OCR
RECOGNISING ACHIEVEMENT

GCSE

Science B J640

Gateway Science Suite

General Certificate of Secondary Education

Mark Scheme for the Units

January 2008

J632/MS/R/08J

Oxford Cambridge and RSA Examinations

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

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

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GCSE Gateway Science B J640

MARK SCHEMES FOR THE UNITS

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
   __ = underlined words must be present in answer to score a mark
   ecf = error carried forward
   AW = alternative wording
   ora = 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. progestrogen / 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 water metal room 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 (x 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** I 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 risk (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**	

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 it's own **ignore** more harmful / dangerous / comments about risk **not** tumours move or travel 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 *Salmonella* (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		$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$: 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 ¼ 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)	1	**allow** 1 hour 15 (mins) / 1.25 or 1 ¼ hours / 1**:**15 (1) **not** 1**.**15 hours need correct units if not minutes
		ii	**any three from:** reference to stay in the sun thirty times as long as no sun cream / 150 minutes (1) 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) **but** reference to can stay in the sun twice as long as golden glow (2) reference to sun cream absorbing UV (1)	3	**ignore** more protection / reference to skin cancer / sunburn / skin damage this answer subsumes second marking point (do not give both marking points two and three)
	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>CFC</u>s (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		
					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)
			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** idea of reducing 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		oceanic (plate) (1)	1	**allow** phonetic spelling
			Total	**4**	

Question			Gd	Expected Answers	Marks	Rationale
8	a		D	zinc + hydrochloric acid → 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 → **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	**not** no more bubbles **ignore** reference to dissolve
		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 x 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**	

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 it 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	oceanic (plate) (1)	1	**allow** phonetic spelling
		ii	convection (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 → zinc chloride + hydrogen (1)	1	**allow** correct formulae or mix of correct formulae and words e.g. Zn + (2)HCl → $ZnCl_2$ + H_2 (1) **allow** = IN PLACE OF → **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 → **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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