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General Certificate of Secondary Education
June 2011

Applied Science (Double Award) 4861

APSC/2F 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.

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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.

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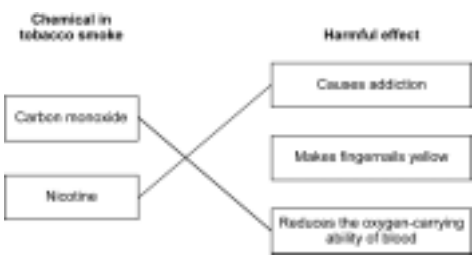
Question 1

question	answers	extra information	mark
1(a)	diaphragm – B lung – A trachea – D		1 1 1
1(b)(i)	red blood (cell)		1
1(b)(ii)	any **one** from: • no nucleus • (relatively) large surface area • has haemoglobin • biconcave shape	ignore shape / size unless qualified allow donut / disc shaped	1
1(c)		only **one** line drawn from each chemical	1 1
1(d)(i)	17		1
1(d)(ii)	83% / more lung cancer patients smoke	it = lung cancer accept 17% of lung cancer patients are non-smokers	1
1(d)(iii)	not every woman who got lung cancer smoked **or** 17% / some women with lung cancer don't smoke	accept there are women who didn't smoke on the pictogram	1
Total			**10**

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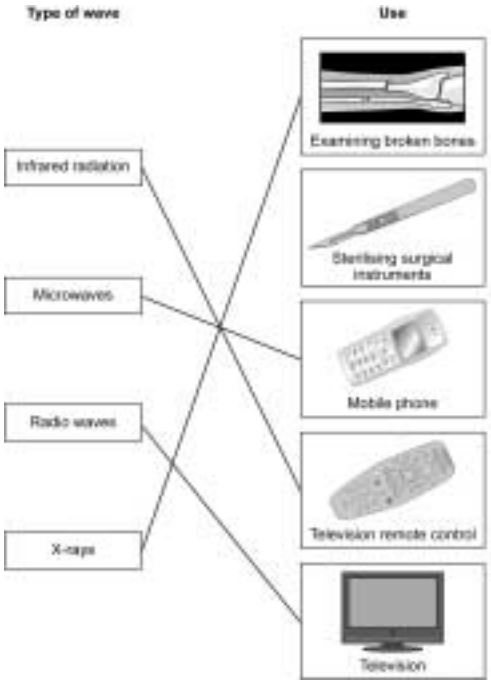
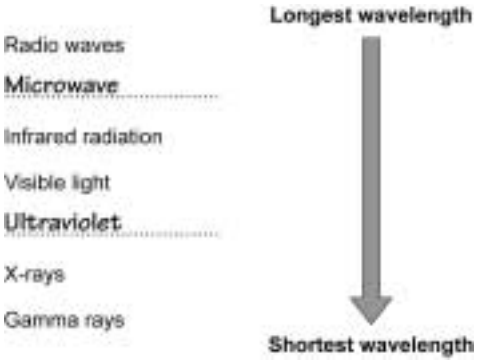
Question 2

question	answers	extra information	mark
2(a)		do **not** allow multiple lines to or from a box	1 1 1 1
2(b)		in correct order allow micro(wave) allow UV	1 1
2(c)(i)	gamma rays		1
2(c)(ii)	radio waves		1
2(d)	the number of waves per second		1

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Question 2 continued

question	answers	extra information	mark
2(e)(i)	reflected		1
2(e)(ii)	transmitted lost		1 1
Total			**12**

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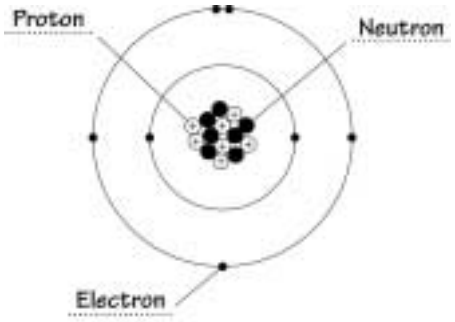
Question 3

