OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Mark Schemes for the Units

June 2008

J641/MS/R/08

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			Expected Answers	Marks	Additional Guidance
1	a	i	X in nucleus (1)	1	centre of X inside nucleus **allow** correct label line touching or inside nucleus
		ii	(cell) membrane (1)	1	more than one answer (0) **allow** other ways of showing correct answer
		iii	(egg cell) joined / combine (1) with sperm (cell) / male gamete / male (sex) cell (1)	2	**allow** enter **ignore** meet **allow** higher level answers e.g. nuclei join (2)
	b	i	3/4 points correctly plotted (1) smooth curve considering all points shown on graph (1)	2	**allow** +/- ½ square (points are 15, 9.7 18, 9.9 21, 10.1 and 24, 10.2) **allow** plotting mark if correct curve is drawn and the points are obscured **allow** smooth curve mark even if other points not plotted **allow** ecf for curve from incorrectly plotted points **ignore** dip between 0 and 3 months **not** 'dot to dot'
		ii	infancy (1)	1	more than one answer (0) **allow** other ways of showing correct answer
			Total	**7**	

Question			Expected Answers	Marks	Additional Guidance
2	a		lungs (1) (small) intestine / digestive system / alimentary canal (1)	2	**allow** air sacs / alveoli (1) **allow** gut **not** large intestine **not** stomach **allow** capillaries for either to max 1
	b	i	pump blood (1)	1	**allow** send blood around body (1) **ignore** transport **ignore** pumps oxygen
		ii	semi-lunar (valve) (1)	1	**allow** aortic (valve)
		iii	blood does not (all) flow in correct direction / AW (1)	1	**allow** can not produce enough pressure / can not pump enough blood / less blood is pumped (1) **allow** (heart) enlarges / (heart rate) speeds up / pulse increases (1) **but ignore** heart works harder **allow** backflow can happen **ignore** angina pain / thrombosis / clotting / blood pooling / speed of blood flow
		iv	replacement valve (1)	1	**allow** heart transplant (1) **allow** repair valve (1) **allow** mechanical valve (1) **but not** mechanical heart **ignore** surgery / operation / bypass / slow blood pressure
			Total	**6**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	leaf (1)	1	**allow** higher level answer stomata (1)
		ii	diffusion (1)	1	**not** photosynthesis / respiration more than one answer (0)
	b	i	runners (1) (produce) plantlets (1)	2	**allow** descriptions / drawings and labels (1) e.g. sends out stems along the ground (1) new plants grow at the ends (1) e.g. sends out stems which grow roots (1) **but** makes lots of new stems (0) **ignore** take cuttings
		ii	slow / can not be sure of features (1)	1	**allow** do not breed true / takes a long time to grow / not all seeds will germinate / get variation / get different characteristics / has different named characteristic e.g. lower yield / seeds can be eaten **ignore** may not be the same / not as good as the original **allow** ora but must be specified i.e. runners or asexual can be sure of features
	c	i	fruit ripening (1)	1	more than one answer (0) **allow** other ways of showing correct answer
		ii	gravity (1)	1	more than one answer (0) **allow** other ways of showing correct answer
			Total	**7**	

- All formulae must be totally correct e.g. CO_2 and not CO2 / CO^2 ; SO_4^{2-} and not SO42-, So_4^{2}-, $SO_4$2- (any subscripts must be at least marginally smaller than the atomic symbol and superscripts must be at least slightly above the symbol)
- Symbols must be as shown in the periodic table e.g. Ne and not NE / nE / ne

Question			Expected Answers	Marks	Additional Guidance
					all answers for question 4 must be from list
4	**a**		gold (1)	1	**allow** Au
	b		bromine (1)	1	**allow** Br / Br_2
	c		copper and carbon and oxygen (1)	1	all required for 1 mark **not** Cu and C and O
	d		sodium (1)	1	**allow** Na
	e		boron (1)	1	**allow** B
	f		sodium / magnesium (1)	1	**allow** Na / Mg **allow** both sodium and magnesium
			Total	**6**	
5	**a**		bauxite (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	b	**i**	electricity (1)	1	**allow** electric / electric current / electric charge (1) **not** just current / charge **ignore** voltage
		ii	aluminium (1)	1	**allow** Al
		iii	attacked by oxygen / (carbon) reacts with oxygen / carbon dioxide made / carbon monoxide made (1)	1	**allow** they are oxidised **ignore** because of the oxygen **ignore** corrosion by oxygen but **allow** corrosion by reaction with oxygen **allow** correct formulae instead of words e.g. CO_2 made, CO made, reacts with O_2
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
6	a		**any two from**: high melting point (1) high boiling point (1) strong (1) malleable (1) ductile (1) (good) conductor of heat (1) sonorous (1) hard (1) high density (1) high tensile strength (1) lustrous / shiny (1)	2	**ignore** good conductor of electricity **allow** coloured compounds **ignore** solid / waterproof **ignore** mouldable / magnetic / durable / **ignore** easy to shape unless qualified e.g. can be hammered into shape **allow** flexible / bendy **ignore** heavy **allow** explanation of given property e.g. particles packed close together so it has a high density (2) one incorrect answer negate one mark two incorrect answers negate two marks e.g. ductile , strong and an insulator = 1 e.g. ductile and insulator =1 e.g. ductile, strong, insulator and low density = 0
	b		(good) conductor of heat / high melting point / malleable (1)	1	**allow** lets heat through easily / will not melt (when heated) **allow** does not corrode / does not rust / does not react with water **ignore** any irrelevant properties e.g. strong / ductile / just a good conductor / not flammable
	c		**any one from**: very little resistance (1) loss free power transmission (1) super-fast electric circuits (1) powerful electromagnets (1)	1	 **allow** no resistance / low resistance **allow** less heat is produced / more efficient / does not heat up as much / less energy is lost **allow** fast switching **allow** current does not stop flowing **but ignore** never stops conducting electricity **ignore** electricity goes faster **ignore** just making magnets
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
7	a		3 / three (1)	1	
	b		3 / three (1)	1	
			Total	**2**	

