



GCSE MARKING SCHEME

SUMMER 2019

**GCSE
APPLIED SCIENCE (DOUBLE AWARD) - UNIT 1
3445U10-1 / 3445UA0-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCSE APPLIED SCIENCE (DOUBLE AWARD)
UNIT 1: ENERGY, RESOURCES AND THE ENVIRONMENT
SUMMER 2019 MARK SCHEME
GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			2 The edges of continents fit like jigsaw pieces (1) 4 Similar rocks of the same age are found on facing sides of different continents (1) 6 Similar fossils are found on opposite sides of oceans (1)	3			3		
	(b)	(i)		5 correct plots ($\pm < 1$ small square) (2) 4 correct plots ($\pm < 1$ small square) (1) 3 correct plots ($\pm < 1$ small square) (0) adding a suitable line (1)		3		3	3	
		(ii)		Take reading from graph – expect 35 million years +/- 1		1		1	1	
		(iii)		Greater the distance from the plate the older the rock		1		1		
	(c)			crust (1) convection (1) mantle (1)	3			3		
	(d)			Earthquakes (1) volcanic (eruptions) (1) accept tsunami	2			2		
				Question 1 total	8	5	0	13	4	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Expt 1 – convection (1) Expt 2 – conduction (1)	2			2		2
	(b)	(i)		75		1		1	1	1
		(ii)		Circle 46			1	1	1	1
		(iii)		Copper aluminum brass steel			1	1		1
	(c)			Radiation is an (electromagnetic) wave which passes through air (in straight lines)(1) Convection would cause hot air to rise(1) Air is a poor conductor – no contact between plates and heater / conduction is only through a solid (1)		3		3		3
				Question 2 total	2	4	2	8	2	8

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Order – (F) C B D A (E) 1 mark for each max 3	3			3		
	(b)			Indicative content (The crystallisation temperature is the temperature at which crystals appear). • {Set up a hot water bath/heat water} and an ice bath. • Put given mass of salt into the boiling tube. • Add given volume water. • Warm the boiling tube in the hot water bath until the salt dissolves. • Put the boiling tube in the ice bath and stir with the thermometer. • Note the temperature at which crystals first appear and record it in the table. • Add 1 cm³ water. • Warm the solution again, stirring until all the crystals dissolve. • Then repeat the cooling and note the new temperature at which crystals appear. • Repeat until 10 cm³ water has been used. Accept alternative methods.	3	3		6		6

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				5-6 marks Comprehensive description of the method above. The water must be warmed until all the salt dissolves. When cooling the temperature of the appearance of crystals is noted. Repeats are also important. <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</i> 3-4 marks Candidates describe most of the method, e.g. heat water, add salt, add more salt, identify the mass of salt added and change in temperature. <i>There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</i> 1-2 marks Candidates describe some of the method. E.g. heat the water and add the salt. <i>There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate used limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</i> 0 marks No attempt made or no response worthy of credit.						

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		Sodium sulfate		1		1		1
		(ii)		$115 - 40 = 75\text{g}/100\text{g water} \pm 2\text{ g}$ (73-77 g)		1		1	1	1
		(iii)		Any 3 $\times$ (1) from: Sodium sulfate – solubility decreases (1) Potassium nitrate increases (between 30°C and 60°C) (1) Potassium is less soluble than sodium sulfate until 38°C (1) more soluble than sodium sulfate after 38°C (1) solubility is the same at 38°C(1)		3		3	2	4
	(d)			Any 2 $\times$ (1) from: At 10°C the point is on the line (1) 30°C potassium nitrate is 50 (1) 50°C potassium nitrate is 90 - wasn't on the line so no don't agree (1) If no values given (0 marks)			2	2		1
				Question 3 total	6	8	2	16	1	12

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Correct positioning of ammeter (1) and voltmeter (1)	2			2		2
		(ii)		Current = $12 / 800$ (subs and selection) = 0.015A (1)		2		2	2	
		(iii)		From 2 to 4 cm – resistance doubles from 400 to 800 (1) But for the others distances e.g. from 4 - 6 and 6 - 8 – resistance does not double quoting data from table so claim is incorrect (1)			2	2		
	(b)			Stayed the same		1		1		
				Question 4 total	2	3	2	7	2	2

