version 1.0 0711

General Certificate of Secondary Education
June 2011

Applied Science (Double Award) 4861

APSC/2H Science for the Needs of Society

Unit 2

Mark Scheme

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334). Registered address: AQA, Devas Street, Manchester M15 6EX

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

APSC/2H

Question 1

question	answers	extra information	mark
1(a)(i)	any **two** from: • clean surfaces / door handles etc • keep away from people who are ill / sneezing / coughing • wear a (face) mask • wash hands (frequently) / use soap and water / use antimicrobial sprays • get vaccinated (before the flu season)	 ignore 'stop touching surfaces' allow cover nose and mouth ignore wash hands after coughing and sneezing allow get flu jab / injection	2
1(a)(ii)	(because) flu is (caused by) a virus **or** is not (caused by) bacteria **or** (because) antibiotics don't work against / kill a virus **or** (because) antibiotics only work on / kill bacteria	allow antibiotics don't fight / treat viruses	1
1(b)(i)	dead / weak / inactive microorganism / pathogen / virus (white blood cells) produce antibodies body responds faster on re-infection	ignore small dose	1 1 1
1(b)(ii)	group of people any **one** from: • (young) children • elderly • anyone with breathing difficulties • doctors and nurses explanation any **one** from: • this group is more prone to infection • higher risk of dying if they get flu • risk of complications • weak / low / not mature immune system • greater exposure **or** to stop spread	 ignore pregnant women accept any valid vulnerable group explanation that reasonably matches the group if pregnant women given as group, allow reasonable explanation for **1** mark	 1 1
Total			**8**

APSC/2H

Question 2

question	answers	extra information	mark
2(a)	any **two** from: • waterproof • stronger **or** won't break / snap as easily • clear **or** not as visible • will not need replacing as often • won't rot	ignore flexible / bendy / ductile / cost do **not** accept malleable allow long lasting or durable allow chemically resistant	2
2(b)(i)	type of (fishing) line (material / polymer) any **one** from: • length (of fishing line) • way of placing / position of the masses / weight • time masses left on for	 do **not** accept diameter/ value of mass ignore amount	1 1
2(b)(ii)	use different diameter lines hang (increasing) masses to line (until it snaps) **or** use same masses on different lines and measure stretch compare the results	 allow weight for mass throughout accept put different weights (on line) allow any valid method allow see which one snaps first **or** see which one stretches least	1 1 1
2(c)(i)	reasonable smooth curve (through the middle of the points) ignoring plot for 1.0, 10		1
2(c)(ii)	reading from their graph	allow ± 1 small square / 0.5	1
2(c)(iii)	any **one** from: • the bigger / wider / thicker / longer the diameter, the more mass / weight required (to break the line) • the bigger / wider / thicker / longer the diameter, the stronger the fishing line	allow positive correlation allow thicker line for wider diameter	1
Total			**10**

APSC/2H

Question 3

question	answers	extra information	mark
3(a)(i)	any **two** from: • hot air expands **or** hot air becomes less dense • so the hot air rises • cold air comes in to take its place	 do **not** accept heat rises accept hot air cools and falls back down **or** cold air sinks	2
3(a)(ii)	conduction / radiation		1
3(b)(i)	fibreglass: 7 foil: 80.88 plastic fibre: 13.98		1 1 1
3(b)(ii)	(foil) their answer from table		1
3(b)(iii)	R-value is higher **or** R-value is the best therefore save more money every year **or** therefore heating needs to be on less	allow it is a better insulator ignore sheep wool lasts longer **or** is warmer	1 1
Total			**9**

APSC/2H

Question 4

question	answers	extra information	mark
4(a)	B – diaphragm C – rib(s) (cage) D – trachea / cartilage rings / wind pipe	accept phonetic spelling	1 1 1
4(b)(i)	red blood (cell)		1
4(b)(ii)	(linked answers) no nucleus and carry more oxygen / more room for haemoglobin **or** large surface area / biconcave shape and absorb oxygen faster **or** thin / flat / disc like absorbs oxygen faster / move into tiny capillaries **or** contains haemoglobin which binds to oxygen	both feature and reason needed for the mark allow doughnut / donut shape do **not** allow carry more oxygen	1
4(c)(i)	addiction / dependency / craving **or** constricts blood vessels		1
4(c)(ii)	stops / limits (red) blood (cells) carrying oxygen **or** binds to (red) blood cells / haemoglobin instead of oxygen	 accept transferred instead of oxygen accept CO replaces oxygen	1

APSC/2H

Question 4 continued

question	answers	extra information	mark
4(d)(i)	83(%) / more women with lung cancer smoke	accept 83(%) of the women in the survey smoked accept converse	1
4(d)(ii)	not every woman who got lung cancer smoked **or** 17(%) / some women who didn't smoke got lung cancer		1
4(d)(iii)	415	for correct answer with or without working if no answer or incorrect answer accept 100 – 17 **or** 83 **or** their 83 x 5 for **1** mark accept 83 × 5 **or** their 83 x 5 correctly calculated for **2** marks **OR** accept 17 × 5 **or** 85 **or** 500 – their 85 for **1** mark accept 500 – 85 **or** 500 – their 85 correctly calculated for **2** marks	3
4(e)	any **two** from: • damages liver or liver failure • damages brain / memory loss **or** loss of consciousness • damages other organs eg lungs / heart / kidneys **or** causes cancer / alcohol poisoning • slows down reactions / nervous system **or** causes reaction time to increase • affects judgement / any other valid effect • causes dependency / addiction • drinking when pregnant can harm your baby	 allow cirrhosis ignore kills brain cells allow could become an alcoholic	2
Total			**14**

