OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science B (Twenty First Century)

Unit **J260/04**: Combined Science

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.

Annotations available in RM Assessor

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.

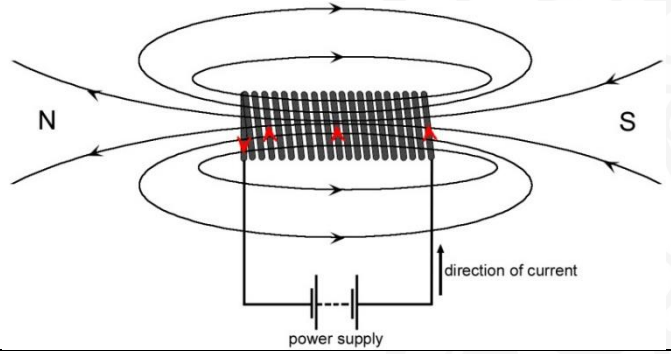
The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science B:

	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.

Question			Answer	Marks	AO element	Guidance
1	(a)		Wear eye protection ✓	1	2.2	**ALLOW** goggles/**safety** glasses/gloves/ lab coat/apron/(face) mask **IGNORE** PPE
	(b)	(i)	D ✓	1	1.2	
		(ii)	Indicator ✓	1	1.2	**ALLOW** any named indicator, including Universal Indicator
	(c)	(i)	NaCl ✓ CO_2✓	2	2 x 2.2	**DO NOT ALLOW** incorrect letter cases. Order of atomic symbols unimportant e.g. ClNa, O_2C **ALLOW** superscript instead of subscript e.g. CO^2 **ALLOW** CO2 **IGNORE** incorrect balancing
		(ii)	Sodium carbonate is neutralised during the reaction HCl ✓	1	2.1	
	(d)		Crystallisation ✓	1	1.2	
	(e)		Distillation ✓	1	1.2	
	(f)	(i)	Increase in salt/sodium increases the deaths (from cancer) ✓	1	3.1a	**ALLOW** positive correlation
		(ii)	The death rate in South Korea is higher than expected from the trend ✓	1	3.2b	
	(g)		**Any two from:** Idea of growing/culturing the bacteria (on Petri dishes/agar) ✓ (Grow *Helicobacter* in) different concentrations/levels/amounts of salt ✓ Measure / compare the growth ✓	2	2 x 2.2	**ALLOW** fermentation to grow bacteria **ALLOW** calculate growth

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>wire wound/coiled ✓</td><td>1</td><td>1.2</td><td>ALLOW make a coil of wire.</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Direction of current flow through solenoid ✓

Magnetic field, including arrows, around solenoid ✓

Poles of the magnetic field ✓
 
</td><td>3</td><td>2.2

3.1a

2.2</td><td>Arrow(s) positioned correctly on any part of the solenoid.
ALLOW arrow above/below/in the solenoid to indicate that the current flows to the left

IGNORE the spacing of magnetic field lines.
Minimum of one line above and one line below the solenoid</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Points plotted correctly ✓

Single continuous straight line of best fit drawn correctly through plotted points ✓</td><td>2</td><td>2 x 2.2</td><td><table><tr><th>Number of turns</th><th>Number of paper clips</th></tr><tr><td>40</td><td>19</td></tr><tr><td>50</td><td>25</td></tr><tr><td>60</td><td>31</td></tr></table></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Increase in number of turns increases strength of magnetic field/number of paperclips lifted ✓

