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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Applied Science (Double Award) 4861

APSC/2H Science for the Needs of Society

Mark Scheme

2008 examination – January series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Higher / 2H

question	answers	extra information	marks
1(a)(i)	from the soil / earth / ground / compost / through the roots	ignore water / sunlight	1
1(a)(ii)	magnesium	allow iron, calcium, sulfur, sulphate, manganese, boron, copper, zinc, molybdenum	1
1(a)(iii)	avoid loss of leaves or water / prevent evaporation	ignore soil	1
1(b)(i)	1307		1
1(b)(ii)	**two** from: • no fertilizer /A / lowest yield • use of fertiliser/ B increases yield • nitrogen-rich fertiliser / C increases yield even more		2
1(b)(iii)	**one** from: • used to make protein • needed for (cell) growth • shortage of nitrate in the soil	ignore healthier	1

question	answers	extra information	marks
1(c)	use the minimum amount of nitrate	**not** 'use less nitrate'	1
	to give maximum yield		1
	or		
	two from: • organic farming • crop rotation / organic fertilizer / manure • valid explanation of chosen method		2
Total			**9**

question	answers	extra information	marks
2(a)	walls / buildings / roads / statues / paving / tiles / flags / glass / cement / mortar / concrete	**not** bricks	1
2(b)	• calcium oxide • calcium hydroxide		1 1
2(c)(i)	• C • O_2 • CO_2	all three formulae correct for **2** marks, two correct for **1** mark 1 correct = 0 symbols **must** be correct	2
2(c)(ii)	• combustion / exothermic reaction provides heat • it / decomposition / endothermic reaction needs heat		1 1
2(d)	any **two** from: • eyesore / destroy area of natural beauty / damage environment / damage habitat • noise (from blasting / lorries) • dust (from heavy lorries) • using the Earth's natural resources too quickly	ignore air pollution and danger	2
Total			**9**

question	answers	extra information	marks
3(a)(i)	more energy / electricity / power supplied to bulb (for same output)	allow wastes energy / gives out more heat	1
3(a)(ii)	(18/60) × 100 = 30%	allow **1** mark for 18/60 = 0.3	1 1
3(b)(i)	more expensive (to buy) / do not always fit into lamps / less attractive / cannot be 'dimmed' / contain Hg / difficult to dispose of / dull when first switched on		1
3(b)(ii)	**Data**: any attempt to use data from the table **Calculation**: sensible use of data in calculation **Explanation**: must refer to result of calculation	**must** quote data eg low energy bulb lasts 6 years • 1.95/6 = 0.33 per year eg cost of low energy bulb is lower per year	1 1 1

question	answers	extra information	marks
3(c)	any **two** sensible methods, eg: • lower temperature setting on washing machine • switch off lights when they are not needed • turn down (electrical) heating / thermostat • don't overfill the kettle • use solar panels to heat water • don't leave appliances on standby • insulation • turn off / reduce use of appliance	do **not** allow gas central heating	2
Total			**9**

question	answers	extra information	marks
4(a)(i)	any **four** from: • trachea / windpipe • lungs • intercostal muscles • ribs • diaphragm	be certain label points to the correct area accept rib muscles ignore ribcage	4
4(a)(ii)	any **four** from: • rib / intercostal muscles / diaphragm contracts • ribs move up / out **or** <u>ribcage</u> expands • diaphragm pulled flat / moves down • volume (inside chest) increases • pressure inside chest decreases / air sucked in / air rushes in	 **not** lungs expand ignore lungs expand / lungs filled with air	4
4(b)	• record the number of breaths • in one minute	allow **1** mark for use of a spirometer no marks for pulse / heart rate	1 1
4(c)	• more oxygen needed / oxygen debt / more CO_2 produced • respiration / to release energy		1 1
Total			**12**

