H

GCSE (9–1)

Combined Science A (Biology) A (Gateway Science)

J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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

Annotation	Meaning
✔	Correct response
✘	Incorrect response
∧	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	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 for GCSE (9-1) in Combined Science A:

	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			A✓	1	2.1	
2			D✓	1	1.1	
3			B✓	1	1.1	
4			B✓	1	1.1	
5			C✓	1	1.1	
6			A✓	1	1.1	
7			D✓	1	2.1	
8			C✓	1	2.1	
9			C✓	1	1.1	
10			B✓	1	1.1	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	**Any two from:** higher levels of blood cholesterol result in more deaths / lower levels of blood cholesterol result in less deaths ✓ blood cholesterol level of 6.5 - 7.99 (mol/dm³) has the highest percentage of deaths ✓ blood cholesterol level of <5 (mol/dm³) has the least percentage of deaths ✓ 5.0 – 6.49 (mol/dm³) the most common cholesterol level / <5 (mol/dm³) least common cholesterol level ✓ ature<5 (mol/dm³) or 5-6.49 (mol/dm³) percentage population was higher than deaths ✓ 6.5 - 7.99(mol/dm³) or >8 (mol/dm³) deaths higher than percentage population ✓	2	2 x 3.2b	**ALLOW** heart disease for deaths **IGNORE** just quoting data e.g. men with blood cholesterol level less than 5 (mol/dm³) had 4% deaths **ALLOW** as blood cholesterol level decreases the number of deaths decrease **IGNORE** smallest percentage of population has less deaths **ALLOW** those with 6.5 - 7.99 (mol/dm³) are more likely to die **ALLOW** those with <5 (mol/dm³) are less likely to die **ALLOW for two marks:** idea that there were few men with >8.0 (mol/dm³) blood cholesterol levels yet they had the second highest percentage of deaths ✓✓ or idea that the percentage deaths in high cholesterol group is very high relative to the percentage of people in that group ✓✓

Question			Answer	Marks	AO element	Guidance
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1:24 award 2 marks** 4:96 / 4 in 96 / 96÷4 ✓ 1:24 ✓	2	2 x 2.2	**DO NOT ALLOW** 96:4 **DO NOT ALLOW** 24:1
		(iii)	only 1 in 25/4% die from heart disease (with levels <5mol/dm^3) ✓ levels above (5 mol/dm^3) account for 96% of the deaths ✓ **Or any one of these for 2 marks:** 10% of people have levels <5 (mol/dm^3) but account for 4%/less than 5% of deaths ✓✓ 12% of people have levels >8 (mol/dm^3) but account for more than 25% of deaths ✓✓	2	2 x 3.2a	**ALLOW** idea it reduces your chance of getting heart disease/heart attack/dying **ALLOW** (<5 mol/dm^3) had the least number of deaths **ALLOW** higher blood cholesterol levels result in more deaths/increase risk of heart disease
(b)	(i)		reducing (the build-up of) cholesterol reduces (risk of) heart disease. ✓ (therefore) blood flows more freely through arteries / less blockages in arteries / less risk of heart attack / heart <u>muscle</u> gets more oxygen/glucose ✓	2	2 x 2.1	**ALLOW** build-up of cholesterol (in arteries) causes heart disease **IGNORE** HRT reduces the build-up of cholesterol/decreases blood cholesterol **IGNORE** less risk of heart disease **ALLOW** arteries will not get clogged up (with cholesterol) **ALLOW** increased blood flow to heart <u>muscle</u>

Question			Answer	Marks	AO element	Guidance
		(ii)	longer period for study (to see if reduction of cholesterol reduces heart disease) ✓	1	3.3a	**ALLOW** takes longer than 5 years for cholesterol build-up to lead to heart disease **ALLOW** perform tests of heart function **ALLOW** record the number of women in the study with heart disease / died of heart disease **ALLOW** increase the dose of HRT **IGNORE** do more tests / increase number of women in study / check on them more often than 5 years
		(iii)	(HRT might) increase the rate of cell division✓	2	2.1	**IGNORE** reference to cell growth / increased mitosis
			(increase the risk of) uncontrolled cell division / (increase the risk of) tumour formation ✓		1.1	**ALLOW** (increase the risk) of uncontrolled cell replication **ALLOW as extra marking point** increased rate of mitosis (increases) risk of mutation
	(c)		(more) exercise / reduced (saturated) fat diet / less alcohol / stop smoking / less salt in diet / less stress ✓	1	1.1	**ALLOW** example of type of exercise **IGNORE** healthier diet

