GCSE MARKING SCHEME

SUMMER 2019

**GCSE
APPLIED SCIENCE (SINGLE AWARD) - UNIT 2
3440U20-1 & 3440UB0-1**

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 (SINGLE AWARD)

UNIT 2

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.
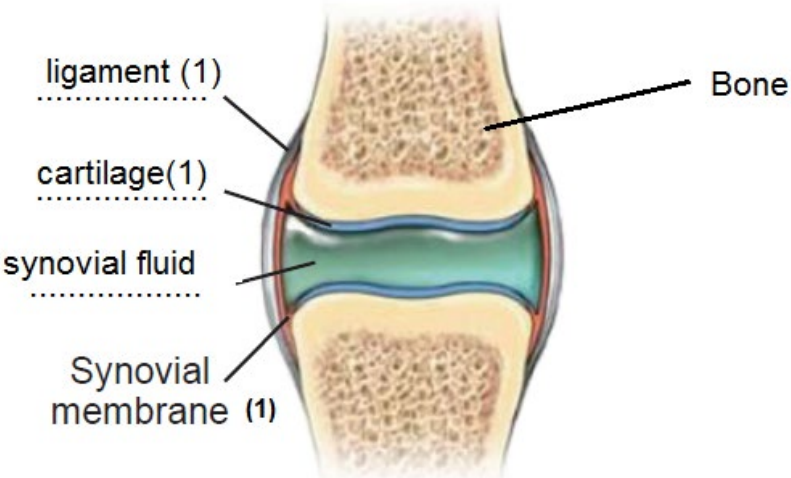
<u>Marking abbreviations</u>

