GCSE MARKING SCHEME

SUMMER 2018

GCSE (NEW)
APPLIED SCIENCE (DOUBLE AWARD) - UNIT 2
3445U20 / 3445UB0-1

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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 2 (NEW)

SUMMER 2018 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 FT	(a)	(i)		blue / red		1		1		
		(ii)		green		1		1		
	(b)	(i)		24 (1) 20 (1)		2		2	2	
		(ii)	I	fox		1		1		
			II	(animals/they) move / (animals/they) hunt / Plants are stationary	1			1		
		(iii)		grasshopper	1			1		
		(iv)		grasshopper	1			1		
		(v)		Triangular shape with 4 layers (1) Labelled wheat (widest) – grasshopper – shrew – fox (narrowest) (1)	2			2		
				Question 1 total	**5**	**5**	**0**	**10**	**2**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2 FT	(a)	(i)		A – red blood (cell) B – white blood (cell) C – plasma D – platelet All correct (3) 2 or 3 correct (2) 1 correct (1)	3			3		
		(ii)		Carry oxygen (1) Clotting (1) Fight infection (1) Do not accept 'stop bacteria/stop virus'	3			3		
	(b)	(i)		red blood cell count below normal range white blood cell count is normal platelets count below normal range 1 or 2 (1) all 3 for (2)		2		2		
		(ii)		anaemia / low clotting ability accept heavy bleeding accept low haemoglobin accept low oxygen-carrying capacity accept low iron			1	1		
	c	(i)		acceleration = $\frac{15}{2.5}$ (1) subs = 6 [m/s^2] (1)	1	1		2	2	
		(ii)		Speed = $\frac{192}{12}$ (1) subs = 16 [m/s] (1)	1	1		2	2	
		(iii)	I	2500		1			1	
			II	$\frac{2500}{16}$ (ecf) (1) = 156(.25) [s] (1)	1	1			2	
				Question 2 total	**9**	**6**	**1**	**16**	**7**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3 FT	(a)			A **D E C B** F All correct (3) 2/3 correct (2) 1 correct (1)	3			3		3
	(b)	(i)	I	freshwater shrimps and caddis fly lava		1		1		1
			II	some pollution			1	1		1
		(ii)		No,stream B has high pollution (1) because the largest population are sludge worms/contains more sludgeworms than A (1) Judgement 'no' can be part of either marking point			2	2		2
		(iii)		All would be 0 / there would be no life (1)		1		1		2
				Question 3 total	**3**	**2**	**3**	**8**	**0**	**8**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4				**Indicative content** MRSA control measures include hand washing, thorough cleaning of hospital wards, use of alcohol gels, isolation of patients, use of sterile dressings, as well as screening of patients using swabs to detect the presence of MRSA before being operated on. Bacteria such as MRSA have become resistant to antibiotics. This could be due to the use of antibiotics in animal feeds and animal treatments, not completing the course of antibiotics, as well as the over-prescription for humans. These have caused mutations. **5– 6 marks** Detailed account of how MRSA has developed and several control measures described. *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.* **3 – 4 marks** Partial account of how MRSA has developed and some control measures described. or Detailed account of how MRSA has developed or several control measures described. *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.* **1-2 marks** Limited account of how MRSA has developed or some control measures described. *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.* **0 marks** No attempt made or no response worthy of credit.	6			6		
				Question 4 total	**6**	**0**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5 FT	(a)			High (1) electromagnetic (1) penetrate (1) low (1)	4			4		
	(b)	(i)		Cobalt (60)		1		1		
		(ii)		It halves		1		1		
		(iii)	I	51 (1) $\frac{1}{4}$ (1)		2		2	2	
			II	An extra half life / 5 half lives / +17 (1) 68 + 17 = 85 OR 5 × 17 = 85 days (1)		2		2	2	
				Question 5 total	**4**	**6**	**0**	**10**	**4**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6 FT	(a)	(i)		Tick boxes 1,4,5: Saturn orbits the Sun with a velocity of 5 km/s faster than Pluto (1) Mars and the Earth have the same day length (1) The Earth has the greatest density (1) 4 boxes (2) 5 boxes (1) all boxes (0)			3	3		
FT	(b)	(i)		Longer wavelength						
		(ii)		Frequency increases						
		(iii)		Moves <u>away faster</u> Do not accept 'further away'						
1 HT	(c) FT (a) HT	(i)		Temperature = within range of -109 to -66(1) orbital time = within range 688 to 4330 (1)			2	2	2	
		(ii)		{Mass / diameter} smaller than the moon / smallest mass / smallest diameter accept 'smallest size' do not accept 'it is small/smaller'			1	1	1	
		(iii)		Scales: x-axis in intervals of 1/ 2 cm and y-axis in intervals of 10 / 2 cm (1) 5 plots correct ± less that one square tolerance (2) 4 plots correct ± less that one square tolerance (1) 3 or fewer plots correct ± less that one square tolerance (0) smooth curve (1) ignore extrapolation Do not accept thick/sketchy/wispy lines Do not award marks if incorrect variables are plotted or planets in incorrect order or bar chart If x-axis is labelled 'planets' do not award scale mark Moon plotted = neutral		4		4	4	
		(iv)		Orbital velocity decreases with distance / this graph curves downwards(1) (To be proportional) line must be a straight, upward and through origin (1)		2		2	2	