PMT

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	(plastic) is flammable / gives off toxic fumes / will melt in flame / ORA ✓	1	2.2	**ALLOW** glass bottles can be reused/ORA **ALLOW** glass has a higher melting point **ALLOW** plastic might burn **IGNORE** plastic cannot be recycled
		(ii)	heating will sterilise the bottle ✓ prevents microbe transferring to agar ✓	2	2 x 2.2	**ALLOW** will kill the bacteria/microbes (on bottle) **ALLOW** prevents (microbial) contamination
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 380 (mm^2) award 3 marks** radius is 11(mm) ✓ 11 x 11 x 3.14 ✓ = 379.94 = 380 (mm^2) (rounded to 3 sig figs) ✓	3	 2.2 2.2 1.2	 **M1** measurement of 11mm **M2** = M1^2 x 3.14 **M3** = M2 correctly converted to three SF Only award M3 if clear evidence they have used πr^2 **ALLOW** subtraction of antibiotic disc area resulting in a final answer of 342 (mm^2) = 3 marks

PMT

Question			Answer	Marks	AO element	Guidance
		(ii)	(antibiotic) A no mark	2	2 x3.2a	**ALLOW ECF -** if answer to (b)(i) is less than 177mm^2 then answer is C no mark – reasons are the same
			larger area (of clear agar jelly) / C has smaller area ✓			**ALLOW** bigger zone of inhibition
			therefore A is more effective / could be used in lower concentrations / ora ✓			**ALLOW** A kills more bacteria / C kills fewer bacteria **ALLOW** could be used in lower doses **IGNORE** stronger / more potent / fights more bacteria **ALLOW** A is 1.75 -1.85 times more effective = 2 marks
	(c)		**Any two from:**	2	2 x 1.1	
			bacteria are able to mutate ✓			
			resistance is passed on (in DNA) ✓			**ALLOW** resistance is inherited
			increase percentage of population with resistance overtime ✓			**ALLOW** idea that those bacteria without resistance die / those with resistance survive **IGNORE** unsuccessful bacteria die / successful bacteria survive
			as new antibiotics developed bacteria become resistant ✓			

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	axes correctly labelled, including units of days and g/litre ✓ axes even scales occupying more than half of the grid ✓ all points correctly plotted ✓ lines labelled or a key ✓ two straight lines of best fit starting at day 0 and 0.15 g/litre✓	5	4 x 2.2 1.2	**MAX 4 for a bar chart** **ALLOW** either order of axis **ALLOW** +/- half a square at least 8 points correctly plotted ✓ **IGNORE** extrapolations

Time (days)	Dry mass at different temperatures (g/litre)	
	25 (°C)	35 (°C)
0	0.15	0.15
5	0.21	0.28
10	0.30	0.42
15	0.36	0.52
20	0.45	0.63
25	0.50	0.74

Question			Answer	Marks	AO element	Guidance
		(ii)		**2**	**2 x 3.1a**	increase in dry mass must be seen at least once
			increase in dry mass over time ✓			**IGNORE** just 'as days increase both temperatures increase'
			increase in dry mass is greater at 35°C ✓			**ALLOW** higher temperature/35°C has higher dry mass
						IGNORE just 'it is higher at higher temperature'
	(b)		**Any three from:** slower rate of photosynthesis ✓	**3**	**3 x 2.1**	**ALLOW** less photosynthesis **IGNORE** not enough heat for photosynthesis
			less (growth of) algae ✓			**ALLOW** not enough algae **IGNORE** no algae **IGNORE** not enough dry mass
			less food (for other organisms) ✓			**ALLOW** no food (for other organisms) / more competition for food / not enough to eat / not enough dry mass to eat
			less oxygen available for animals ✓			**ALLOW** not enough oxygen for respiration
			ideas about reduce populations / decrease biodiversity ✓			**ALLOW** less organisms **IGNORE** animals and plants die / no organisms
	(c)		increase (in mass of) algae in lakes/rivers ✓	**2**	**2.1**	**ALLOW** faster growth of algae
			increase in toxic products will kill (more) animals/humans ✓		**3.2a**	**ALLOW** more toxin so (more) fish are killed / more toxin so decrease in fish numbers

