GCSE MARKING SCHEME

SUMMER 2017

GCSE (NEW)
APPLIED SCIENCE (DOUBLE AWARD) - UNIT 1

3445U10-1 / 3445A0-1

INTRODUCTION

This marking scheme was used by WJEC for the 2017 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.

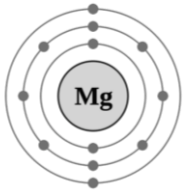
WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE APPLIED SCIENCE (DOUBLE AWARD)

UNIT1 (NEW) 3445U10-1/3445A0-1

SUMMER 2017 MARK SCHEME

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1 **FT**	(a)			Falls at first (until 15:00) (± 1))/less people using electricity (1) Then rises (quickly until 18:00) / more people turn appliances on (1) ignore references to times		2				
	(b)			Either after 22:00 OR between 01:00 and 05:00 cross marked on or near the line			1			
				Question 1 total		**2**	**1**	**3**		

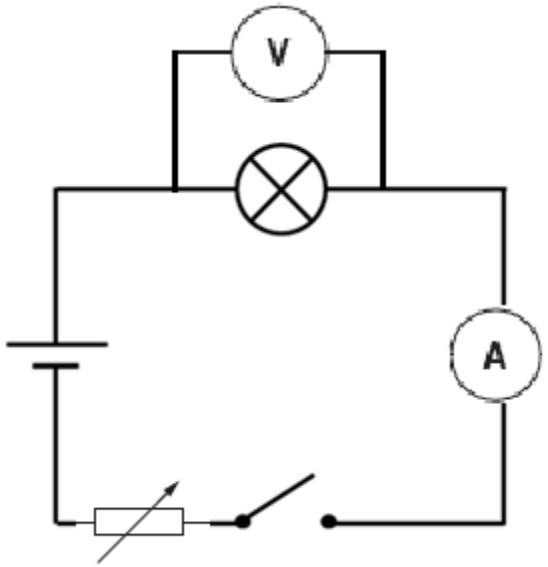
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2 FT	(a)			8 electrons (1) 8 neutrons (1) 8 protons (1)		3				
	(b)					1				
	(c)			loses (one/two) electron(s)/becomes Mg^{2+}/becomes positive	1					
	(d)			**2 Mg** + O_2 → **2 MgO** reactant (1) product (1) balancing (1) Accept symbols in boxes Do not accept numbers on the dotted line after the symbol	2	1			0	
				Question 2 total	**3**	**5**		**8**	**0**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3 FT	(a)			-101 (1) 1.14 (1) 53 (1)			3		0	
	(b)	(i)		Boiling points of halogens increase (down the group) (1) No not the same (1)			2			
		(ii)		fluorine (1) chlorine (1)		2				
		(iii)		bromine		1				
		(iv)		increases	1					
		(v)		Ticks in second, third and fourth boxes. 4 boxes ticked max (2) 5 boxes ticked max (1) 6 boxes ticked (0)		3				
	(c)			Deep shaft mining	1					
				Question 3 total	**2**	**6**	**5**	**13**	**0**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4 FT	(a)	(i)		25% of 2 000 (1) = £500 (1) 2 marks for correct answer		1	1		2	
		(ii)		increases			1			
		(iii)		decreases			1			
		(iv)		450 ÷ 150 (1) = 3 years (1) 2 marks for correct answer			2		2	
		(v)		(Cavity) wall insulation (1) because currently only used in 42% of homes (1) Accept: Highest percentage of heat loss / 40% lost through walls / saves the most money (1)			2			
	(b)	(i)		Savings =£600 (1) % = 600/2 000 = 30 (1) Do not accept 600 on answer line if no workings shown		2			2	
		(ii)		Subs of 600 ÷ 0.2 (1) = 3 000 (1) 2 marks for correct answer	1	1			2	
	(c)			reduce {carbon dioxide / greenhouse gas} emissions to atmosphere /reduce carbon footprint / reduce global warming (1) less damage caused by extraction of gas (1) do not accept less pollution / less fossil fuel used	2					
				Question 4 total	**3**	**4**	**7**	**14**	**8**	