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			A – hot gases/waste gases C – Slag B – Molten iron 3/2 correct (2), 1 correct (1)	2			2		
	(b)			Iron oxide (1) C (1) element (1) Compound (1)	4			4		
	(c)			2(1) both need for the mark CO (1) Fe(1)	3			3		
	(d)			140 (1) £197 (1) (ecf)		2		2	2	
	(e)			Aluminum too reactive (higher up/too high reactivity table)/more reactive than carbon (1)	1			1		
				Question 5 total	10	2	0	12	2	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6 FT 1 HT	(a)			$3000 - 600 = 2400$ (1) $\frac{120000}{2400}$ (1) (ecf) $= 50$ months(1) $\frac{120000}{600} / \frac{120000}{3000} = (0)$ marks		3		3	3	
	(b)			Ay $2 \times (1)$ from: wind power is intermittent (1) noise (1) spoils view (1) more land needed (1) kills birds (1)	2			2		
	(c)	(i)		$\frac{160}{480}$ kWh $\times 100$ (1) (selection and substitution) $= 33(.33\%)$ (1) Accept 0.33 for (1)		2		2	2	
		(ii)		His cows produce: 120×3 (1) $= 360$ tonnes of waste (1) He needs: $\frac{160000}{160}$ (1) $= 1000$ tonnes so he doesn't have enough cows/less than his cows produce(1)			4	4	4	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				OR He needs: $\frac{160000}{160}$ (1) =1000 tonnes (1) No of cows = $\frac{1000}{3}$ (1) =333.3 so he hasn't got enough cows (1) OR 120 × 3 = 360 tonnes of waste. 1 tonne 160kWh so 360 × 160 = 57600kWh electricity he needs 160000 kWh so not enough electrical energy produced to run his farm OR 160 × 3 (1) = 480 kWh per cow (1) 120 × 480 = 57 600 kWh (1) 160 000 – 57 600 = 102400 extra needed so not enough (1) Accept conclusion based on candidate answer ecf						
				Question 6 total	2	5	4	11	9	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7 FT 2 HT	(a)	(i)		Volume = 125 Surface area = 294 Surface area:volume=3:5/6:10		3		3	3	3
		(ii)		Diffusion { <u>rate/speed</u> } of the acid into the gelatin cube is the same (1) The bigger the cube the longer decolourisation takes as the acid needs to diffuse {further distance/greater volume}(1) so she is incorrect. Or Greater/larger surface area:volume ratio in smaller cubes so bigger cubes take longer to decolourise as acid needs to diffuse further for decolourisation to occur.			2	2		2
	(b)			SA:Vol = 3:2 (approx.) / 90:60 / 136:90(1) Diffusion faster (1) Faster gas exchange (1)			3	3	1	
				Question 7 total	0	3	5	8	4	5

