

GCSE (9-1)

Combined Science (Biology A) (Gateway Science)

Unit **J250/08**: Biology

General Certificate of Secondary Education

Mark Scheme for June 2018

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

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

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	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

Subject-specific Marking Instructions**INTRODUCTION**

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

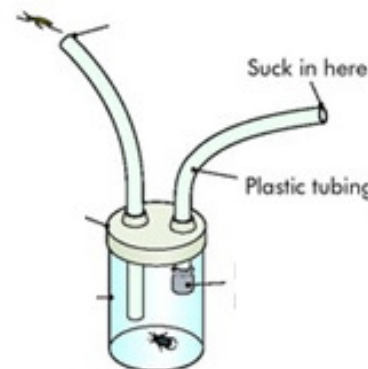
The breakdown of Assessment Objectives:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	D ✓	1	1.1	
2	D ✓	1	1.1	
3	A ✓	1	1.1	
4	B ✓	1	1.1	
5	C ✓	1	2.1	
6	C ✓	1	2.1	
7	B ✓	1	2.1	
8	C ✓	1	1.2	
9	B ✓	1	1.1	
10	D ✓	1	1.1	

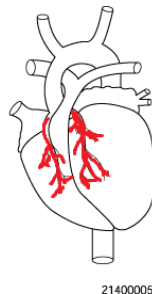
BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question		Answer	Marks	AO element	Guidance
11	(a)	pooter / diagram of a pooter ✓ Any two from description of how to use the pooter e.g. suck the insect into a tube/jar/bottle/container ✓ details of how marked ✓ collect at different heights or different areas (of the tree) ✓	3	1 x 1.2 2 x 2.2	IGNORE pitfall traps / beating sheet / brush / net / use of hand lens  ALLOW instruction on diagram as a description of use, so correct diagram labelled with instruction ✓✓ e.g. (small) paint mark / pen mark / marker (pen) / nail polish / dye / ink / colour IGNORE sticker / tags ALLOW collect at the same time each day

Question			Answer	Marks	AO element	Guidance
	(b)		idea that mark should not be able to be removed (for the time of the experiment) ✓ idea that mark must not make it more visible to predators ✓ idea that mark should not be toxic or poisonous (to the mealybug) ✓	3	3 x 2.2	ALLOW mark will not rub off / is permanent / waterproof ALLOW mark not visible to predators / doesn't make it more likely they get eaten by predators DO NOT ALLOW so it is visible BUT ALLOW only visible under UV light IGNORE make sure it is marked in the same place ALLOW does not cause harm (to the mealybug / predator) IGNORE does not affect (the mealybug) IGNORE not too much paint or ink / different colours ALLOW answers in terms of questions e.g. how long the mark will stay on? will it make it visible to predators? will it harm the mealybug?
	(c)	(i)	500 ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
		(ii)	Any two from no deaths ✓ no reproduction / no births ✓ idea of no emigration ✓ sampling methods used are identical ✓ marking has not affected the survival rate of the animals ✓ marks have not rubbed off ✓	2	2 x 2.2	IGNORE immigration / repopulation / migrate ALLOW no predation / none were eaten / all survive / predator numbers don't change IGNORE just population decreases ALLOW no breeding IGNORE just population increases ALLOW doesn't wander out of area / mealybugs stay on the tree IGNORE mealybugs are hiding ALLOW predators can't spot them easier IGNORE different weather conditions / other factors

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	(yes) (tree B) high(er) light intensity smaller population / (tree A) low(er) light intensity bigger population ✓	1	3.2a	IF ANSWER IS NO THEN ZERO MARKS unless (c)(i) is 250 or less ALLOW (tree B) more light smaller population/ (tree A) less light bigger population ALLOW (tree B) more light and 250 mealybugs and (tree A) less light and 500 mealybugs ALLOW ecf if wrong answer in (c)(i)
		(ii)	light meter might be shielded from light / clouds may alter intensity ✓ Any one from sample light in random or different areas of the tree ✓ sample light at different times of the day ✓	2	2.2 3.3b	ALLOW some areas in more shade (than others) / readings only taken on one side of tree ALLOW person taking reading could block the light IGNORE light intensity is different on different days / light intensity varies during the day IGNORE human error / leaves covering light meter /position of the Sun ALLOW different angles / different heights / different sides of tree ALLOW stand back when taking readings✓ BUT stand back when taking readings to prevent shadowing ✓✓ IGNORE just 'take more readings' / 'more precise readings BUT ALLOW take readings over several days

