

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Mark Schemes for the Units

June 2008

J641/MS/R/08

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

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GCSE Gateway Additional Science B J641

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Mark Scheme Guidance

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

/ = alternative and acceptable answers for the same marking point

(1) = separates marking points

not = answers which are not worthy of credit

reject = answers which are not worthy of credit

ignore = statements which are irrelevant

allow = answers that can be accepted

() = words which are not essential to gain credit

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

ecf = error carried forward

AW = alternative wording

ora = **or reverse argument**

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

Question			Expected Answers	Marks	Additional Guidance
1	a	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)	2	allow air sacs / alveoli (1)	
		(small) intestine / digestive system / alimentary canal (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 <u>aortic</u> (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. CO₂ and not CO2 / CO² ; SO₄²⁻ and not SO42-, So₄²⁻, SO₄2- (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	1	allow electric / electric current / electric charge (1) not just current / charge ignore voltage
		ii	1	allow Al
		iii	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	2	allow bicarbonate indicator (1) allow turns yellow if linked to bicarbonate indicator (1)
		ii	1	allow $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ allow = instead of arrow allow mixture of correct formulae and words not copper carbonate + heat \rightarrow copper oxide + carbon dioxide / $\text{CuCO}_3 + \text{heat} \rightarrow \text{CuO} + \text{CO}_2$ 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	2	<p>allow length / metres / how far - for distance (1) not time / how long (0)</p> <p>allow while driver reacts (1) not driver thinks (0)</p> <p>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)</p> <p>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)</p> <p>e.g. time taken to think about braking (0) e.g. time taken to press the brake (0)</p>
		ii	2	<p>any two from: higher speed / driving faster (1)</p> <p>alcohol / drugs (1) tiredness / illness / stress (1) distraction / poor concentration (1)</p> <p>getting older (1)</p> <p>ignore just high speed – there must be a comparative comment allow medication</p> <p>allow a named distraction within the car e.g. using a mobile phone, drinking a can of coke</p> <p>ignore poor visibility / external distractions</p>
	c	wet (road) / icy (road) / snowy (road) / muddy (road) / greater speed / AW (1)	1	<p>allow poor road surface / oil on road / slippery 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 / greater mass / more weight / more people in car (1) allow steeper (downhill) gradient</p>
		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. mitochondria
			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	<u>diffusion</u> (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. CO₂ and not CO2 / CO² ; SO₄²⁻ and not SO4²⁻, So₄²⁻, SO₄2- (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 ⁻ → O ₂ / 2O ²⁻ → O ₂ + 4e ⁻ correct formulae including electrons (1) balancing (1)	2	allow correct multiples of equation e.g. O ²⁻ - 2e ⁻ → ½O ₂ balancing mark is conditional on correct formulae allow O ²⁻ - 2e ⁻ → O / O ²⁻ → 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 $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ allow = instead of arrow allow mixture of correct formulae and words not copper carbonate + heat → copper oxide + carbon dioxide / $\text{CuCO}_3 + \text{heat} \rightarrow \text{CuO} + \text{CO}_2$ / 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 <i>typical candidate answers together with the mark that should be awarded are included at the end of this mark scheme</i>
	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	

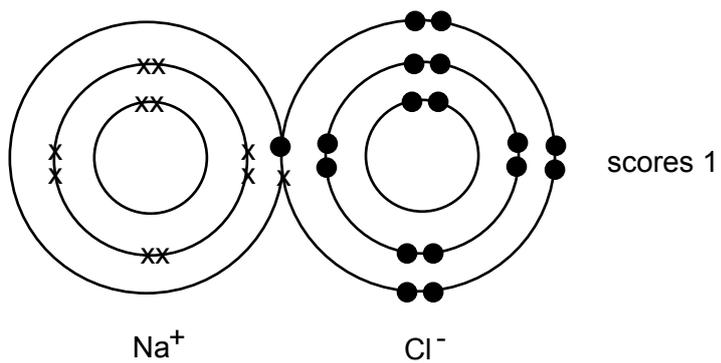
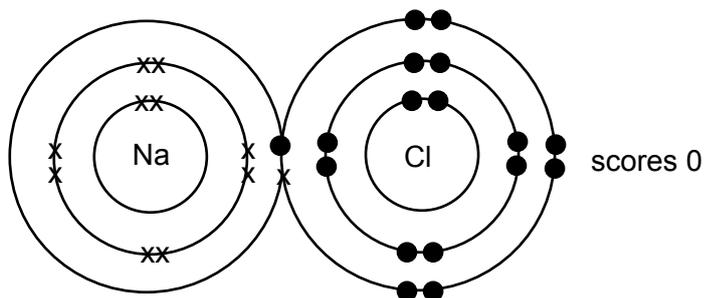
13	a	i	any two from: higher speed / driving faster (1) alcohol / drugs (1) tiredness / illness / stress (1) distraction / poor concentration (1) getting older (1)	2	ignore just high speed – there must be a comparative comment allow medication allow a named distraction within the car e.g. using a mobile phone, drinking a can of coke ignore poor visibility / external distractions
		ii	wet (road) / icy (road) / snowy (road) / muddy (road) / greater speed / AW (1)	1	allow poor road surface / oil on road / slippery 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 / greater mass / more weight / more people in car (1) allow steeper (downhill) gradient
	b		400 × 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		