8	a		copper – blue **and** iron(II) - light green (1)	1	both required for 1 mark
	b	i	limewater / calcium hydroxide solution / $Ca(OH)_2$ (1) turns cloudy / milky / white / white precipitate (1)	2	**allow** bicarbonate indicator (1) **allow** turns yellow if linked to bicarbonate indicator (1)
		ii	copper carbonate → copper oxide + carbon dioxide (1)	1	**allow** $CuCO_3 \rightarrow CuO + CO_2$ **allow** = instead of arrow **allow** mixture of correct formulae and words **not** copper carbonate + heat → copper oxide + carbon dioxide / $CuCO_3$ + heat → $CuO + CO_2$ **allow** heat over or under the arrow **not** and in equation
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
9	a		diesel (1) petrol (1)	2	any order acceptable **allow** DERV / gasoil as alternatives to diesel (1) **allow** gasoline as alternative to petrol (1) **allow** LPG (1) **not** merely 'oil' **not** petroleum **ignore** gas
	b		B (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	c		(use) batteries (1)	1	**allow** cell **ignore** electricity
			Total	**4**	

10	a		punto (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	b		fiesta (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	c		corsa (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
			Total	**3**	

11	a		C (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	b		600kg Citroen (1)	1	more than one answer (0) **allow** other ways of showing correct answer **but** anything on answer line takes precedence
	c		400 x 125 i.e. correct substitution into correct formula (1) 50 000 (1)	2	**allow** two marks for correct answer with no working out
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
12	a		96 (1)	1	
	b	i	distance car moves / AW (1) during driver reaction / AW (1)	2	**allow** length / metres / how far - for distance (1) **not** time / how long (0) **allow** while driver reacts (1) **not** driver thinks (0) e.g. distance taken for driver to react (2) e.g. the distance travelled (1) from seeing need to brake to driver starting to brake (1) e.g. distance taken for driver to think (1) e.g. distance taken to press the brake (1) e.g. distance taken to think about braking and putting foot on brake (1) e.g. time it takes brain to realise you need to brake (1) e.g. time taken to think about braking (0) e.g. time taken to press the brake (0)
		ii	**any two from**: high**er** speed / driving fast**er** (1) alcohol / drugs (1) tiredness / illness / stress (1) distraction / poor concentration (1) getting old**er** (1)	2	**ignore** just high speed – there must be a comparative comment **allow** medication **allow** a named distraction within the car e.g. using a mobile phone, drinking a can of coke **ignore** poor visibility / external distractions
	c		wet (road) / icy (road) / snowy (road) / muddy (road) / great**er** speed / AW (1)	1	**allow** poor road surface / oil on road / slippy road / less friction (on road) / less grip (on road) / less traction **ignore** fog / just 'weather conditions' / just 'poor weather conditions' **ignore** just high speed – there must be a comparative comment **allow** more load / great**er** mass / more weight / more people in car (1) **allow** steep**er** (downhill) gradient
			Total	**6**	

Question			Expected Answers	Marks	Additional Guidance
13	a	i	weight (1)	1	**allow** gravity / gravitational (1) **but** gravitational potential (0) **ignore** energy
		ii	drag / friction / (air) resistance (1)	1	**ignore** upthrust
	b		no atmosphere (1)	1	**allow** no drag / no friction / no (air) resistance / no air (1) **BUT not** less drag / less friction / less (air) resistance / less air **allow** there is a vacuum **ignore** 'no gravity' **ignore** less gravity **ignore** weighs less
			Total	**3**	

			Paper Total	**60**	

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

Question			Expected Answers	Marks	Additional Guidance
1	a	i	3/4 points correctly plotted (1) smooth curve considering all points shown on graph (1)	2	**allow** +/- ½ square (points are 15, 9.7 18, 9.9 21, 10.1 and 24, 10.2) **allow** plotting mark if correct curve is drawn and the points are obscured **allow** smooth curve mark even if other points not plotted **allow** ecf for curve from incorrectly plotted points **ignore** dip between 0 and 3 months **not** 'dot to dot'
		ii	0 – 3 (months) (1)	1	**allow** any age in range 0 – 3 (months) (1) **not** 0 – 3 years
	b		warn of growth problems / to detect health problems / AW (1)	1	**allow** check if underweight / check if normal weight / check if overweight / check for abnormality / check if growing properly / check if eating properly
	c	i	mitosis (1)	1	if two answers given 0 marks
		ii	mitochondria / mitochondrion (1)	1	**allow** near miss spelling or phonetic spelling e.g. mitocondria
			Total	**6**	

Question			Expected Answers	Marks	Additional Guidance
2	a		semi-lunar (valve) (1)	1	**allow** aortic (valve)
	b		(blood in veins at) lower pressure / not enough (blood) pressure (1)	1	**allow** stop backflow / stop blood going the wrong way round (1) **ignore** reference to blood moving against gravity **not** so blood is pumped the correct way
	c		blood does not (all) flow in correct direction / AW (1)	1	**allow** can not produce enough pressure / can not pump enough blood / less blood is pumped (1) **allow** (heart) enlarges / (heart rate) speeds up / pulse increases **but** **ignore** heart works harder **allow** backflow can happen **ignore** angina pain / thrombosis / clotting / blood pooling / speed of blood flow
	d		rejection / lack of availability / need close match to donor / correct tissue type / match of tissue type (1)	1	assume unqualified answer refers to transplants **allow** someone has to die to donate heart (1) **ignore** risk of dieing in transplant operation / need to take drugs / same blood group **allow** ora but it must be specified
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	diffusion (1)	1	**not** photosynthesis / respiration more than one answer (0)
		ii	**any two from**: large surface area (1) short diffusion pathway / thin (leaf) / AW (1) **many** stomata / **many** pores (1)	2	**allow** leaves maintain a diffusion gradient (1) **not** thin cell wall / not thin membrane **allow** many guard cells **ignore** just stomata
	b		slow / can not be sure of features (1)	1	**allow** do not breed true / takes a long time to grow / not all seeds will germinate / get variation / get different characteristics / has different named characteristic e.g. lower yield / seeds may be eaten **ignore** may not be the same / not as good as the original **allow** ora but must be specified i.e. runners or asexual can be sure of features
	c		genetic engineering / gene transfer / genetic modification / GM (1)	1	**allow** description of gene transfer e.g. put frost resistant gene into strawberry plant **allow** vector(s) (1) **allow** recombinant DNA (1) **not** selective breeding
			Total	**5**	