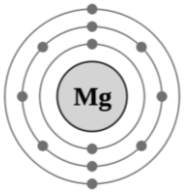
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5 FT	(a)	(i)		A-trachea (1) B- intercostal muscles (1) C- ribs (1) D- diaphragm (1)	4					
		(ii)		**Indicative content:** The intercostal muscles and the diaphragm contract. The rib cage moves up and out and the diaphragm flattens/lowering to increase the volume. This decreases the air pressure within our lungs, causing air to rush in from outside. At the end of a breath, the intercostal muscles and diaphragm relax, returning to their starting position, which decreases the volume of the chest cavity. The decreased space and increased air pressure in the lungs forces air out. **5-6 marks** The terms intercostal muscles, diaphragm and ribs are used correctly. The sequence of changes is correct and there is a reference to air pressure changes. *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** Some references to intercostal muscles/diaphragm/ribs/pressure changes. However description will not be complete. *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					

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks Limited reference to intercostal muscles, diaphragm, ribs or pressure changes. *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.						
	(b)			2 breaths/minute (1) less / slower (1) 10 minutes (1)		3			0 0 1	3
	(c)	(i)		oxygen (1) carbon dioxide (1) Accept CO2, CO^2, O2 No not accept O or CO	2					
		(ii)		diffusion	1					
		(iii)		Any 2 × (1) from: large surface <u>area</u> (1) good blood supply (1) thin <u>walls</u> (1) moist (1)	2					
				Question 5 total	**15**	**3**		**18**	**1**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6 FT **1** HT	(a)	(i)		Variable resistor in series (1) Ammeter in series (1) Voltmeter in parallel across lamp (1)  	3			3		3
		(ii)		Variable resistor set at maximum/minimum value (1) I and V values measured (1) Resistance of variable resistor varied and new values recorded (1)	3			3		3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		6 correct plots <1 square tolerance (2) 5 correct plots <1 square tolerance (1) less than 5 correct plots (0) Smooth curve of best fit through points that candidates have plotted from 2,0.8 point onward(1) Do not accept thick, wispy, disjointed lines or point to point		3		3	3	3
		(ii)		As V increases I increases at a decreasing rate.		2		2		2
	(c)	(i)		Selection of correct current of 0.5 [A] (1) Answer = 1 [Ω] (1) accept correct answer for 2 marks		2		2		
		(ii)		increases			1	1		
	(d)	(i)		Subs of 0.5 × 0.5 (1) = 0.25[W] (1)	1	1		2	2	
		(ii)		increases			1	1		
	(e)			Diagonal straight line to origin (1) to 12,1.5 or point indicated(1)		2		2	2	2
				Question 6 total	**7**	**10**	**2**	**19**	**7**	**13**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2 HT	(a)	(i)		Trachea (1) Intercostal muscles (1) Diaphragm (1)	3					
		(ii)		{Intercostal muscles /B} {contract/pull up}/expand the ribcage (1) {Diaphragm/C} {contracts/lowers/flattens} /increases volume of chest (1) Air pressure inside chest lowers (1)	3					
	(b)			Breathing rate drops for both (1) At 8 minutes difference is 3.6/4 breaths/minute OR At 12 minutes difference is 4.4/5 breaths/minute (1) Matthew's breathing rate decreases quicker / Matthew's breathing rate returns to normal sooner (1)		3			1	3
	(c)			Blood arriving in the alveoli has a higher carbon dioxide concentration than the air in the alveoli (1) There is a (concentration gradient which allows) carbon dioxide to <u>diffuse</u> out of the blood and into the alveolar air. (1*) Similarly, blood arriving in the alveoli has a {lower oxygen / deoxygenated} concentration than the air in the alveoli. (1) Therefore, oxygen moves into the blood by <u>diffusion</u>. (or 1*) *Either of the (1*) statements*	3					
				Question 2 total	**9**	**3**		**12**	**1**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3 HT		(a)		Causes blockages	1					
		(b)	(i)	Nucleus contains 12 protons (1) Nucleus contains 12 neutrons (1) There are 12 electrons (1) if nucleus not included in answer max (2) if 12 neutrons/12 protons and 12 electrons (1)		3				
			(ii)			1				
			(iii)	$2\ Mg + O_2 \rightarrow 2\ MgO$ reactants (1) products (1) balancing (1)	2	1				
			(iv)	loses two electrons from outer shell		1				
				Question 3 total	**3**	**6**		**9**	**0**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4 HT	(a)	(i)		Long chains/many joined together (1) of glucose (molecules) (1)	2					
	(b)	(i)		C (must have lost liquid) (1) Water flows from high to low (water) concentration (1)			2			2
		(ii)		(Volume) did not change /no net movement(1) So concentration inside = concentration outside / isotonic (1)		2				2
				Question 4 total	**2**	**2**	**2**	**6**		**4**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5 HT	(a)			Within the ranges 45 to 90 (63) (1) 1.75 to 2.35 (1.9) (1) -20 to -200 (–101) (1)			3		3	
	(b)			**Indicative content** Similar trends in terms of density and atomic radius. Alkali metals are all solids and the melting point/boiling point decreases as they get bigger. Halogens can be solids (I_2 and At_2), liquids (Br_2), or gases (F_2 and Cl_2) at room temperature and the melting point/boiling point increases as they get bigger. Reactivity increases down the group for the alkali metals but decreases down the group for the halogens. Alkali metals have 1 electron in the outer shell but halogens have 7 electrons in the outer shell **5-6 marks** Comprehensive comparison of similarities and differences in trends. Expect all properties in tables to be included together with comment about trends in reactivity and electronic structure. *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** Comparison of similarities and differences in trends. Expect 3 of the properties in tables to be included and maybe comments about trends in reactivity. *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. inaccuracies in spelling, punctuation and grammar.*	3	3				