Trend is linear ✓</td><td>2</td><td>3 x 3.1a</td><td>ALLOW positive correlation

ALLOW proportional/approximate doubling idea/similar amount each time/constant rate/straight line</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
		(iii)	**Any one from:** Increase current/voltage ✓ Plausible answers related to changing the metal / use metal/ alloy with increased magnetic permeability or wtte ✓	1	1.2	**DO NOT ALLOW** more turns in coil **IGNORE** power/power supply/ battery **IGNORE** larger/stronger core
	(c)		Electromagnets are not permanent magnets ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
3	(a)		**Any one from:** Monitor / measure the volume of carbon dioxide produced / decrease in mass owing to loss of carbon dioxide/ rate of carbon dioxide production ✓ Monitor / measure the loss of glucose / rate of glucose loss ✓	1	2.2	**ALLOW** count number of bubbles **ALLOW** measure the amount of glucose
	(b)	(i)	48 (cm^3) ✓	1	3.1a	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.4 (cm^3 / h) award 3 marks** Rate of ethanol production = vol. of ethanol produced (cm^3) ÷ time taken (h) ✓ = 48 ÷ 120 ✓ = 0.4 (cm^3 / h) ✓	3	1.2 2 x 2.2	**ALLOW** ECF from (b)(i) for all 3 marks
	(c)	(i)	3.5 (°C) to 44 (°C) ✓	1	3.1a	**ALLOW** 3.25-3.75 °C to 43.75-44.25 °C inclusive **ALLOW** numbers reversed
		(ii)	32.3 (°C) ✓	1	3.1a	**ALLOW** 32.0-33.0 °C inclusive
		(iii)	Measure the reaction rate at smaller temperature intervals ✓ Carry out the experiment again between 30 ° C and 35 ° C ✓	2	2 x 3.3b	
	(d)		(Idea of finding) mass **and** volume ✓ mass ÷ volume ✓	2	2 x 1.2	**DO NOT ALLOW** weight

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	One student to release, one to catch / necessary for catcher not to know when ruler released/dropped, owtte ✓	1	2.2	
		(ii)	**Any three from:** Same (size/length) ruler ✓ Same people/roles ✓ Same (catching) hand ✓ Same catching position ✓ Same measuring point ✓ Same release point/position ✓ Dropped, not thrown/pushed down ✓ Same influence/lack of influence of stimulants e.g. caffeine ✓ Same place/environment or light level ✓ Same time of day ✓ No practice ✓	3	3 × 2.2	**IGNORE** just same distance
		(iii)	**Any one from:** Measurement to be made at same point on catcher's hand ✓ Answers relating to eyeline / parallax ✓	1	2.2	**ALLOW** measure from same fingers/do it from the same place

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 110 (mm) award 2 marks** = 110.1 ✓ = 110 (mm) (3 sig. figs) ✓	**2**	**2 x 2.2**	
		(ii)	109 (mm) ✓	**1**	**3.1a**	
	(c)	(i)	eye → sensory neuron → brain → spinal cord →motor neuron → muscle (3rd box) ✓	**1**	**2.1**	
		(ii)	Across gaps called synapses ✓	**1**	**1.1**	
	(d)	(i)	**Any one from:** Same colour ✓ Ensure that they tasted the same / disguise (differences in) taste ✓	**1**	**3.2a**	 **ALLOW** so they didn't know which drink they had/which group they were in/could not tell the difference/it was a blind test
		(ii)	so volume does not affect the results ✓	**1**	**3.2a**	**ALLOW** so they didn't know which drink they had/which group they were in/could not tell the difference/it was a blind test **IGNORE** it was a fair test
		(iii)	**Any two from:** no hint of when line appears ✓ Person being tested by electronic timing/automated timing/can be done by one person ✓ Direct measurement of reaction time / No need to convert lengths into times ✓ Greater accuracy (of computer timer) ✓ reduced human error ✓ improved repeatability ✓	**2**	**2 x 3.3b**	**Assume answer relates to the computer unless specifically mentioned otherwise** **ALLOW** computer is random **ALLOW** Instant results **DO NOT ALLOW** quicker process **ALLOW** less (chance of) mistakes

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td>(i)</td><td>PET waste would eventually sink in seawater ✓</td><td>1</td><td>3.2a</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Appropriate bar and axis labels, including % or the word ‘percentage’, and linear scale ✓