4	a		(going down) G C A (1)	1	all 3 needed
	b		unzips (1) new strands made by base pairing / new DNA made by complementary bases (1)	2	**not** reference to genes / chromosomes **allow** (DNA) strands split / (DNA) ladder splits in half / base pairs are separated / bases are separated / base pairs are split **not** (DNA) strand splits / bases are split **ignore** uncoils **allow** specific examples of base pairs e.g. DNA made by base pairing C with G or A with T **allow** semi-conservatively (1)
	c		change to base sequence (1) (causes) change to amino acid (sequence) (1)	2	**be careful** marking points must refer to amino acids rather than proteins **allow** change in codon / change in triplet code **ignore** change in genetic code **allow** codes for different amino acids (1)
			Total	**5**	

Rules for use of formulae

- All formulae must be totally correct e.g. CO_2 and not CO2 / CO^2 ; SO_4^{2-} and not SO42-, So_4^{2}-, $SO_4$2- (any subscripts must be at least marginally smaller than the atomic symbol and superscripts must be at least slightly above the symbol)
- Symbols must be as shown in the periodic table e.g. Ne and not NE / nE / ne

Question			Expected Answers	Marks	Additional Guidance
5	a		neon (1)	1	**allow** Ne (1)
	b		potassium / copper / bromine (1)	1	**allow** K / Cu / Br (1)
	c		carbon (1)	1	**allow** C (1)
			Total	**3**	

6	a		aluminium (1)	1	**allow** Al (1)
	b		attacked by oxygen / (carbon) reacts with oxygen / carbon dioxide made / carbon monoxide made (1)	1	**allow** they are oxidised **ignore** because of the oxygen **ignore** corrosion by oxygen but **allow** corrosion by reaction with oxygen **allow** correct formulae instead of words e.g. CO_2 made, CO made, reacts with O_2
	c		uses (large amounts of) electricity / electricity is expensive / uses an electric current (1)	1	**allow** need to transport from far away / ore needs to be purified / ore is difficult to mine / aluminium ores are rare / lots of energy needed (in electrolysis) / high temperatures needed (in electrolysis)
	d		$2O^{2-} - 4e^- \rightarrow O_2$ / $2O^{2-} \rightarrow O_2 + 4e$- correct formulae including electrons (1) balancing (1)	2	**allow** correct multiples of equation e.g. $O^{2-} - 2e^- \rightarrow ½O_2$ balancing mark is conditional on correct formulae **allow** $O^{2-} - 2e^- \rightarrow O$ / $O^{2-} \rightarrow O + 2e^-$ for one mark **allow** e for electron
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
7	a		electrons / e^- (1) move (1)	2	**allow** has mobile electrons / free electrons / delocalised electrons (2) **but** sea of electrons (1) **allow** charged particles move / mobile charge carrier (1) but particles move (0) **not** ions move / e^+ / positive electrons **n.b.** move is not an independent marking point
	b		(good) conductor of heat / high melting point / malleable / (1)	1	**allow** lets heat through easily / will not melt (when heated) **allow** does not corrode / does not rust / does not react with water **ignore** any irrelevant properties e.g. strong / ductile / just a good conductor / not flammable
	c	i	**any one from:** very little resistance (1) loss free power transmission (1) super-fast electric circuits (1) powerful electromagnets (1)	1	 **allow** no resistance / low resistance / current does not stop flowing **but ignore** never stops conducting electricity **allow** less heat is produced / more efficient / does not heat up as much / less energy is lost **allow** fast switching **ignore** electricity goes faster **ignore** just making magnets
		ii	**only** work at (very) low temperatures (1)	1	**ignore** difficult to make **ignore** costs
			Total	**5**	

8	a		2 / two (1)	1	
	b		5 / five (1)	1	
			Total	**2**	

Question			Expected Answers	Marks	Additional Guidance
9	a		copper – blue **and** iron(II) - light green (1)	1	both required to gain the mark
	b		copper carbonate → copper oxide + carbon dioxide (1)	1	**allow** $CuCO_3 \rightarrow CuO + CO_2$ **allow** = instead of arrow **allow** mixture of correct formulae and words **not** copper carbonate + heat → copper oxide + carbon dioxide / $CuCO_3$ + heat → $CuO + CO_2$ / and in equation **allow** heat over or under the arrow
			Total	**2**	

Question			Expected Answers	Marks	Additional Guidance
10	a		sodium ion 2.8 and chloride ion 2.8.8 (1) correct charges on ions (i.e. Na^+ and Cl^-) (1)	2	an alternative way to mark the question is Na^+ with 2.8 (1) **allow** sodium ion written as $[Na]^+$ i.e. empty outer shell and inner shells not shown Cl^- with 2.8.8 (1) look for the answer on the diagrams given in the question as well as in the answer space the electron lost by sodium must only be drawn **once** e.g. either on the chloride ion outer shell or on the sodium atom with an arrow showing it is being transferred to the chlorine atom **allow** chloride is negative and sodium ion is positive (the charge on ion mark) if it is clear that only one electron has been transferred from sodium to chlorine electronic structure can be drawn or stated **n.b.** charge on the ions is **independent** of the dot and cross diagram **ignore** errors in the inner shells even if a shell is missing *typical candidate answers together with the mark that should be awarded are included at the end of this mark scheme*
	b		covalent (1)	1	**allow** coordinate / dative
			Total	**3**	