APSC/2H

Question 5

question	answers	extra information	mark
5(a)(i)	a compound / molecule containing hydrogen and carbon <u>only</u>		1
5(a)(ii)	2 2	both required for mark	1
5(b)	the effect of methane (on global warming) is (always) higher than carbon dioxide so burning methane is better than allowing it to escape into the atmosphere (over 500 years) the effect of methane (as a green house gas) decreases over time	must be comparative	1 1 1
5(c)(i)	$CaCO_3$ → $CaO + CO_2$		1 1
5(c)(ii)	thermal decomposition	accept heated	1
5(c)(iii)	water / H_2O	allow OH_2	1
5(c)(iv)	$Ca(OH)_2$	allow $Ca(HO)_2$	1
Total			**10**

APSC/2H

Question 6

question	answers	extra information	mark
6(a)(i)	energy waves	allow light <u>energy</u> **or** heat <u>energy</u>	1 1
6(a)(ii)	any **two** from: • radio (waves) • micro (waves) • infrared (radiation)		2
6(a)(iii)	the shorter the wavelength the higher the frequency	accept converse	1
6(a)(iv)	higher frequency = more energy	accept lower frequency = less energy	1
6(b)(i)	reflected **or** total internal reflection	ignore bounces / rebounds	1
6(b)(ii)	accept any internal organ except eye and brain		1
6(b)(iii)	any **two** from: • x-rays: detecting (broken) bones • gamma: detecting / treating / cure cancer **or** sterilise medical equipment **or** use as a tracer • UV: skin conditions / vitamin D deficiency • infrared: muscle damage	allow looking at internal organs	2
Total			**10**

APSC/2H

Question 7

question	answers	extra information	mark
7(a)(i)	long / extended / elongated (hair) **or** large surface area	ignore tail do **not** accept stem / root	1
	absorbs more water / minerals / named minerals	accept absorbs (water / minerals) faster	1
7(a)(ii)	(more) chloroplasts / chlorophyll		1
	absorb sunlight **or** carry out photosynthesis	ignore 'to get more sun' allow description of photosynthesis eg to make sugar / starch / glucose ignore food	1
7(a)(iii)	magnesium	accept Mg	1
	required for chlorophyll production	allow chloroplast production	1
7(b)(i)	40 (%)	for correct answer with or without working if no answer or incorrect answer allow **2** marks for $\frac{20}{50} \times 100$ **or** $\frac{\text{their } 20}{50} \times 100$ correctly calculated allow **1** mark for 70 − 50 = 20 **or** $\frac{\text{their } 20}{50} \times 100$	3
7(b)(ii)	750	allow 725 to 760	1
	any **one** from: • highest/optimum/fastest (rate of) photosynthesis • above this increasing concentration makes no difference • above this a different factor is limiting / affecting photosynthesis	only award explanation if value is above 725 ignore reference to slowing down	1
Total			**11**

APSC/2H

Question 8

question	answers	extra information	mark
8(a)(i)	9		1
8(a)(ii)	covalent		1
8(a)(iii)	ethanol is made from a fermentation reaction plant material / sugar **and** yeast / microorganism (renewable because) plant materials can easily be replaced		1 1 1
8(b)(i)	carbon reacts with oxygen to form carbon monoxide reaction between carbon / carbon monoxide and iron oxide is a reduction reaction **or** carbon / carbon monoxide are reducing agents carbon monoxide reacts with iron oxide / ore to form carbon dioxide and iron **or** $3CO + Fe_2O_3 \rightarrow 3CO_2 + 2Fe$	allow $C + O_2 \rightarrow CO_2$ together with $C + CO_2 \rightarrow 2CO$ if the only mark awarded is for correct reference to reduction **or** **if no other marks gained** allow carbon reacts with iron oxide to give iron plus carbon monoxide / carbon dioxide for **1** mark **or** allow $C + FeO \rightarrow Fe + CO$ for **1** mark **or** allow $C + 2FeO \rightarrow 2Fe + CO_2$ for **1** mark	1 1 1

Question 8 continued

8(b)(ii)	lead / Pb / copper / Cu / zinc / Zn **or** silver / Ag / platinum / Pt / tin / Sn / cobalt / Co / chromium / Cr / nickel / Ni / bismuth / Bi / cadmium / Cd / manganese / Mn / mercury / Hg	do **not** accept gold / iron	1
Total			**9**

APSC/2H

Question 9

question	answers	extra information	mark
9(a)	1.8 km = 1800 m		1
	car **A**: speed = 1800 / 40 **or** car **B**: time = $\frac{1800}{45}$ **or** $\frac{1.80}{0.045}$	allow $\frac{1.8}{40}$ = 0.045(km/s)	1
	car **A** speed = 45 (m/s) **or** car **B** time = 40(s)	allow **3** marks for getting to this stage irrespectively of working	1
	draw / neither team won	can be awarded without working allow ecf from clear attempt to compare speeds or time	1
9(b)	6.5	for correct answer with or without working if no answer or incorrect answer 26/4 gains **1 mark**	2
	m/s^2 or ms^{-2} or m/s/s	allow m per s per s	1
9(c)(i)	the greater the mass the greater the stopping distance	ignore reference to time / easier accept converse	1
9(c)(ii)	tyres / brakes	ignore wheel	1
Total			**9**
			Overall mark = 90

The UMS conversion calculator can be found on the following web link:

www.aqa.org.uk/umsconversion