to technology / equipment
		Total	4	

2	a	reactants: water, carbon dioxide product: oxygen all correct (2) 1 or 2 correct (1)	2	allow correct formulae (ignore balancing) H_2O CO_2 not CO^2 O_2 but not O^2 allow mixture of formulae words
	b	(starch is) insoluble / does not dissolve (1) so won't move through plant / won't upset water balance / AW (1)	2	allow (starch) is large molecule (1) allow so won't escape from storage organs (1) allow correct reference to water potentials / osmosis / osmotic pressure / e.g. has no affect on osmosis / does not upset osmotic balance / does not alter osmosis (1) not does not do osmosis / stops osmosis
	c	(release) energy / ATP (1)	1	ignore make / create / produce / correct reference to photosynthesis not incorrect reference to photosynthesis
		Total	5	

Question		Expected Answers	Marks	Rationale			
3	a	average per quadrat = 2 (1) total number of quadrats = 80 000 (1) 160 000 (1) OR total of 4 quadrats = 8 (1) multiply by 20 000 (1) 160 000 (1)	3	look for 160 000 with or without working for 3 marks marks for working must not be awarded for numbers ON ANSWER LINE			
				160 000 (3) 80 000 x 2 (2) 2 OR 8 ÷ 4 (1)	160 000 (3) 8 x 20 000 (2) 8 OR 5 + 1 + 2 (1)	160 000 (3) 20 000 ÷ 0.25 x 2 (2) 20 000 ÷ 0.25 (1)	
	b	idea that average per quadrat will be more representative / average won't be 'skewed' by 'rogue' results (1)	1	allow more field is sampled / better representation / sample size is bigger / eliminates anomalies (1) allow show variation across field e.g. some areas have more than others (1) ignore more accurate / more reliable / fair test			
		Total	4				

4	a	any two from: bacteria (1) (in) root nodules (1) (are) nitrogen-fixing / fix nitrogen (1)	2	allow root nodules fix / use nitrogen (2) allow Rhizobium / nitrogen from air / nitrogen into nitrates (1) ignore symbiotic / mutualism not nitrifying / denitrifying / decomposers e.g. nitrifying bacteria fix nitrogen = 1 for bacteria but 0 for fix nitrogen because incorrect type of bacteria			
	b	any one from: no / little nitrate available for weeds (1) more competition for light / water / other minerals (1)	1	allow beans release toxins / used herbicides (1) allow beans have larger leaves block out light (1) allow beans have larger roots take nutrients / water (1) ignore food not beans take nitrates e.g. beans take nitrates so no nitrates for weeds = 0			
	c	colourful / attractive / conspicuous flowers / petals / nectar / sticky pollen (1)	1	ignore reference to just flowers allow scent / smell (1)			
		Total	4				

Question		Expected Answers	Marks	Rationale
5	a	food / oil / cosmetics / glue (1)	1	allow ivory / buttons / soap (1) not zoos / entertainment / tourism / scientific research / chewing gum
	b	any one from: idea that so spread out makes it difficult to meet a mate / gender imbalance / unable to maintain population due to low numbers of breeding pairs / lower gene pool (1)	1	e.g. can't find a mate because the oceans are so large (1) e.g. they may not meet to find a mate (1) but can't mate because too few = 0 can't find a mate = 0 e.g. not enough males for all the females to find a mate (1) e.g. not enough whales to mate = 0 allow death rate is greater than birth rate (1) don't breed fast enough needs to be qualified e.g. don't breed fast enough to maintain population (1) e.g. takes too long to reproduce so they cannot increase / maintain the population / number of whales (1) BUT e.g. takes too long to reproduce = 0 ignore pollution / habitat change / damage to food chains
	c	not universal agreement (between governments) / difficult to enforce laws / sea is too large to cover or police / not clear which country is responsible for different parts of the sea (1)	1	allow idea of tradition qualified e.g. it is their only / main food source = 1 but hunt for food = 0 e.g. lose job = 0 but there are no other jobs in that country = 1 ignore illegal hunting ignore scientific research
		Total	3	

Question		Expected Answers	Marks	Rationale
6	a	strong / malleable / less likely to rust than iron / cheap / AW (1)	1	allow flexible / bendable / easily pressed into shape (1) ignore hard / tough / ductile / magnetic / hardwearing / moulding / reference to crushing / other irrelevant properties ignore does not rust – MUST be comparison with iron
	b	steel is cheaper / ORA (1)	1	ignore steel is stronger assume unqualified answer refers to steel
	c	oxidation (1)	1	allow oxidising / oxidise (1)
	d	aluminium has a protective layer (of aluminium oxide) (1)	1	layer must be qualified e.g. has a layer = 0 but has a protective layer (1) allow protective surface / barrier
		Total	4	

7	a	i	<u>oceanic</u> (plate) (1)	1	allow phonetic spelling
		ii	<u>convection</u> (currents in the mantle) (1)	1	mark can be awarded from a labelled diagram, needs the word convection ignore incorrect drawing
	b	i	the slower the cooling the bigger the crystals / ORA (1)	1	must be a comparison e.g. slow cool means big crystals = 0 but slow cool means big crystals fast cool means small crystals = 1
		ii	magma can have different compositions / elements / minerals (1)	1	ignore different types of magma unless qualified allow named minerals
			Total	4	