11	a		9 (litres) (1)	1	more than one answer (0) **allow** other ways of showing correct answer but anything on the answer line takes precedence
	b	i	recharging (batteries) (1)	1	**allow** solar power / solar electricity / connect up to the mains
		ii	power station pollutes (1)	1	**ignore** light / heat pollution **allow** pollution during manufacture of cars / pollution during disposal of cars / pollution during disposal of parts of car / electricity generation involves using fossil fuels / brake dust particulates (1)
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
12	a		Corsa (1)	1	more than one answer (0) **allow** other ways of showing correct answer but anything on the answer line takes precedence
	b		110 × 3 i.e. correct substitution into correct formula (1) 330 (1)	2	**allow** two marks for correct answer with no working out **allow** one mark for 110 × 180 / 19800
			Total	**3**	

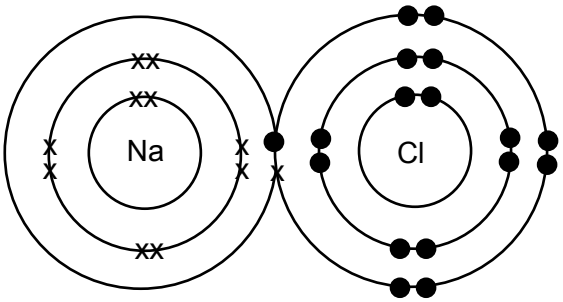
13	a	i	**any two from**: high**er** speed / driving fast**er** (1) alcohol / drugs (1) tiredness / illness / stress (1) distraction / poor concentration (1) getting old**er** (1)	2	 **ignore** just high speed – there must be a comparative comment **allow** medication **allow** a named distraction within the car e.g. using a mobile phone, drinking a can of coke **ignore** poor visibility / external distractions
		ii	wet (road) / icy (road) / snowy (road) / muddy (road) / great**er** speed / AW (1)	1	**allow** poor road surface / oil on road / slippy road / less friction (on road) / less grip (on road) / less traction **ignore** fog / just 'weather conditions' / just 'poor weather conditions' **ignore** just high speed – there must be a comparative comment **allow** more load / great**er** mass / more weight / more people in car (1) **allow** steep**er** (downhill) gradient
	b		400 x 125 i.e. correct substitution into correct formula (1) 50 000 (1)	2	**allow** two marks for correct answer with no working out
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
14	a		**any two from**: change shape / AW (1) absorb energy (1) increased stopping time / increased collision time / AW (1) increased stopping distance / increased collision distance / AW (1) decreased acceleration (1) less force (on passengers) (1)	2	**allow** crumple zone is crushed **ignore** merely 'car crumples' **ignore** absorb force / absorb impact / absorb damage
	b	**i**	speed doubles braking distance quadruples / braking distance is proportional to speed^2 / braking distance is proportional to velocity^2 (2)	1	**mark parts (i) and (ii) together** for answers shown on left (whether written in parts i or ii) award one mark in part (i) **and** one mark in part (ii) **not** just quoting figures **ignore** as speed increases so does braking distance – given in question
		ii	braking distance increases as KE increases / ora / breaking distance is proportional to KE (1)	2	**mark parts (i) and (ii) together** for answer on left (whether written in parts i or ii) award one mark in part (ii)
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
15	a	i	drag increases / AW (1)	1	**allow** resistance or friction for drag
		ii	weight = drag / forces balanced / forces reach equilibrium / forces become equal / AW (1)	1	**allow** resistance or friction for drag **allow** up and down forces balance
	b	i	(PE does) work against drag / AW (1)	1	**allow** resistance or friction for drag **allow** (PE) changed into heat / (PE) changed into KE of air particles / energy is lost overcoming friction / work done moving air particles aside (and giving them KE) (1) **not** (PE) changed into **her** KE
		ii	KE remains constant (1)	1	more than one answer (0) **allow** other ways of showing correct answer but anything on the answer line takes precedence
			Total	**4**	
			Paper Total	**60**	

Extra Advice Question 10 (a)

An empty outer shell (sodium's third shell) does not need to be shown.



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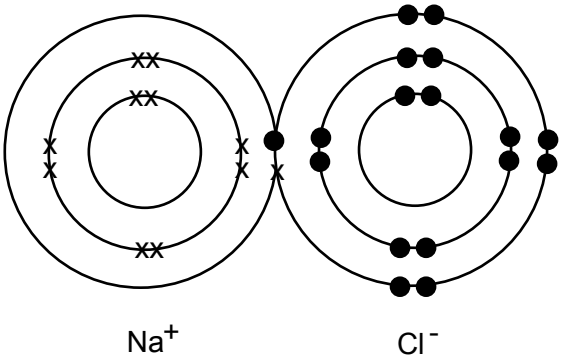

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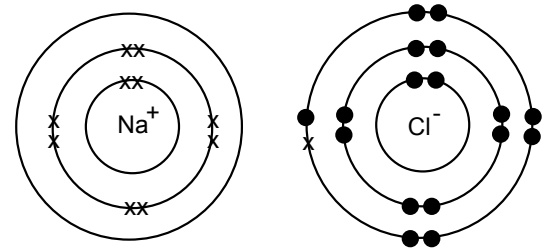

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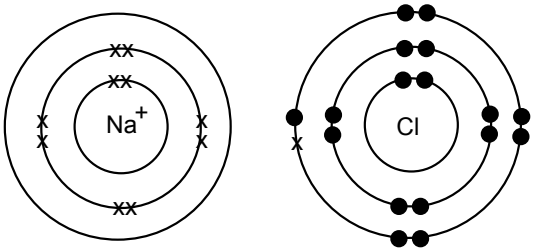