Question			Answer	Marks	AO element	Guidance
14	(a)		**Any four from:** (insulin) gene identified (in human DNA) ✓ gene inserted into plasmid ✓ restriction enzyme to cut open the plasmid or to cut out the gene ✓ ligase enzyme to insert the gene ✓ correct reference to sticky ends ✓ correct reference to selection using antibiotic markers ✓	4	4 x 1.1	**ALLOW** gene is taken from a human cell **ALLOW** idea sticky ends are joined
	(b)		diet high in sugar/fat causes obesity ✓ type 2 diabetes linked to obesity ✓	2	2 x 1.1	**ALLOW** diet high in sugar/fat causes type 2 diabetes **ALLOW** reducing sugar/fat in diet could help treat type 2 diabetes **IGNORE** healthy diet reduces obesity/type 2 diabetes **ALLOW** decrease weight can prevent or treat type 2 diabetes
	(c)		doctors will be able to predict which people are likely to suffer from type 2 diabetes ✓ personalised/individual treatments can be developed / treatments more effective (because medicines tailored for specific medical needs) ✓	2	2 x 1.1	**ALLOW** idea that genes that prevent cells losing their sensitivity to insulin can be identified **ALLOW** idea of identifying carriers of type 2 diabetes **IGNORE** identify gene that causes type 2 diabetes **ALLOW** idea of developing more effective/personalised/specific medication **IGNORE** can identify which type of drug to produce **IGNORE** idea of just 'developing new or correct medication'

Question			Answer	Marks	AO element	Guidance
15	**(a)**		growth ✓ division / mitosis ✓	**2**	**2 x 1.1**	either order **ALLOW** multiplication / replication **IGNORE** mutation

Question			Answer	Marks	AO element	Guidance
*	(b)		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)** Considered evaluation of benefits and risks of gene therapy on cancer treatment. **AND** Demonstrates and applies knowledge and understanding to explain why gene therapy could be used. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Evaluates benefits and risks of gene therapy on cancer treatment. **AND** Demonstrates or applies knowledge and understanding to explain why gene therapy could be used. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Attempts to evaluate benefits/risks of gene therapy on cancer treatment. **OR** Applies knowledge and understanding to explain why gene therapy could be used. **OR** Demonstrates knowledge and understanding of cancer.	6	2 x 1.1 2 x 2.1 2 x 3.1b	**AO1.1 Demonstrate knowledge and understanding of cancer and use of gene therapy** • uncontrolled cell growth causes cancer • gene therapy would involve replacing faulty p53 gene or replacing with a correct version of faulty gene • gene therapy uses a vector to insert gene **AO2.1 Apply knowledge and understanding of to explain why gene therapy could be used** • replacing (p53) gene will prevent replication of damaged DNA • preventing replication of damaged DNA reduces effects of lung cancer/prevent further growth of cancer/stop cancer spreading **AO3.1b Analyse information and ideas to evaluate benefits and risks of gene therapy for example** benefits: • if gene therapy saves lives, it can only be a good thing • replacing a faulty (p53) gene could prevent years of (painful) cancer treatment • current treatment is unreliable and gene therapy may improve on this • reduce effects of lung cancer / prevent further growth of cancer / stop cancer spreading risks: • long-term outcomes / effects not known • ethically controversial to interfere with human genome • idea of rejection **ALLOW** gene therapy may be short lived / not effective

PMT

Question			Answer	Marks	AO element	Guidance
			There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant. **0 marks** *No response or no response worthy of credit.*			**Level 3** consideration that benefits may outweigh risks as lung cancer is major cause of death in humans and current treatments are unreliable and painful

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