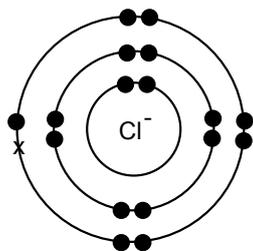
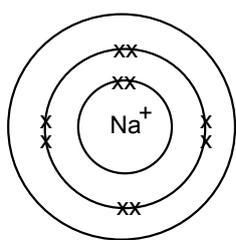
Question		Expected Answers	Marks	Additional Guidance
14	a	<p>any two from: change shape / AW (1) absorb energy (1) increased stopping time / increased collision time / AW (1) increased stopping distance / increased collision distance / AW (1) decreased acceleration (1) less force (on passengers) (1)</p>	2	<p>allow crumple zone is crushed ignore merely 'car crumples' ignore absorb force / absorb impact / absorb damage</p>
	b	i	1	<p>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</p>
		ii	2	<p>mark parts (i) and (ii) together for answer on left (whether written in parts i or ii) award one mark in part (ii)</p>
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	

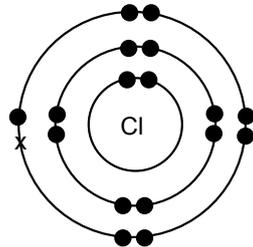
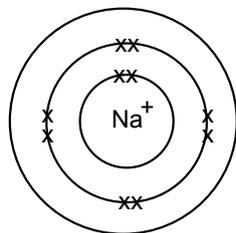
Extra Advice Question 10 (a)

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

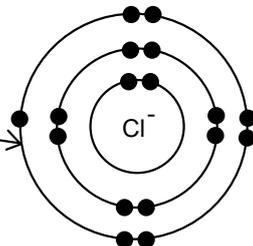
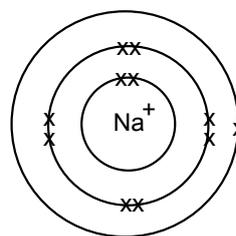




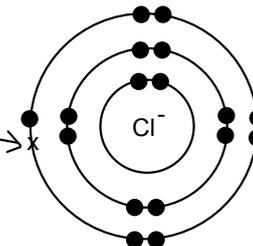
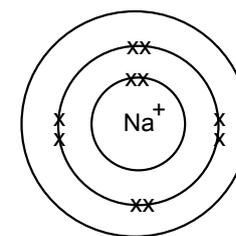
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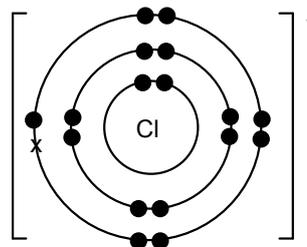
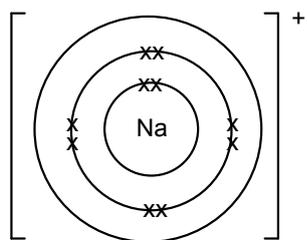
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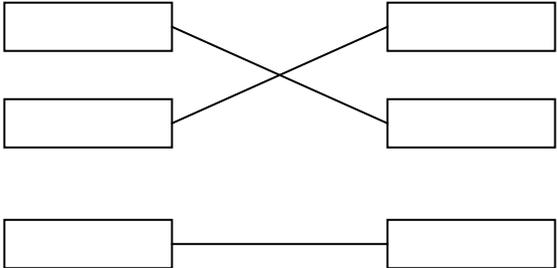
B624/01 Unit 2: Modules B4, C4 and P4 Foundation Tier

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 weeds herbicide — kills beetles insecticide — kills fungi	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
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	

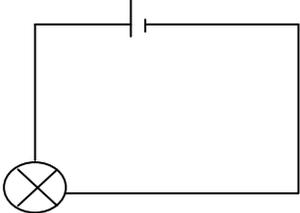
Question		Expected Answers	Marks	Additional Guidance
6	a	research / testing / labour costs or AW / raw materials. Ingredients or chemicals / takes time / equipment / rent or rates or taxes (1)	1	allow transport / marketing / packaging / AW (1)
	b	crush the plant / grind up the plant (1) add a solvent 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 $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$ (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	 <p>any complete circuit that forms a loop containing bulb and cell (1)</p>	1	<p>allow other reasonable electrical components in circuit</p> <p>If switch in circuit and open or closed allow the mark.</p>	
	b	i	F (1)	1	<p>Mark answer line first. If answer line is blank allow F ticked, underlined or circled or marked on diagram</p> <p>allow rheostat or variable resistor</p>
		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	<p>one correct = 1</p> <p>two correct = 2</p> <p>three or four correct =3</p> <p>more than one line from or to a box is incorrect (for that box)</p>
	b	Pregnancy scans / breaking down (kidney) stones (1)	1	<p>allow ultrasound cleaning / scanning / tumours / cancel / muscle / tendon / joint treatment / dental cleaning / any reasonable answer in medicine (1)</p> <p>NOT merely 'looking at babies</p> <p>allow checking unborn baby (1)</p>
		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	1	More than one answer scores (0) allow γ allow alpha (as implant for localised cancer treatment) (1)
		ii	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	<p>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</p>
	b	i	1	<p>allow DNA / RNA / ATP / ADP / AMP ignore cells / membranes / other structural features / chlorophyll</p>
		ii	1	<p>ignore photosynthesis / chloroplasts / keeping leaves green</p>
	c	acid(ic) / low pH (1) kills / stops growth of bacteria / microbes / fungi / mould / decomposers (1)	2	<p>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</p>
	d	i	1	<p>allow phonic spelling allow hydrophonics not hydrophobic</p>

Question			Expected Answers	Marks	Rationale
1	d	ii	<p>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)</p> <p>disadvantage lack of support (of plant) / cost of additional fertilisers / cost of initial set up (1)</p>	2	<p>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</p> <p>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</p>
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' ignore '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	1	Mark answer line first. If answer line is blank allow 'base' ticked, underlined or circled
		ii	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
		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 $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$ (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. $2 \div 0.5$ or $2 \text{ hrs} \div 30 \text{ mins} = 4$ 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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