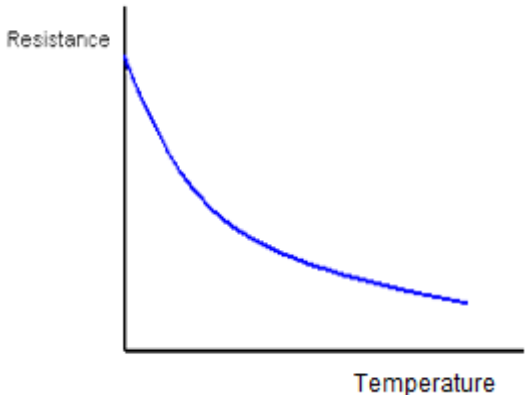
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Jig-saw fit to the edges of the continents (1) Similar rocks of same age found on different continents(1) Similar fossils of organisms found on opposing sides of continents(1)	3			3		
		(ii)		Rock in mantle heated by the core (1) Causes convection currents (in the mantle)(1) (Continents are on the plates) and plates move (1)	3			3		
	(b)	(i)		Both C and D correctly labelled			1	1		
		(ii)		Destructive - The plates move towards each other. (1) Consequence - can be crushed together and forced upwards creating mountains (and earthquakes) (1) NOT volcanos form Constructive - The plates move apart; (1) (from the mantle). The magma cools/solidifies Consequence - Rock build up (to form a volcano and earthquakes) / sea floor spreads (1) NOT mountains form	2 2			4		
				Question 3 total	10	0	1	11		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Haematite – source of iron (ore)(1) Limestone – removes impurities (found in Haematite) (1)	2			2		
	(b)	(i)		Fe ₂ O ₃ + 3 CO → 2 Fe + 3 CO ₂ Products (1) Reactants (1) Balancing (1) Accept: 2 Fe ₂ O ₃ + 3 C → 4 Fe + 3 CO ₂		3		3		
		(ii)		Any 2 × (1) from: C is oxidised (1) Fe ₂ O ₃ is reduced (1) CO is oxidised (1)		2		2		
	(c)			105.88 + 30.23 + 20 + 9 (1) =£165.11 (1) 165.11 (ecf) × $\frac{5000000}{12}$ (1) = £68.8 million – answer = £69 million (1) Accept for 3 marks 263.65 (1) × $\frac{5000000}{12}$ (1) = £109.9 million – answer = £110 million (1)		4		4	4	
				Question 4 total	2	9		11	4	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			QER Indicative content During rest (0-20s) aerobic respiration occurring there is no oxygen debt. During exercise(20-60s) anaerobic respiration increases as oxygen debt increases. Aerobic respiration also increases -Max oxygen uptake 2.5dm³ Recovery (60-100s) aerobic respiration slows as oxygen debt decreases. Anaerobic respiration stops. 5-6 marks Candidates describe the graph and link to aerobic and anaerobic respiration and rate of oxygen uptake/demand. <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</i> 3-4 marks Candidates describe the graph and some linking to aerobic or anaerobic respiration. <i>There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</i>	2	2	2	6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks Candidates state the terms aerobic and anaerobic respiration OR candidates describe the graph without linking to aerobic and anaerobic respiration. <i>There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate used limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</i> 0 marks No attempt made or no response worthy of credit.						
				Question 5 totals	2	2	2	6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Break down of (large /insoluble) to {small molecules / soluble} (1) so that they can be <u>absorbed</u> (1)	2			2		
		(ii)		Contraction (and relaxation) of muscles in gut wall (1) Push food along (1)	2			2		
	(b)	(i)		Increase (in temp 20-40) and decreases (40-60) (1) (Optimum at) 40 – fastest rate (1) kinetic energy increasing/ more successful collisions between 20-40 (1) enzyme is denature / active site changes shape 40-60 (1)	2	2		4		4
		(ii)		pH / partial denaturation / different enzyme	1			1		1
		(iii)		boiled <u>and</u> cooled enzyme (1)	1			1		1
		(iv)		Above 65°C Bacterial amylase has <u>higher</u> rate / tolerance at <u>higher</u> temperatures / Optimum at a <u>higher</u> temperature / Less active at lower temperatures (1) Denatures at a <u>higher</u> temperature (1) Allow correct comparison of data for first marking point (1)		2		2		2
				Question 6 totals	8	4		12	0	8

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		 Resistance Temperature	1			1		1
		(ii)		or alternative graph of resistance increasing with temperature thermistor resistance decreases (1) total resistance decreases (1) So ammeter reading increases (1) So voltage across R increases (1) Therefore voltmeter reading decreases (1) Allow converse statements which are linked to candidates graph If alternative graph is used – accept the following thermistor resistance increases (1) total resistance increases(1) So ammeter reading decrease (1) So voltage across R decrease (1) Therefore voltmeter reading increase (1) Answer should link to candidate graph	1	4		5		4

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		Light intensity / distance of the torch from the LDR	1			1		1
		(ii)		Resistance of the LDR accept voltmeter reading/ ammeter reading /meter readings	1			1		1
		(iii)		Total resistance = $2.5 + 1 = 3.5 \text{ k}\Omega$ (1) (sub) $I = \frac{9}{3500}$ (1)(manip and conversion) $= 2.57 \times 10^{-3} / 0.00257$ (1) $V = 0.00257 \text{ (ecf)} \times 2500$ (1) (sub) $= 6.42 \text{ V}$ (1) Or Total resistance = $2.5 + 1 = 3.5 \text{ k}\Omega$ (1) (sub) PD across LDR + $1 \text{ kohm} = 9 \text{ V}$ (1) PD across LDR $2.5/3.5 \times 9 = 6.43 \text{ V}$ (1) $I = \frac{6.43 \text{ (ecf)}}{2500}$ (1) (manip and conversion) $= 0.00257$ (1) If conversion not done, expect answers of 2.57 A and 6428/9 V for (4) Do not penalise incorrect rounding	2	3		5	5	5
		(iv)		Keep light intensity constant (1) Add a variable resistor / use variable power supply (1) Take positive and negative readings of current and voltage (1)			3	3		3
				Question 7 total	6	7	3	16	4	14

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	8	5	0	13	4	0
2	2	4	2	8	2	8
3	6	8	2	16	1	12
4	2	3	2	7	2	2
5	10	2	0	12	2	0
6	2	5	4	11	9	0
7	0	3	5	8	4	5
TOTAL	30	30	15	80	22	25

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	5	4	11	9	0
2	0	3	5	8	4	5
3	10	0	1	11		
4	2	9	0	11	4	
5	2	2	2	6		
6	8	4	0	12		12
7	6	7	3	16	4	14
TOTAL	30	30	15	75	21	26