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)			1.1 km		1		1	1	
	(b)			Accelerated/got faster		1		1		
	(c)			2 (minutes)		1		1	1	
	(d)			4 to 11 min		1		1	1	
	(e)			1.1/11 (read values from graph and substitution) (1) 0.1 km/min (1)		2		2	2	
				Question 1 total	**0**	**6**	**0**	**6**	**5**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)				3			3		
				Double Blind — More likely that side effects will be noticed						
				Large number of patients samples — A dummy drug						
				— Used to work out the cost of the drug						
				Placebo — Patients and doctors do not know who gets the drug						
				one mark each correct line						
	(b)	(i)	I	X/Z			1			
			II	Causes drowsiness			1			
		(ii)	I	Y			1			
			II	(Good) pain killer and effective against blood clots			1			
				Question 2 total	**3**	**0**	**4**	**7**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)				3			3		
	(b)			Lubrication/reduce friction/stops bones rubbing	1			1		
				Question 3 total	**4**	**0**	**0**	**4**	**0**	**0**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	To control the {rate / speed} of the chain reaction (1) By absorbing (excess) neutrons (1)	2			2		
		(ii)	{Drop them / lower} <u>all the way</u>	1			1		
	(b)	(i)	The diagram shows an uncontrolled chain reaction (1) A neutron is absorbed by the U-235 nucleus (1) After each stage the number of neutrons doubles (1)	1 1 	 1		3		
		(ii)	90 (1) 2 (1)		2		2		
			Question 4 total	**5**	**3**	**0**	**8**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Any 2 × (1) from Over-prescription of antibiotics (1) Antibiotics in animal feeds/tissue (1) Failure to take whole course of antibiotics (1)	2			2		
		(ii)		Any 1 × (1) from Hand washing (1) Isolating infected patients (1) Deep cleaning (1)	1			1		
	(b)	(i)		Points ± < 1 small square (2) Line (best fit or dot to dot) (1)		3		3	3	
		(ii)		reducing number of cases (with time) (1) so control measures have been effective (1)			2	2		
				Question 5 total	**3**	**3**	**2**	**8**	**3**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Any 2 × (1) from: Lack of advertising/sponsorship/not on display / plain cigarette packets (1) Understanding of health effects / promotion of adverse effects (1) Increased use of e-cigarettes /patches (1) Taxation / have become too expensive (1) Banned in public places (1)	2			2		
		(ii)		**Indicative content:** Smoking short term effects include foul smelling cloths and hair, bad breath, staining to fingers, feeling mild euphoria, increased blood pressure, reduced taste and smell, addiction. Lung diseases (COPD, emphysema), cancer especially lung, circulation problems/loss of limbs, heart disease and stroke. Increased risk to family by passive smoking. The 350 who stopped would reduce the risk of developing these diseases. The 900 people who carry on smoking would suffer long term effects **5 – 6 marks** *Detailed description of short <u>and</u> long term effects of smoking. Reference to the data in the table.* 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.	4	2		6		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			3 – 4 marks *Description of some effects of short <u>and</u> long term effects smoking.* 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** *A basic description of some effects of smoking is given.* There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.						
	(b)		20 units / 14+6 (1) Cut down on alcohol intake (by at least six units) (1)		2		2		
			Question 6 total	**6**	**4**	**0**	**10**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		Temperature increases/gets hotter (1)	2			2		
				so rate of reaction increase <u>which</u> causes a further increase in temperature (1)						
		(ii)		Allow heat to escape /remove heat	1			1		
	(b)	(i)	I	D(1)		1		1		
			II	temperature rises/ temperature increases from -30°C to -12°C (1)		1		1		
		(ii)		less than	1			1		
				Question 7 total	**4**	**2**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			5		1		1		
	(b)	(i)		Drop with paper therefore contains α (1) Aluminium makes no difference so no β (1) Some radiation passes through lead so γ / aluminium makes no difference so γ (1)			3	3		
		(ii)		(All) radiation is absorbed by paper (1) So only α (1) Won't travel far through air (1)			3	3		6
				Question 8 total	**0**	**1**	**6**	**7**	**0**	**6**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
9 F T 1 H T	(a)	(i)		$\frac{787}{8400} \times 100$ (1) = 9.4 % (1) OR $\frac{8400}{100}$ = 84 which is 1% of RDA (1) $\frac{787}{84}$ = 9.4% (1) Allow 9.36/9.37 for (1)		2		2	2	
		(ii)		$\frac{787}{1966}$ (1) × 100 = 40 g (1) OR $\frac{1966}{787}$ = 2.49 bars (1) $\frac{100}{2.49}$ = 40.16 g (1) Allow 0.4 for (1)		2		2	2	
		(iii)		Masses are different/weight different Do not accept 'amount' or 'size'		1		1		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iv)	Excess energy converted into fat (1) Leads to obesity/ allow overweight (1) Consequences to health e.g. diabetes/heart disease/arthritis (1)		3		3		
	(b)	(i)	(Type of) food	1			1		
		(ii)	Temperature {change/increase} (in water)	1			1		
		(iii)	Distance of food from boiling tube (1) / Mass of food (1) / Mass of water / volume of water (1) / Surface area of food (1) Do not accept 'amount'		1		1		3
	(c)	(i)	Other students follow same method (with identified apparatus)	1					
		(ii)	0.5 × 1848 = 924 (1)		1		1	1	1
		(iii)	20 × 26 (1) × 4.2/4 (1) 546 (ecf)(1) 130 seen gets (2)	1	2		3	3	2
		(iv)	Biscuit 60 × 409 = 24 540 J (1) corn snack 30 × 1 848 = 55 440 J (1) if the student was correct the corn snack would be 122 70J / the student is incorrect as the corn snack contains approximately double (ecf)(1)			3	3	1	