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	label clearly indicating any part of the coronary blood vessels ✓	1	1.1	
		(ii)	lactic acid (produced or released by anaerobic respiration) ✓ BUT (build-up) of lactic acid causes pain in (heart) muscle ✓✓	2	1.1 2.1	ALLOW lactic acid in the muscle causes pain ✓✓ ALLOW lactic acid is a poison ✓✓ ALLOW lactic acid causes muscle fatigue ✓✓ IGNORE causes cramp
	(b)	(i)	First check answer on the answer line If answer = 3.5 (mm²) then award 3 marks radius is 1.05 ✓ $\pi \times 1.05 \times 1.05$ ✓ = 3.46...rounded to 2 sig figs = 3.5 ✓	3	2.2 2.2 1.2	ALLOW 3.46185 / 3.4619 / 3.462 or 3.46 (mm ²) ✓✓ ALLOW $\pi \times 1.05^2$ ALLOW MAX one mark if they use diameter and answer is 14 (mm ²) ✓ BUT IGNORE 13.9 / 13.85 (mm ²)

Question			Answer	Marks	AO element	Guidance
		(ii)	80.66 (%) ✓	1	2.2	ALLOW 80.7(%) / 80.663 (%) / 81(%) DO NOT ALLOW 80.6 (%) ALLOW ECF correctly substituted $\frac{18.1 - (\text{answer to bi}) \times 100}{18.1}$
		(iii)	ANY two from coronary arteries are over 80(%) narrowed ✓ which means severe CVD ✓ lifestyle and medicines or other methods unlikely to work ✓	2	2 x 3.1a	IGNORE just stating answer to bii e.g. narrowed by 80(%) IF answer to 12(b)(ii) value is less than 80(%) then ONE MARK for identifying the correct severity e.g. decrease was between 50(%) to 80(%) so moderate severity ALLOW could die without surgery ALLOW lifestyle and medicines or other methods may take too long to have an effect

Question	Answer	Marks	AO element	Guidance
c*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) explain how the types of surgery would help AND evaluate more than one type of surgery AND draw conclusions about which type of surgery might be best <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) explain how the types of surgery would help AND evaluate at least one type of surgery OR evaluate at least one type of surgery AND draw conclusions about which type of surgery might be best <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i>	6	2 x 2.1 2 x 3.1b 2 x 3.2b	AO2.1 Apply knowledge and understanding of CVD to explain how the types of surgery would help. - coronary angioplasty would increase the diameter of artery to increase blood flow - bypass increases blood flow by avoiding the narrowed artery - heart transplant would provide a healthy heart with no restricted blood flow / more oxygen will get to the heart muscle AO3.1b Analyse information and ideas to evaluate each type of surgery. Coronary angioplasty risk likelihood that the coronary artery might narrow again / anti-clotting drugs needed / more surgery might be required later benefit has a short recovery time / as relieves symptoms that fail to respond to medicine / only 1 in 25 chance artery will narrow Coronary artery bypass graft risk long recovery time / is painful / may require further surgery / is effective in over 65s' but patient is younger benefit as used to treat extensive disease / idea that it is effective in patients with severe CVD Heart transplant risk possible rejection / donor issues might be significant / long recovery time / arteries can narrow again benefit increases life expectancy significantly for a 55 year old / further surgery unlikely

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) explain how the types of surgery would help OR evaluate at least one type of surgery. OR draw conclusions about which type of surgery might be best <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>			IGNORE references to poor heart function and diabetes / ignore cost unqualified AO3.2b Analyse information to draw conclusions about which type of surgery might be best. final decision made based on benefits versus risks analysis • e.g. coronary angioplasty is best as there is a short recovery time even though it may require further surgery • e.g. coronary artery bypass graft is best as it doesn't have donor or tissue rejection problems even though there is a long recovery time • e.g. heart transplant is best as further surgery is unlikely

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	TOP LEFT BOX (in response to glucagon liver breaks down) glycogen into glucose ✓ BOTTOM RIGHT BOX (in response to insulin) target cells take up glucose / (liver converts) glucose into glycogen ✓	2	2 x 1.1	ALLOW liver or muscles take up glucose IGNORE just 'glucose is stored' BUT ALLOW glucose is stored as glycogen / glucose is stored in the liver or muscle or target organ IGNORE just 'glucose removed from the blood' DO NOT ALLOW breaks down glucose ALLOW spellings of glycogen to include - glycogen / glycagon DO NOT ALLOW glucagon BUT IGNORE glucogon / glucagen / glucogen
		(ii)	if the level (of glucose) changes control systems (respond by) returning levels to normal ✓	1	1 x 1.1	ALLOW low levels of glucose inhibit insulin release / high levels of glucose inhibit glucagon release IGNORE if level (of glucose) is too high body lowers levels BUT ALLOW if level (of glucose) is too high body lowers levels AND if level (of glucose) is too low body increases levels DO NOT ALLOW answers in terms of changes in hormone levels causing the response