question	answers	extra information	marks
5(a)	any **four** from: • poor electrical conductivity / electrical insulator / no free electrons • low density • low melting point / low boiling point / melts easily • dull • brittle / not malleable • poor thermal conductivity / thermal insulator • gains electrons / forms negative ions	**1** mark for insulator **not** gases / liquids ignore chemical reactivity eg rusting	4
5(b)(i)	sulfur / S or gold / Au or carbon / diamond / C	if symbol used must be correct	1
5(b)(ii)	carbon / C / coke **or** Hydrogen / H / H_2	do **not** allow carbon monoxide / CO	1
5(b)(iii)	lead / Pb or Copper / Cu	**not** silicon	1
5(b)(iv)	aluminium / Al / titanium / Ti		1
5(c)(i)	Cl_2	**not** Cl	1
5(c)(ii)	(atom) gains electron(s)		1
Total			**10**

question	answers	extra information	marks
6(a)	(distance) = speed × time d = st = (13.5)(23) = 310.5 m	 ignore units accept 311 answer alone scores full marks	(1) (1) 3
6(b)	acceleration = $\frac{\text{(change in) velocity}}{\text{time}}$ = $\frac{(22.0 - 13.5)}{7}$ **or** $\frac{8.5}{7}$ = 1.21 ms^{-2}	accept a = $\frac{\Delta v}{t}$ ignore units accept 1.2 answer alone score full marks	(1) (1) 3
6(c)	max **2** marks for constant speed • constant / steady speed • for 9 seconds / until 54 seconds • = 22 ms^{-1} max **2** marks for deceleration • decelerates / slows down • for 22 seconds • from 22 ms^{-1} to 0 ms^{-1} • = 22/22 = 1.0 ms^{-2}		3
Total			**9**

question	answers	extra information	marks
7(a)	• nucleus • chromosome • allele		1 1 1
7(b)(i)	• identification of homozygous recessive ff (need label) • parental genotype identified as Ff and Ff (need label) • gametes identified as F and f • correct identification of combination		1 1 1 1
7(b)(ii)	¼, 0.25, 25% or one in four 1:3		1
7(b)(iii)	transfer copy of normal gene into cells (in the lungs)	allow any idea of swapping faulty gene for normal gene	1
7(b)(iv)	any **two** from: • object to experiments on human tissue / embryos • against religious belief / ethical objection • not fully tested	 allow general answers, eg release foreign genes into environment do **not** allow vague statements eg "it's unnatural" / "it's expensive" / "it's unsafe"	2
Total			**11**

question	answers	extra information	marks
8(a)(i)	a liquid mixed with (insoluble) solid		1
8(a)(ii)	any **two** from: • stain scratched away • by solid particles • detergent dissolves / cleans the stain		2
8(b)(i)	a liquid (trapped inside) a solid structure	allow mixture of solid and liquid	1
8(b)(ii)	any **two** from: • not washed away / stays on the wall • because it is sticky / viscous • detergent dissolves / cleans grease / perfume gives fresh smell		2
8(c)(i)	(very small) liquid particles mixed with a gas		1
8(c)(ii)	any **two** from: • surface is covered • spray spreads widely / on uneven surface / awkward places • detergent dissolves grease / perfume gives fresh smell / disinfectant kills germs		2
Total			**9**

question	answers	extra information	marks
9(a)(i)	covalent		1
9(a)(ii)	weak forces between molecules	**not** weak bonds any mention of molecules for **1** mark	1 1
9(b)	C_7H_{16}		1
9(c)	• butane is more volatile / lower boiling point / easier to ignite or hexane is less volatile / higher boiling point / harder to ignite • fuel needs to be more volatile / turn to gas easier / ignites more easily in cold weather	ignore reference to melting point	1 1
9(d)(i)	$C_6H_{14} + 9½O_2 \rightarrow 6CO_2 + 7H_2O$	equation must be completely correct	1
9(d)(ii)	any **two** from: • carbon increases by 1 and hydrogen increases by 2 • carbon dioxide increases by 1 and water increases by 1 • oxygen increases by 1½		2
9(e)(i)	not enough oxygen		1
9(e)(ii)	• lower energy output / car won't go as far • formation of toxic products / carbon monoxide /CO / carbon / soot /C	do **not** allow just pollution allow less efficient ignore wastes energy	2
Total			**12**
			Overall mark = 90