			Question 9 total	**5**	**11**	**3**	**19**	**8**	**10**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Produces synovial fluid (1) Which lubricates the knee joint /reduces friction/prevents bones rubbing together (1)	2			2		
	(b)			Osteoarthritis damages cartilage (1) So bones rub together (1) + 2 × (1) from Loss of synovial fluid (1) synovial membrane becomes damaged (1) Less lubrication of the joint/more friction (1)	4			4		
				Question 2 total	**6**	**0**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			For: (any 1) Humans cannot be used to test new drugs/avoid unnecessary adverse effects (1) Mammals all have similar body systems (1) Against: (any 1) Animals feel pain /cruel (1) Benefits not proven (1) Animals don't react in the same way as humans (1) Other methods could be used (1) No choice (1) One argument for and one against	2			2		
	(b)	(i)		Placebo used (1) Neither patients or medical staff know who gets drug/placebo (1)	2			2		
		(ii)		To find out differences from genetics/environment (1) More subjects greater chance of side effects showing up (1)	2			2		2
	(c)			170 000 000/7 500 000 000 (1) × 100 000 2 267 (1) Ignore incorrect rounding Allow 2.267×10^n for (1)		2		2	2	
				Question 3 total	**6**	**2**	**0**	**8**	**2**	**2**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4				MRSA is a bacterial infection which is resistant to most antibiotics. They can be controlled by stopping bacteria from spreading. Control methods consist of handwashing, use of antiseptic gels, isolating infected people and deep cleaning medical facilities. This cannot be effectively controlled by vaccination. Measles is a viral infection so can be treated using antivirals. Measles is controlled through vaccination, vaccines contain antigens that stimulate antibody production. If the majority of the population has resistance it is very difficult for the virus to spread (Herd immunity) **5 – 6 marks** Recognise both type of infection and give a detailed description of control methods. 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** Recognise both type of infection and give a partial description of control methods. 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.	6			6		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks A Partial description of one correct control method There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.						
				Question 4 total	**6**	**0**	**0**	**6**	**0**	**0**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)	$\rightarrow\ ^{144}_{56}Ba$ (1) $+\ ^{90}_{36}Kr + 2\ ^{1}_{0}n$ (1)		2		2		
		(ii)	1024		1		1	1	
	(b)		Number of neutrons doubles at each generation / increases exponentially (1) So energy released doubles each time / increases exponentially (1)	2			2		
	(c)		A: energy produced increases (exponentially) (1) So the control rods must be (completely) raised (1) B: Energy production constant so rods haven't moved (1) C: energy released drops to zero/cuts off(1) So control rods must be <u>completely</u> lowered (1)		1	4	5		
			Question 5 total	**2**	**4**	**4**	**10**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		It is not suitable for external as it not penetrating enough /Beta won't reach the tumour (1) Will cause too much damage to healthy cells before it reaches tumour (1)			2	2		
		(ii)		Not suitable for internal as half-life is too long (1) Emits radiation for a long time damaging cells (1)			2	2		
	(b)			Both therapies hit tumour with the same dose of radiation (1) Similar number survived within five years of treatment (1) Internal gives smaller dose to surrounding tissue (1) Less developed cancer elsewhere in lungs (1) Accept converse argument for 3rd and 4th marking point		4		4		
				Question 6 total	**0**	**4**	**4**	**8**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		Linear scale including plot at 0,0 (1) Plots (1) (within <1 small square tolerance) Line (1) Plot mark not given if non linear scale used on y axis		3		3	3	3
		(ii)		Line drawn above 40ºC (1) Plateau earlier than 7.6 (1)		2		2	1	1
		(iii)		More <u>successful</u> collisions (per unit time) <u>and</u> so rate of reaction increases as temperature increases (1) Particles move faster / have more energy / More particles have the required activation energy (1)	2			2		
	(b)			A substance that speeds up reaction (1) Lowers activation energy/lowers minimum energy required for successful collisions (1)	2			2		
				Question 7 total	**4**	**5**	**0**	**9**	**4**	**4**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		Triangle drawn on straight line of graph (1) y step and x step are correct (1) correct division = y/x (1) ans = approx.12.5 m/s (based on candidate's results) therefore commentator was wrong (1)			4	4	4	
		(ii)		mean speed = $\frac{total\ distance}{total\ time}$ / mean speed is less due to it being calculated over the total distance/mean speed is the average of all the different speeds on the graph	1			1		
	(b)			From 0 to between 2.0 and 3.0 s graph steeper so accelerating (1) Allow speed up for accelerating Between 2.0 and 3.0 to 10.0 s gradient constant so acceleration is 0 (1) 10.0s-12.0s gradient decreases so decelerating (1) Allow slow down for decelerating After 12.0s stops so no acceleration 0 (1)		4		4		
				Question 8 total	**1**	**4**	**4**	**9**	**8**	**0**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	0	6	0	6	5	0
2	3	0	4	7	0	0
3	4	0	0	4	0	0
4	5	3	0	8	0	0
5	3	3	2	8	3	0
6	6	4	0	10	0	0
7	4	2	0	6	0	0
8	0	1	6	7	0	6
9	5	11	3	19	8	10
TOTAL	32	30	15	75	17	16

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	11	3	19	8	10
2	6	0	0	6	0	0
3	6	2	0	8	2	2
4	6	0	0	6	0	0
5	2	4	4	10	0	0
6	0	4	4	8	0	0
7	4	5	0	9	4	4
8	1	4	4	9	8	0
TOTAL	30	30	15	75	22	16