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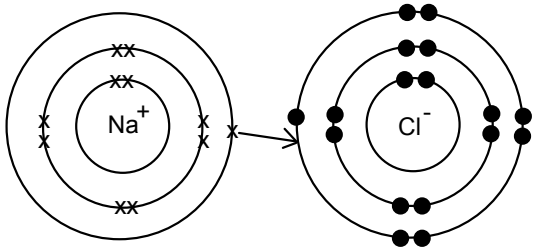

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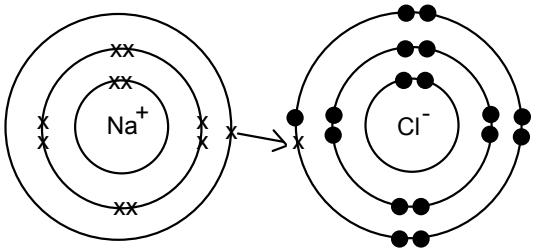
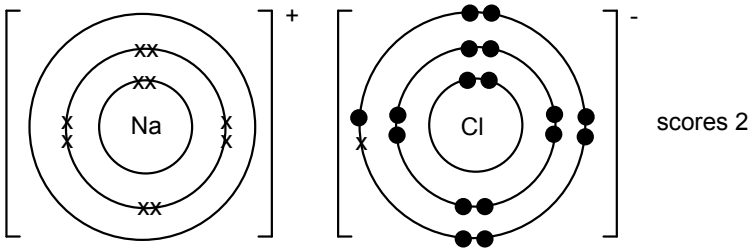


scores 1

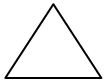


scores 2

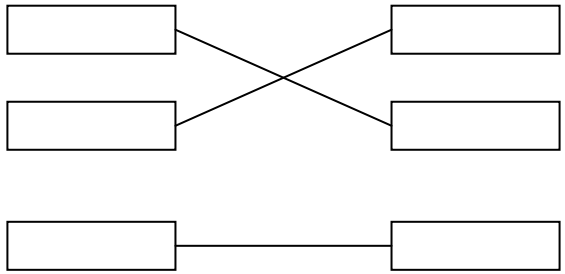
B624/01 Unit 2: Modules B4, C4 and P4 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	a		A / flower (1) D / root (1)	2	**allow** petal / named part of flower (1), BUT not sepal (0) more than one different answer on a line scores 0 for that line
	b		absorb light energy / make sugar or food or carbohydrate (1)	1	**allow** joins water and carbon dioxide (1) allow contains chlorophyll (1) allow transfers energy (1) not attracts sunlight
	c		absorbed through root (hairs) AW (1) transported through stem / xylem / vascular bundle (1)	2	**but** correct reference to osmosis in the root (2) **but** correct reference to transpiration (stream) in stem / leaves (2) allow sucks through the root
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
2	a		poor growth (1) yellow leaves (1)	2	**ignore** thinner stem **ignore** references to roots or shoots or fruits **ignore** slow(er) growth **ignore** wilting / drooping **not no** growth / smaller cells **allow** smaller / stunted / shorter (plants) / shorter stems / smaller leaves / fewer cells. **BUT ignore** short plants or short growth **allow** lose colour **allow** discoloured / yellow brown / paler / loses colour **ignore** brown / changes colour
	b		phosphorus / potassium (1)	1	**not** phosphate **ignore** nitrogen Mark first answer for multiple answers more than one different answer on the line scores 0
	c		30 g (1)	1	Any clear way of indicating correct answer **allow** underlining / ticked more than one answer scores 0
	d		proteins / amino acids / enzymes (1)	1	**allow** DNA / RNA / ATP / ADP / AMP **ignore** cells / membranes / other structural features / chlorophyll
	e		**any two from**: freeze / refrigerate / cool / keep cold (1) drying / dehydrating (1) add vinegar / make pickle / chutney / ketchup / cooking (1) canning / bottling (1) controlled atmosphere / air tight container / oxygen removed (1)	2	 **allow** salted (for dehydrate mark)
			Total	**7**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	mass of living organism(s) / cells / living thing(s) (1)	1	**allow** weight **allow** kg / g of **ignore** amount of
		ii	sun / sunlight (1)	1	**not** merely light **ignore** artificial light / UV light
	b	i	10cm **above** lettuce and 1cm on top (1)	1	all correct for the one mark +/-1mm does not need to be labelled but 0 if labels wrong does not need to be centrally placed **ignore** vertical scale
		ii	blue-tit bar is smaller than caterpillar bar which is smaller than lettuce bar (1)	1	**allow** correct diagram. Does not need to be labelled but 0 if incorrectly labelled **allow** a drawn triangle correct way up e.g.  **not** 'it's a triangle' as no reference to orientation **allow** correct description of pyramid shape e.g. 'it starts off bigger and gets smaller as it gets higher' **not** 'lettuce would be the biggest box' or 'biggest box is at the bottom'
	c		heat / movement / egestion / waste / respiration / excretion / death / eaten by another animal not in food chain / not all parts eaten (1)	1	**Ignore** eating / breathing / growth **Allow** faeces (1)
			Total	**5**	

4	a		fungicide → kills fungi herbicide → kills weeds insecticide → kills beetles	2	1 or 2 correct = 1 3 correct =2 more than one line from or to a box is incorrect (for that box)
	b		biological (control) (1)	1	**allow** predation (1)
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
5	a		acid - less than 7 alkali - more than 7 neutral – 7 	2	three correct scores 2 one or two correct scores 1 more than one line from or to a box is incorrect (for that box)
	b		increases (1) alkali neutralises acid / neutralisation (1)	2	**Look at both answers before awarding appropriate marks.** **allow** moves towards 7 (1) **allow** 'it becomes less acidic' or 'it becomes more alkaline' **allow** 'pH of neutral or alkaline solution is higher than the pH of an acidic solution' **allow** 'acid reacts with alkali' **ignore** 'pH of acid is high' or 'acid and alkali balance out'
			Total	**4**	