Correctly plotted bars ✓</td><td>2</td><td>2 × 2.2</td><td>IGNORE width/shading/touching bars
DO NOT ALLOW larger pieces used to label two bars

<table><tr><th>Type of plastic litter</th><th>Amount (%)</th></tr><tr><td>Beads</td><td>3</td></tr><tr><td>Fibres</td><td>57</td></tr><tr><td>Fragments</td><td>34</td></tr><tr><td>Larger pieces</td><td>5</td></tr></table></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>The proportions of acrylic and polyurethane are approximately the same ✓

The proportion of polypropene is approximately double that of acrylic. ✓</td><td>2</td><td>3.2b</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>Any four from:
Sort /separate types of plastics ✓

Wash/clean ✓

Dried ✓

Grind/ flake ✓

Make into new products/materials ✓

Depolymerised / converted to monomers ✓

Re-polymerise the pure monomer/ new PET synthesised ✓</td><td>4</td><td>4 × 1.1</td><td>IGNORE melting
IGNORE crushed
IGNORE reused</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	**Any two from:** Answers related to reducing (energy) costs ✓ Breakdown products used to produce more PET ✓ PET to landfill/waste reduced ✓ Simpler (recycling) process ✓ Less litter ✓	**2**	**2 x 2.1**	**IGNORE** faster/sustainable/natural **IGNORE** more recycling takes place
		(ii)	BADC ✓✓	**2**	**2 × 2.1**	**ALLOW** B anywhere before C for one mark

Question			Answer	Marks	AO element	Guidance
6	(a)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 29000 award 2 marks** 145000 x 0.20 / 145000 ÷ 5 ✓ = 29000 ✓	**2**	**2 x 2.2**	**ALLOW** 145 000 x 1.2 **OR** 174 000 ✓ **ALLOW** 29000 seen in working but not final answer for maximum 1 mark
	(b)		**Any one from:** Risk (of developing Parkinson's disease) is lower in (former) smokers / is higher in non-smokers ✓ Risk (of developing Parkinson's disease) is low**est** in current smokers ✓ **Any one from:** (Approximately) 41% of patients are former smokers ✓ (Approximately) 8% are current smokers ✓ (Approximately) 50% of the patients have never smoked ✓	**2**	**3.1a** **3.1b**	
	(c)	**(i)**	**Any two from:** increase in speed / (kinetic) energy ✓ (Particles) move apart ✓ changes (from a liquid) to a gas / vapour ✓	**2**	**2 x 2.1**	**ALLOW** idea of vibrate or move around **more** **ALLOW** overcome weak intermolecular forces **ALLOW** evaporates / boils

Question			Answer	Marks	AO element	Guidance
		(ii)	Comparison of e-cigarette is a physical change and cigarette is a chemical change ✓	1	2.1	**ALLOW** new products formed (including gases/carcinogens) in cigarettes
	(d)	(i)	Ali ✓	1	3.1b	
		(ii)	Sarah ✓	1	3.1b	
	(e)*		*Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question*. **Level 3 (5–6 marks)** Analyses data to form reasoned conclusions about the relative risk and presence or lack of correlation. *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)** Analyses some data to form conclusions about the risk and presence or lack of correlation. *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)** Identifies foods from the data that change the risk of Parkinson's disease. *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.*	6	**3 × 3.1a** **3 × 3.2b**	**AO3.1a Analyse data** For example: • reduction of risk linked with eating all foods except tomato juice • peppers - 0.24 reduced risk (conc. 102) • tomatoes – 0.58 reduced risk (conc. 44) • potatoes – 0.92 reduced risk (conc. 19) • tomato juice – 2.16 increases risk (conc. 30) **AO3.2b Analyse information to make conclusions/correlations** • Idea that results from tomato juice suggest that other factors may be involved. • correlations imply that nicotine-containing foods give protection against Parkinson's disease • Portion may alter risk • Comparative statements about risk • Correlation ideas limited by small sample size • other factors may be involved in patients who ate nicotine-containing foods

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