Question		Answer	Marks	AO element	Guidance
	(b)	restriction enzyme ✓ ligase (enzyme) ✓ Then MAXIMUM of two marks from: enzyme cuts (insulin) gene out (of the human DNA) ✓ same enzyme (that cut the human DNA) is used to cut (open) bacterial DNA or plasmid or host (bacteria) ✓ idea of sticky ends matching ✓ enzyme sticks (insulin) gene into bacterial DNA or plasmid or host (bacteria) / enzyme sticks sticky ends together ✓	4	4 x 1.1	IGNORE restrictive enzyme ALLOW (insulin) gene cut out (of the human DNA) by restriction enzyme ✓✓ DO NOT ALLOW ligase cuts (insulin) gene out (of the human DNA) IGNORE just 'enzyme cuts human DNA' DO NOT ALLOW ligase is used to cut (open) bacterial DNA IGNORE just 'enzyme cuts bacterial DNA or plasmid or host (bacteria) ' BUT restriction enzyme cuts the plasmid and (insulin) gene out (of the human DNA) ✓✓✓ IGNORE enzyme used to separate the plasmid or cut out the plasmid from the bacteria ALLOW sticky ends are complementary IGNORE sticky ends are the same ALLOW (insulin) gene is stuck into plasmid using ligase ✓✓ DO NOT ALLOW restriction enzyme sticks (insulin) gene into bacterial DNA ALLOW sticky ends stuck by ligase ✓✓ ALLOW join /connect /paste for the idea of stick IGNORE just '(insulin) gene put into or inserted into bacterial DNA or plasmid '

Question			Answer	Marks	AO element	Guidance
14	(a)		skin colour controlled by multiple genes or three genes eye or hair are controlled by a single gene or one gene ✓	1	1.1	MUST BE COMPARATIVE ALLOW there are more genes (than eye or hair colour) / eye or hair colour have fewer genes IGNORE just 'there is more than one gene' BUT ALLOW there is more than one gene but eyes or hair have one gene ALLOW alleles for genes
	(b)	(i)	46 ✓	1	2.1	ALLOW 23 pairs
		(ii)	environmental effects have an impact as well as the genetics ✓	1	2.1	ALLOW examples of environmental effects e.g. they might have a healthy diet ALLOW idea of also having the non-faulty gene, assuming faulty genes is recessive e.g. gene is recessive and they only have one (copy) / gene is recessive and they are heterozygous / gene is recessive and they (also) have the dominant / gene is recessive and they are carriers IGNORE just it is recessive / they are carriers
	(c)	(i)	(gene) mutation ✓	1	2.1	ALLOW base sequence in gene has altered
		(ii)	(kidney) cells have not differentiated properly ✓	1	2.1	ALLOW cell differentiation did not happen ALLOW kidney cells could not specialise IGNORE prevents the control of kidney cell differentiation IGNORE codes for a faulty or non-functional protein

Question			Answer	Marks	AO element	Guidance
		(iii)	50% / ½ / 1 in 2 / 0.5 / 1 : 1 ✓ 			

Question		Answer	Marks	AO element	Guidance
15	(a)	Any four from bacteria enter through a wound ✓ bacteria has a tumour-inducing plasmid ✓ plasmid integrates into tree's genome ✓ excess growth chemicals are now produced ✓ (causes large) tumour ✓ galls grow round the roots or the stem ✓ flow of sap cut off ✓ growth is stunted ✓	4	4 x 1.1	ALLOW bacteria enter through damaged tissue IGNORE disease enters through wound ALLOW plasmid/bacterial DNA joins tree DNA or changes tree DNA ALLOW bacteria multiply rapidly ALLOW mitosis is uncontrolled / uncontrolled growth / rapid cell division of tree (tissue) ALLOW(causes large) cancerous growth / cancerous gall IGNORE just 'gall grows' IGNORE galls grow on the roots or the stem ALLOW translocation is restricted or stopped / flow of nutrients is restricted or stopped / flow of sugar or sucrose is restricted or stopped ALLOW uptake of water / minerals / nutrients restricted or stopped ALLOW water transport or transpiration is restricted or stopped ALLOW less growth / will not grow / prevent root growth IGNORE just 'affects growth' IF NO OTHER MARK AWARDED ALLOW tree dies

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	easier for bacteria/pathogen to get inside ✓	1	2.1	ALLOW provides a way in for the bacteria IGNORE wound can get infected / disease can enter
		(ii)	overall the wounding leads to more galls or total or mean for the two wounded trees is greater / ORA ✓ idea that wounding seems to affect roots more than shoots or crowns ✓	2	2 x 3.2b	ALLOW wounded 58 galls not wounded 43 ALLOW wounded trees have more galls / ORA ALLOW wounded trees grown next to trees with galls had the highest percentage ALLOW wounded trees had highest percentage of galls on root ALLOW more galls on roots when wounded ALLOW 47 root galls and 17 crown galls
		(iii)	trees originally grown next to trees with galls are more likely to get galls / ORA ✓ trees are more likely to get root galls (than crown galls) / ORA ✓ .	2	2 x 3.2b	IGNORE references to wounded / not wounded ANSWER MUST BE COMPARATIVE ALLOW trees originally grown next to trees with galls are more likely to get the disease or infected / ORA ✓ ALLOW trees originally grown next to trees with galls have the higher percentage or more galls / ORA ALLOW trees have more root galls (than crown galls) / ORA ✓ IGNORE infection of the roots is more common than infection of the crown

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