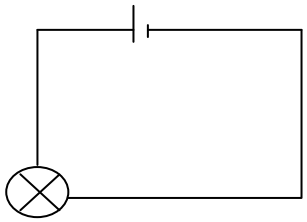
Question			Expected Answers	Marks	Additional Guidance
6	a		research / testing / labour costs or AW / raw materials. Ingredients or chemicals / takes time / equipment / rent or rates or taxes (1)	1	**allow** transport / marketing / packaging / AW (1)
	b		crush the plant / grind up the plant (1) add a solvent or named solvent (to dissolve the chemical) (1) (separate chemicals using) chromatography / distill / crystallise / solvent extraction (1)	3	**allow** cut it up or cut or chopped or squeezed or pressed or mashed or pulp it or blend it **allow** 'freeze and then defrost' **allow** 'add water or ethanol or propanone ' **allow** 'dissolve the chemical' **ignore** 'add a solution' or 'boil it' **allow** 'boil it in water' scores 2 ignore ' add an acid' **allow** correct description of separation process **ignore** evaporation
	c		batch (1)	1	More than one answer scores (0) If answer not on line allow batch circled / ticked / underlined / marked on diagram (1)
			Total	**5**	

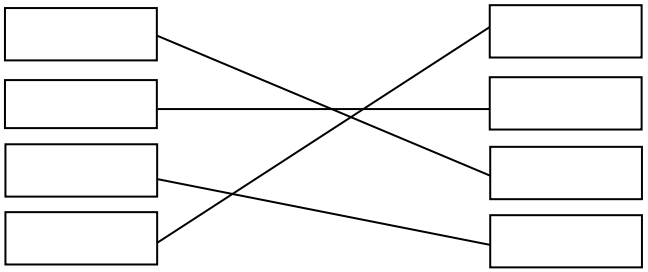
Question			Expected Answers	Marks	Additional Guidance
7	a		24 (1)	1	ignore units
	b		74 (1)	1	ignore units
	c	i	50 (g) (1)	1	ignore units
		ii	increases (1)	1	more than one answer scores (0)
			Total	**4**	

8	a		lakes / aquifers / springs / reservoirs / dam / wells / rain / sea / ocean (1)	1	**allow** loch / the cut / canal / streams / delta / pond / bore holes (1)
	b		lead compounds / pesticides / herbicides (1)	1	**not** litter / merely toxic waste / potassium / rubbish / dead animals in river **allow** insecticides / oil / heat / radioactive waste / heavy metals / sewage / phosphates / human waste / named toxin / industrial waste (1) eg 'waste from factories (1) **allow** chemical (as industrial waste)
	c		kill microbes / kill bacteria / kill named bacteria / sterilise (1)	1	**ignore** kill germs **allow** to make it safe to drink / prevent disease (1) **NOT** merely clean
	d	i	white (1)	1	More than one answer scores (0)
		ii	silver nitrate + sodium chloride → silver chloride + sodium nitrate (1)	1	**allow** correct formulae or mix of formulae and words **allow** $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ (1) **allow** = instead of arrow
			Total	**5**	

9	a		cutting tools (1)	1	More than one answer scores (0) **allow** cutting / tools / correct line indicated (1)
	b		making fertilisers (1)	1	More than one answer scores (0) **allow** fertilisers / making / correct line indicated (1)
			Total	**2**	

Question			Expected Answers	Marks	Rationale
10	**a**		dust extraction / precipitator (eg in chimneys) / restarting heart / defibrillator / photocopiers / (laser) printers (1)	1	Ignore dusters / balloons / Van-der-Graaff generator
	b		idea that strips charged (1) BUT strips have **same** charge scores (2) BUT both **strips have same** charge and **repel** scores (3)	3	**allow** ideas about charge / electron transfer (1) do not penalise incorrect charge eg charged with positive electrons (1) 3 mark answer must include ideas of a force eg repel / push apart just strips repel / move apart with no reference to charge scores (0) allow like charges repel (2)
			Total	**4**	

Question			Expected Answers	Marks	Rationale
11	a		 any **complete** circuit that forms a loop containing bulb and cell (1)	1	**allow** other reasonable electrical components in circuit If switch in circuit and open or closed allow the mark.
	b	i	F (1)	1	Mark answer line first. If answer line is blank allow F ticked, underlined or circled or marked on diagram **allow** rheostat or variable resistor
		ii	6 (ohms) = (2) BUT 3/0.5 = (1)	2	
	c		earth (1)	1	More than one answer scores (0)
	d		Tammy (1)	1	More than one answer scores (0)
			Total	**6**	

Question			Expected Answers	Marks	Rationale
12	a			3	one correct = 1 two correct = 2 three or four correct =3 more than one line from or to a box is incorrect (for that box)
	b		Pregnancy scans / breaking down (kidney) stones (1)	1	**allow** ultrasound cleaning / scanning / tumours / cancel / muscle / tendon / joint treatment / dental cleaning / any reasonable answer **in medicine** (1) **NOT** merely 'looking at babies **allow** checking **unborn** baby (1)
			Total	**4**	

Question			Expected Answers	Marks	Rationale
13	a		emissions / decays (1)	1	**allow** waves / particles / gamma / alpha / beta (1) **allow** (radioactive) electrons / nuclei / ionisations / AW (1)
	b		nucleus / nuclei (1)	1	**NOT** merely 'centre' (0) **allow** neutron (1)
	c		alpha (1)	1	More than one answer scores (0) **allow** α
	d	i	gamma (1)	1	More than one answer scores (0) **allow** γ **allow** alpha (as implant for localised cancer treatment) (1)
		ii	idea that: the activity decreases with time (1)	1	**allow** weaker (1) **allow short** half-life (1)
	e		nuclear bomb / explosions / blast (1)	1	**allow** named nuclear event eg Chernobyl / Hiroshima / Nagasaki / 3 mile island (1)
			Total	**6**	