	(d) FT (b) HT	(i)		(Sunspots) are cooler (1) + Any 1 × (1) from: so do not emit as much light (1) OR (magnetic field) blocks hot gases reaching the surface (1)	1	1		2		
		(ii)		Electricity supply could be affected/power cut (1) TV / radio / mobile phone/satellite/communications affected (1)	2			2		
		(iii)		Number of sunspots (in each cycle) is different (1) and flares are linked with sunspots (1)		2		2		
	(e) FT (c) HT			Statements about one model implies the other model is different: Any 4 × (1) from: Aristotle: (converse for 2006 model) Earth at the centre of the Solar System / geocentric(1) Sun and planets orbit the Earth (1) Only one moon (1) Less planets (Absence of Uranus / Neptune / Plutoids) (1) Absence of asteroid belt (1)			4	4		
	(d) HT	(i)		Lines are red-shifted (1) All galaxies moving away (from the Earth)(1) The more distant the galaxy the faster it moves (1)						
		(ii)		{Same / similar} pattern of lines(1) So {same / similar} chemical composition(1) As each set of lines corresponds to an element (1)						
				Question 6/1 total	**3**	**11**	**11**	**25**	**9**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Brian(1) High white blood cell count (1)	1		1	2		
		(ii)		Gareth(1) Low red blood cell count (1)	1		1	2		
		(iii)		Gareth(1) Low platelet count / problems with blood clotting(1)	1		1	2		
	(b)			veins have thinner walls / valves / larger lumen(1) muscle contractions push blood along / to prevent backflow of blood / reduce friction (1) capillaries are <u>one cell</u> thick (1) to allow exchange of substances (1)	4			4		
	(c)	(i)		Constant speed = $\frac{96}{6}$ (subs) (1) = 16 m/s(1) acceleration = $\frac{16}{2.5}$ (ecf)(subs) (1) = 6.4 (m/s^2) (1) Only allow ecf if speed calculation has been attempted	1 1 1	1 1		4	3	
		(ii)		Subs: 22 = $\frac{mass}{1.9^2}$ (1) Manip and answer = 79.4(2) (kg) (1)	1	1		2	1	
				Question 2 total	**10**	**3**	**3**	**16**	**4**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			**Indicative content:** Collect some water in a large container – about 2-3cm deep. Collect samples of invertebrates using the net and transfer them to the tray. Study the organisms in the tray and try and identify the invertebrates against the chart. Record the number of each invertebrate that has been caught. Compare with the key to determine water quality according to numbers of indicator species present. Pour them and the water gently back into the stream. **5– 6 marks** Comprehensive account of the method of collection and determination of water quality and reference to conclusions. *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.* **3 – 4 marks** Full method of collection and how to determine water quality OR most of method and conclusion. *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.* **1-2 marks** Limited account of collection method or how to determine water quality. *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.* **0 marks** No attempt made or no response worthy of credit.	6			6		6

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		Stream A has <u>some pollution</u> (1) since majority of invertebrates are freshwater shrimps and caddis fly lava (1). Stream B has <u>highly pollution</u> (1) because the largest population are sludge worms. (1)		4		4		4
		(ii)		Even if the same group of students (used the same method) (1) results may differ because the ecosystem is not static(1)			2	2		2
				Question 3 total	**6**	**4**	**2**	**12**	**0**	**12**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Minimum absorbency at 500 (nm) (1) Two maxima at 450 and 700 (nm) (1) Increases between 500 and 700 nm (1) Allow 'peaks, dips and peaks again' for (1)		3		3		
		(ii)		Selection of 450 (1) Manipulation $\frac{300\,000\,000}{450\ (ecf) \times 10^{-9}}$ (1) Answer = 6.667 / 6.7 $\times$ 10^{14} [Hz] (1)	1	2		3	2	
	(b)	(i)		60% = 30 so 20% = 10 (1) therefore 40% = 20 (1)		2		2	2	
		(ii)		Plants are (generally) stationary / animals move more(1) so no energy / energy required for movement (1) OR foxes move more than / shrews / more than grasshoppers OR foxes have more body mass {than shrews / than grasshoppers} (1)	2			2		
		(iii)		Foxes move carrying seeds (1) Seeds / plant becomes more widely distributed (1)	2			2		
				Question 4 total	**5**	**7**	**0**	**12**	**4**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		High frequency / high energy / short wavelength (1) electromagnetic wave (1)	2			2		
		(ii)		Easily pass through the body / highly penetrative(1) with low ionising power (1)	2			2		
		(iii)		Thallium–(201) (1) because it will <u>decay quicker</u> than the others / won't be exposed to radiation for too long(1) Do not accept shortest half life		1	1	2		
	(b)			$1 \rightarrow \frac{1}{2} \rightarrow \frac{1}{4} \rightarrow \frac{1}{8} \rightarrow \frac{1}{16} \rightarrow \frac{1}{32}$(1) = 5 half lives (1) time = 5 (ecf) $\times$ 17 (ecf) (1) ans = 85 days (1) only allow ecf if first line arrives at an answer other than 5 and is shown		4		4	3	
				Question 5 total	**4**	**5**	**1**	**10**	**3**	**0**

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	11	9	25	9	0
2	10	3	3	16	4	0
3	6	4	2	12	0	12
4	5	7	0	12	4	0
5	4	5	1	10	3	0
Total	30	30	15	75	20	12

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	5	0	10	2	0
2	9	6	1	16	7	0
3	3	2	3	8	0	8
4	6	0	0	6	0	0
5	4	6	0	10	4	0
6	3	11	11	25	9	0
Total	30	30	15	75	22	8