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks Limited comparisons made. May include similarities and/or differences. OR Description of trends without comparison of alkali metals and halogens. *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.						
	(c)			Outer shell is further away (from nucleus) / radius of atom gets larger (1) and is more difficult to attract another electron (1) so is <u>less</u> reactive (1)	3					
	(d)			Fluorine and sodium			1			
				Question 5 total	**6**	**3**	**4**	**13**	**3**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6 HT	(a)	(i)		25% of 1 800(1) = £450(1)		2			2	
		(ii)		shortest payback time (1) of 3 years (1)			2			
		(iii)		Energy costs may change (1) Outside temperature will vary / climate varies (1) which affects rate of energy loss (1)			3			
		(iv)		Saving = 1 800 – 1 300 = 500 (1) 500/1 800 (1) = 27.8% 1(1) therefore below industry estimates (1) **OR** 30% of £1 800 (1) = £540 (1) Saving = 1 800 – 1 300 = 500 (1) therefore below industry estimates (1) only award last mark if it matches with numerical answer		2	2		4	
		(v)		Conversion of 500 to 50 000 OR 18 to 0.18 (1) Subs of 50 000 ÷ 18 or 500 ÷ 0.18 (1) = 2 778 (accept 2 800/2 780) (1) no ecf	1	1 1			3	
	(b)			less gas burned/less fuel burned (1) so less greenhouse effect /less <u>effect on</u> global warming(1)	2					
				Question 6 total	**3**	**6**	**7**	**16**	**9**	

SUMMARY FT

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1		2	1	3	0	0
2	3	5	0	8	0	0
3	2	6	5	13	0	0
4	3	4	7	14	8	0
5	15	3		18	1	3
6	7	10	2	19	7	13
TOTAL	30	30	15	75	16	16

SUMMARY HT

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	7	10	2	19	7	13
2	9	3	0	12	1	3
3	3	6	0	9	0	0
4	2	2	2	6	0	4
5	6	3	4	13	3	0
6	3	6	7	16	9	0
TOTAL	30	30	15	75	20	20