			Paper Total	**60**	

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

Question			Expected Answers	Marks	Additional Guidance
1	a		poor growth (1) yellow leaves (1)	2	**ignore** thinner stem **ignore** references to roots or shoots or fruits **ignore** slow(er) growth **ignore** wilting / drooping **not** no growth **ignore** references to cell growth **allow** smaller / stunted / shorter (plants) / shorter stems/ smaller leaves / fewer cells but **ignore** 'short plants' or 'short growth' **allow** lose colour **allow** discoloured / yellow brown / paler / loses colour **ignore** brown / changes colour
	b	i	proteins / amino acids / enzymes (1)	1	**allow** DNA / RNA / ATP / ADP / AMP **ignore** cells / membranes / other structural features / chlorophyll
		ii	(make) chlorophyll (1)	1	**ignore** photosynthesis / chloroplasts / keeping leaves green
	c		acid(ic) / low pH (1) kills / stops growth of bacteria / microbes / fungi / mould / decomposers (1)	2	 **allow** sterilise / antiseptic **allow** denatures enzymes or destroys enzymes but **not** 'kills enzymes' **ignore** kills germs / viruses **ignore** fights off microbes **ignore** stops decay slows down decay is insufficient
	d	i	hydroponics (1)	1	**allow** phonic spelling **allow** hydrophonics **not** hydrophobic

Question			Expected Answers	Marks	Rationale
1	d	ii	**advantage** control mineral level or fertiliser level / no competition for minerals / control disease / no leaching / no pollution from run off / no need for weeding (1) **disadvantage** lack of support (of plant) / cost of additional fertilisers / cost of initial set up (1)	2	**ignore** chemicals or no pesticides needed **ignore** plant will get more minerals / fertiliser **allow** control nutrients / fertilisers / minerals eg no minerals passed to weeds scores 1 **allow** no need to use herbicides **allow** control pests in soil **not** just control pests **ignore** recycle minerals **ignore** no need for soil **ignore** more expensive unless qualified eg equipment more expensive scores 1 **allow** 'expensive chemicals have to be used' **allow** plants fall over or are unstable **ignore** pots fall over **allow** roots have no support
			Total	**9**	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	10cm **above** lettuce and 1cm on top (1)	1	all correct for the one mark +/-1mm does not need to be labelled but 0 if labels wrong does not need to be centrally placed ignore vertical scale
		ii	blue-tit bar is smaller than caterpillar bar which is smaller than lettuce bar (1)	1	**allow** correct diagram. Does not need to be labelled but 0 if incorrectly labelled **allow** a drawn triangle correct way up e.g. △ **not** 'it's a triangle' as no reference to orientation **allow** correct description of pyramid shape e.g. 'it starts off bigger and gets smaller as it gets higher' i**gnore** 'it is a pyramid shape' **not** 'lettuce would be the biggest box' or 'biggest box is at the bottom'
	b		heat / movement / egestion / waste / respiration / excretion / death / eaten by another animal not in food chain / not all parts eaten (1)	1	**ignore** eating / breathing / growth **allow** 'faeces'
	c		**denitrifying bacteria** converts nitrogen compounds / nitrates / ammonium compounds / ammonia to nitrogen (gas) (1) **nitrifying bacteria** converts nitrogen compounds / ammonia / ammonium compounds to nitrites or converts nitrites to nitrates or converts ammonium compounds or ammonia into nitrates (1) **nitrogen-fixing bacteria** converts nitrogen (gas) or atmospheric nitrogen or N_2 to nitrogen compounds or named nitrogen compound or ammonia or ammonium compounds or nitrates or nitrites (1)	3	must have substrate and product for mark e.g. denitrifying bacteria convert nitrates = 0 e.g. denitrifying bacteria convert nitrates to nitrogen = 1 **ignore** converts nitrogen compounds to nitrates
			Total	**6**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	transpiration / movement of water / movement of minerals / support (1)	1	**not** transports nutrients or sugar or fertilisers movement of water to roots i.e. wrong direction scores 0
		ii	thick(ened) (cell) wall / contains lignin / or has a hollow lumen / tubes / dead cells / tracheids (1)	1	**ignore** just 'long' **allow** dead tissue
	b	i	(air) spaces (1) allow diffusion or a correct description of diffusion (between stomata and cells) / large surface area (1)	2	**allow** gaps, holes, pockets etc
		ii	broad or large surface area to get more light / thin so short distance for gases to travel / have chlorophyll or chloroplasts to absorb light / network of veins for transport or support / waxy layer or epidermis transparent to let in light / palisade at top to absorb maximum light / waxy cuticle to conserve water / stoma or stomata for gas movement (1)	1	structure and reason needed for mark **do not allow** reference to spongy layer **allow** 'lots of chloroplasts at the top to absorb maximum light' **ignore** guard cells **allow** 'allows air or carbon dioxide in or oxygen out'
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
4	a		alkali neutralises acid / neutralisation (1)	1	**allow** 'it becomes less acidic' or 'it becomes more alkaline' **allow** 'pH of neutral or alkaline solution is higher than the pH of an acidic solution' **allow** 'acid reacts with alkali' **ignore** 'pH of acid is high' or 'acid and alkali balance out'
	b		calcium nitrate (1)	1	**allow** $Ca(NO_3)_2$ (1)
	c	i	base (1)	1	Mark answer line first. If answer line is blank allow 'base' ticked, underlined or circled
		ii	$CuO + 2HCl \rightarrow CuCl_2 + H_2O$ formulae (1) balancing (1)	2	**allow** multiples balancing mark is conditional on correct formulae
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
5	a		crush the plant / grind up the plant (1) add a solvent or named solvent (to dissolve the chemical) (1) (separate chemicals using) chromatography / distill / crystallise / solvent extraction (1)	3	**allow** cut it up or cut or chopped or squeezed or pressed or mashed or pulp it or blend it **allow** 'freeze and then defrost' **allow** 'add water or ethanol or propanone ' **allow** 'dissolve the chemical' **ignore** 'add a solution' or 'boil it' **allow** 'boil it in water' scores 2 **ignore** add an acid **allow** correct description of separation process **ignore** evaporation
	b		Idea that R and D can take a long time / (high) labour costs / (specialist) equipment / cost of failed medicines (1)	1	**allow** needs lots of people / needs to be tested / needs to be pure / needs to be safe / many stages (1) **allow** cost of materials
			Total	**4**	