question	answers	extra information	mark
3(a)		1 mark for each correct label	3
3(b)	3		1
3(c)(i)	lead / Pb carbon dioxide / carbon monoxide / carbon oxide / CO / CO_2	in either order allow O_2C	1 1
3(c)(ii)	Pb		1
3(c)(iii)	reduction		1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)(i)	to reduce dust / to clean them / to reduce pollution	do **not** accept methane allow waste / chemicals / harmful substances for dust	1
4(a)(ii)	any **two** from: • nature reserve / farming • play / sports ground **or** theme park • buildings eg factory, wind turbines etc • museum / tourist attraction	ignore land fill	2
4(a)(iii)	any **one** from: • restrict traffic **or** use less heavy machinery • restrict working hours **or** restrict use of machinery • idea of screening site eg fencing / planting trees etc	ignore less machinery allow quieter machines ignore sound proofing	1
4(a)(iv)	washing / heating / cooking / cleaning		1
4(b)(i)	carbon / C hydrogen / H	answers in either order	1
4(b)(ii)	produces CO_2 (combustion products cause) global warming / greenhouse effect	ignore greenhouse gas ignore air pollution do **not** accept ozone layer	1 1
4(c)(i)	(replacing / adding) nutrients / minerals		1
4(c)(ii)	increased / better yield / profit **or** bigger crop	ignore faster	1
4(d)	jobs or increased trade or cheap coal	ignore get coal easier	1
Total			**11**

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Question 5

question	answers	extra information	mark
5(a)(i)	increases surface area	allow long / elongated / extended ignore tail do **not** allow stem	1
5(a)(ii)	chloroplasts / chlorophyll	allow phonetic spelling	1
5(b)(i)	colder / frosty **or** less light / sun	 allow less heat ignore no sun / less CO_2	1
5(b)(ii)	heating / lighting	allow add CO_2	1
5(c)(i)	20	for correct answer with or without working if answer incorrect 70 **and** 50 seen gains **1** mark	2
5(c)(ii)	highest / optimum / fastest (rate of) photosynthesis / growth above 750 the rate (of photosynthesis) stays the same	allow best (rate of) photosynthesis	1 1
5(d)	breed / cross / fertilise genes / DNA / alleles / genetic material / genotype increased / better / greater / higher or more likely	allow mate / pollinate / reproduce not put / join / mix / grow ignore characteristics / features ignore good	1 1 1
Total			**11**

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Question 6

question	answers	extra information	mark
6(a)(i)	60	correct answer with or without working allow $\frac{300}{5}$ for **1** mark	2
6(a)(ii)	the car is not going at a constant speed	owtte	1
6(a)(iii)	driver will get tired / sleepy / bored or easily distracted or lose concentration so increases thinking / stopping distance **or** so increases thinking / reaction time	allow get cramp ignore factors of car	1 1
6(a)(iv)	64 **or** 63.6 to 64.2	correct answer with or without working if answer incorrect 16 x 4 **or** $\frac{16}{0.25}$ **or** $\frac{16}{15}$ x 60 **or** 1.06 x 60 **or** 1.07 x 60 gains **2** marks **OR** $\frac{16}{15}$ **or** 1.06 **or** 1.07 **or** $\frac{60}{15}$ **or** 4 gains **1** mark	3
6(b)	slow down / leave larger gaps / brake steadily / use higher gear plus any **one** from: • ice decreases friction (ice makes roads slippery) • breaking / stopping distance increased	accept use (snow) tyres / chains allow skidding allow tyres won't grip (snow) chains increase grip = **2** marks	1 1
6(c)	increases thinking distance **or** increases reaction time **or** reactions become slower	allow blurs vision **or** causes drowsiness allow lose concentration	1
Total			**11**

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Question 7

question	answers	extra information	mark
7(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
7(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
7(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
7(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**

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Question 8

question	answers	extra information	mark
8(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
8(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
8(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
8(c)(i)	reasonable smooth curve (through the middle of the points) ignoring plot for 1.0, 10		1
8(c)(ii)	reading from their graph	allow ± 1 small square / 0.5	1
8(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**

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Question 9

question	answers	extra information	mark
9(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
9(a)(ii)	conduction / radiation		1
9(b)(i)	fibreglass: 7 foil: 80.88 plastic fibre: 13.98		1 1 1
9(b)(ii)	(foil) their answer from table		1
9(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**
			Overall mark = 90

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