Question		Expected Answers	Marks	Rationale
8	a	zinc + hydrochloric acid \rightarrow zinc chloride + hydrogen (1)	1	allow correct formulae or mix of correct formulae and words e.g. $Zn + (2)HCl \rightarrow ZnCl_2 + H_2$ (1) allow = IN PLACE OF \rightarrow not and IN PLACE OF + ignore incorrect balancing not Zn^2 or $H^2 ZN$ etc.
	b	i more surface / more area / more surface area (1) more frequent collisions / more chance of collisions (1)	2	allow more collisions per unit time (1) BUT more collisions unqualified = 0 ignore reference to successful / effective /energetic collisions
		ii more crowded particles / AW (1) more frequent collisions / more chance of collisions (1)	2	allow particles closer together / more in same volume (1) allow more collisions per unit time (1) BUT more collisions unqualified = 0 unless no other marking point gained then max 1 mark for the D grade ignore reference to successful / effective /energetic collisions
Total		5		

9	a	sulfur dioxide - sulfur impurities in fossil fuels burn carbon monoxide - incomplete combustion of petrol AND/OR made in an internal combustion engine (1)	1	both required any incorrect line (0)
	b	carbon monoxide is poisonous / toxin(1)	1	allow high level answers such as correct reference to haemoglobin / red blood cells e.g. stops red blood cells / haemoglobin carrying oxygen (1) ignore dangerous / harmful / pollutant / deadly / kills
	c	$2CO + 2NO \rightarrow N_2 + 2CO_2$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae e.g. incorrect formulae such as CO^2 or N^2 or nO in the equation = 0 even if correctly balanced allow = IN PLACE OF \rightarrow not and IN PLACE OF +
Total		4		

Question			Expected Answers		Marks	Rationale
10	a	i	copper sulfate (solution) (1)		1	allow ringed answer
		ii	impure copper anode (1)		1	allow ringed answer N.B. look for both impure AND anode
	b		zinc (1)		1	allow Zn (1)
Total					3	

11	a		any three from: direct current is in same direction (all the time) / flows one way (1) (light) energy absorbed (by photocell) (1) idea of electrons 'knocked loose' from atoms / particles (of photocell material) (1) electrons flow (in photocell / circuit) (1)	3	allow higher level answers: hole / positive charge movement in p-type (1), electron / negative charge movement in n-type (1) ignore does not alternate allow photons absorbed / gives electrons energy / electrons become excited / light energy converted to electrical (1) BUT ignore light energy converted to electricity allow electrons leave or become free from atom / particle(1) allow electrons flow in one direction (2)	
	b		= 0.25 (2) =2.5 x 0.1 (1) watts / W (1)	3	correct answer with no working and without unit gains 2 marks	
Total					6	

Question		Expected Answers	Marks	Rationale
12	a	moving particles (1) charged particles / electrons (1)	2	allow flowing / moving electrons (2) BUT the moving particles =1 electrons mark can only be awarded if moving mark is awarded e.g. the electrons = 0 ensure answer refers to magnetic field caused by electron flow not magnetic field causes electrons to flow
	b	any two from: use stronger / more powerful / more / magnets / AW (1) use a coil with more turns (1) coils closer together (1) move the magnet / coil faster (1) put an iron core in the coil (1)	2	ignore bigger / closer magnet allow more coils / more turns (1) allow tighter coils (1) ignore longer coil / larger coil allow steel / magnetic material for core mark
Total		4		

Question		Expected Answers	Marks	Rationale
13	a	Mars (1)	1	allow correct label on diagram
	b	Solar System (1) gravitational / gravity (1)	2	
	c	any two from: speed increases as comet approaches Sun (1) gravity increases as it approaches Sun (1) speed increases as gravity increases (1)	2	not reference to planets e.g. speed increases closer to planet = 0 allow reverse arguments e.g. slows down further from Sun speed depends on gravity is insufficient candidates must describe how it changes
	d i	1 outer layers..... 2 star expands 3 white dwarf..... 4 star runs out..... 5 red giant formed 6 core cools.....	3	4 correct = 3 2 or 3 correct = 2 1 correct = 1
	ii	(thermonuclear) fusion (1)	1	not fission
	iii	mass (of star) (1)	1	not weight or size two answers e.g. 'mass and size' or 'mass and weight' = 0
		Total	10	
		Overall Total	60	

Grade Thresholds

General Certificate of Secondary Education
 Science B (Specification Code J640)
 January 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B621/01	Raw	60	-	-	-	37	31	25	19	13	0
	UMS	69	-	-	-	60	50	40	30	20	0
B621/02	Raw	60	45	37	28	20	15	12	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0
B622/01	Raw	60	-	-	-	36	29	23	17	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B622/02	Raw	60	42	34	26	18	11	7	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	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
J640	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
	3.42	20.2	43.5	71.0	87.9	96.0	99.0	99.8	100.0	1581

1921 candidates were entered for aggregation this series

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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