6	a		74 (1)	1	**ignore** any units
	b		RMM of calcium carbonate = 100 **and** RMM of calcium chloride = 111 (1) BUT 55.5 (g) scores (2)	2	
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
7	a		filtration – idea of removal of solid (particles) (1) chlorination - to kill or remove microbes / kill or remove bacteria (1)	2	**allow** named solids e.g. dirt **allow** 'bits' **ignore** just particles **ignore** to kill germs **allow** kills viruses
	b		uses large amounts of energy or heat or fuel (1)	1	**ignore** just 'uses heat' **allow** large apparatus / will take a long time (1) **ignore** 'lots of equipment needed **allow** high temperature needed **ignore** cost of apparatus **ignore** 'sea water is corrosive'
	c		silver nitrate + sodium chloride → silver chloride + sodium nitrate (1)	1	**allow** correct formulae or mix of formulae and words **allow** $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ (1) **allow** = instead of arrow
			Total	**4**	

8	a		lustrous / shiny / transparent / decorative (1)	1	**allow** idea of decorative, refracts well or separates light or reflects well **ignore** cost
	b		no free electrons (1)	1	**allow** no delocalised electrons or all the electrons are being used or no spare electrons or no loose electrons
	c		(good) conductor of **electricity** / high melting point / inert (1)	1	**ignore** does not rust or corrode
	d		industrial catalysts (1)	1	Mark answer line first. If answer line is blank allow 'industrial catalysts' ticked, underlined or circled
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
9	a	i	explosive atmospheres / refuelling / AW (1)	1	**allow** petrol stations, flour mills ignore any references to defibrillators or hospital machinery
		ii	idea of earthing / AW (1)	1	**allow** grounding **allow** idea of use of an inert atmosphere **allow** 'use a lightning conductor' or other sensible precaution to avoid lightning strikes
	b		idea that strips charged scores (1) **BUT** strips have the same charge scores (2) **BUT** both strips have the same charge **and** repel scores (3)	3	**allow** ideas about electron or charge transfer do not penalise incorrect charges e.g. charged with positive electrons scores 1 3 mark answer must include idea of a force e.g. repel, push apart just 'strips repel or move apart' with no reference to charge scores 0 just 'like charges repel' scores 2
	c	i	so that there will be a fine mist produced / to stop the paint forming blobs / particles repel or spread out (1)	1	**allow** spread evenly **allow** 'stop the particles sticking together' **ignore** 'even finish'
		ii	to attract the paint to the car / opposites attract (1)	1	**ignore** to make the paint stick
	d		better finish / less waste / even coating / shadows painted / use less paint / allows paint to get to inaccessible places / reduced dripping (1)	1	**ignore** quicker
			Total	**8**	

Question			Expected Answers	Marks	Additional Guidance
10	a		F (1)	1	Mark answer line first. If answer line is blank allow F ticked, underlined or circled or marked on diagram **allow** rheostat or variable resistor
	b		6 (ohms) = (2) BUT 3/0.5 = (1)	2	
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
11	a	i	ideas that: they cannot be detected outside the body / cannot penetrate the skin / ORA for β and γ (1)	1	**allow** cannot penetrate the body **ignore** ideas about damage to the body **ignore** just 'low penetration' or references to paper
		ii	Idea of swallowed or injected (1)	1	**allow** through medicine, taking pills or taking medicine
		iii	Use of a radiation detector e.g. GM tube, geiger counter, gamma camera, photographic plate(1)	1	**ignore** 'use a scanning machine' **ignore** readers **allow** radioactive detector
	b		electrons collide with metal (target) scores (1) **BUT** fast moving or high energy electrons collide with metal (target) scores (2)	2	**ignore** β particles
			Total	**5**	

12	a		100 (2) BUT two hours = four half lives / AW (1)	2	e.g. 2 ÷ 0.5 or 2 hrs ÷ 30 mins = 4 look for evidence of halving at least twice 200 scores 1
	b		metal / boron / cadmium / (control) rods (1) absorbs or controls the number of neutrons (1)	2	**allow** bars **not** fuel rods e.g. boron absorbs neutrons scores 2, rods absorb protons scores 1 **ignore** references to moderators
			Total	**4**	

			Paper Total	**60**	

Grade Thresholds

General Certificate of Secondary Education
Additional Science B (Specification Code J641)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B623/01	Raw	60	-	-	-	33	27	21	16	11	0
	UMS	60	-	-	-	60	50	40	30	20	0
B623/02	Raw	69	48	40	30	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B624/01	Raw	60	-	-	-	33	27	21	16	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B624/02	Raw	60	46	37	27	17	11	8	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B626/01	Raw	60	52	47	41	36	30	24	18	12	0
	UMS	100	90	80	70	60	50	40	30	20	0

B626 - The grade thresholds have been decided on the basis of the work that was presented for award in June 2008. The threshold marks will not necessarily be the same in subsequent awards.

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	5.0	17.6	40.1	67.6	83.5	92.3	97.0	98.9	100	62429

63077 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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