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General Certificate of Secondary Education January 2011

Applied Science (Double Award) 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)(i)	C		1
1(a)(ii)	B		1
1(b)	oxygen carbon dioxide water	 water and carbon dioxide in either order 	1 1 1
1(c)(i)	energy		1
1(c)(ii)	diffusion		1
1(d)	water low high		1 1 1
Total			**10**

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Question 2

Question	Answers	Extra information	Mark
2(a)(i)	foam – whipped cream aerosol – spray polish		1 1
2(a)(ii)	aerosol – liquid spread out in a gas foam – gas trapped inside a liquid		1 1
2(b)(i)	evaporation / distillation / boiling to dryness (owtte)	do **not** accept boiling / boil on its own do **not** accept heat	1
2(b)(ii)	sieving / sieve	allow pick out beads	1
2(b)(iii)	filter	do **not** accept heat / sieving allow evaporation / boiling to dryness / distillation	1
2(c)	(●) close together at the bottom of the beaker (●) a few further apart at the top of the beaker and more (**O**) at the top of the beaker than the bottom	must have at least 5 (●) and 5 (**O**)	1 1
2(d)(i)	no / less liquid left **or** volume decreased	owtte	1
2(d)(ii)	(water) evaporates / evaporation	if evaporated is mentioned only in **2(d)(i)** give **1** mark accept water becomes a gas / vaporised	1
Total			**11**

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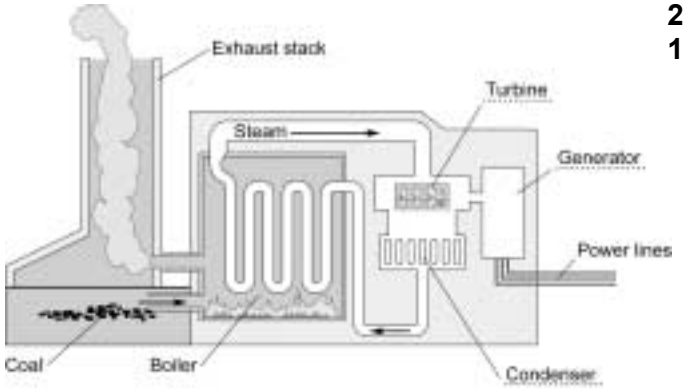
Question 3

Question	Answers	Extra information	Mark
3(a)		**2** marks for all 3 correct **1** mark for 1 or 2 correct	2
3(b)(i)	D B A C	**2** marks for all 4 correct **1** mark for 2 or 3 correct	2
3(b)(ii)	oil / gas / uranium / plutonium / nuclear fuels / peat / wood / animal or plant waste / biofuels / biomass / bioethanol	do **not** accept crude oil	1
3(c)(i)	any **one** from: • waterproof / non-porous • (good heat) conductor • does not corrode • high melting point • malleable • strong	ignore unreactive ignore cost do **not** accept rust do **not** accept erode	1
3(c)(ii)	might affect the health of fish / plants / wildlife / habitat	owtte affect must be qualified do **not** accept it will be hot	1

Question 3 continues on the next page

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Question 3 continued

Question	Answers	Extra information	Mark
3(d)	no / very little coal left **or** coal is non-renewable	allow references to reducing global warming or air pollution do **not** accept global warming alone ignore bad for the environment ignore use of renewable energy sources	1
3(e)	water / wind	allow waves / tides ignore air	1
3(f)	31 / 31.05 / 31.1	**2** marks for correct answer alone $\frac{68}{219} \times 100$ for **1** mark	2
Total			**11**

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Question 4

Question	Answers	Extra information	Mark
4(a)	penicillin – fungus cotton wool – plant yoghurt – bacteria	all 3 correct for **2** marks 1 or 2 correct for **1** mark	2
4(b)(i)	pancreas	accept phonetic spelling	1
4(b)(ii)	glucose	do **not** accept sugar	1
4(b)(iii)	converts glucose into glycogen **or** removes glucose (from blood)	ecf allow sugar for glucose	1
4(b)(iv)	4, 3, 2	all 3 correct for **2** marks 1 correct for **1** mark	2
4(b)(v)	any **one** from: • rejection (of pig insulin) • allergic reaction **or** side effects • transferring disease from pig to human	ignore reference to pig insulin not the same as human insulin ignore reference to production of insulin ignore quality unreliable ignore cost ignore reference to religious / ethical objections	1
4(c)(i)	pump		1
4(c)(ii)	carries / transports oxygen	allow haemoglobin	1

Question 4 continues on the next page

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Question 4 continued

Question	Answers	Extra information	Mark
4(c)(iii)	clots blood **or** seals cuts / wounds	accept scabs ignore repair wounds ignore protects from infection / disease	1
Total			**11**

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Question 5

Question	Answers	Extra information	Mark
5(a)	methane	must be in correct order	1
	CO_2	accept O_2C	1
5(b)(i)	seas / oceans	ignore clouds / rain / rivers / atmosphere	1
5(b)(ii)		must be in correct order	
	O_2		1
	H_2		1
5(c)(i)		must be in correct order	
	decreased	accept goes down / lowers / reduces / gets less owtte	1
	photosynthesis	accept phonetic spellings	1
5(c)(ii)	increased	owtte	1
5(c)(iii)	plants releasing / producing (oxygen)		1
	by / due to / during photosynthesis		1
Total			**10**

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Question 6

Question	Answers	Extra information	Mark
6(a)	gamma alpha beta	all 3 correct for **2** marks 1 or 2 correct for **1** mark	2
6(b)	gamma gamma beta alpha	accept correct symbols points 2 and 3 can be in either order	1 1 1 1
6(c)(i)	kill microorganisms / bacteria / germs	do **not** accept any reference to microorganisms being removed	1
6(c)(ii)	kills microorganisms **or** heat would melt (plastic)	do **not** accept any reference to microorganisms being removed	1
6(c)(iii)	heat would melt (plastic)	accept would soften (plastic) ignore weaken (plastic)	1
6(c)(iv)	any **one** from: • can cause radiation sickness • (radiation) can kill • can cause cancer • can damage cells	ignore harmful if unqualified ignore they are frightened ignore they think the equipment is radioactive	1
Total			**10**

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Question 7

Question	Answers	Extra information	Mark
7(a)	any **three** from: • diaphragm contracts • intercostal / rib muscles contract • reference to correct volume change • reference to (correct) pressure change	 accept diaphragm moves down or flattens as alternative to both of the first 2 bullet points, accept muscles contract for **1** mark accept ribs **or** rib cage expands / moves up / out ignore lungs inflate / expand ignore muscles tighten	3
7(b)(i)	breaths per minute		1
7(b)(ii)	27.27(%)	accept 27.27, 27.3 or 27 accept 27.2 with no working for **2** marks accept 55 − 40 for **1** mark accept ÷ 55 × 100 for **1** mark for correct procedure, using incorrect figures allow **1** mark	3
7(b)(iii)	breathing rate (at rest / after 10 minutes of exercise) decreased **or** exercise did not cause as big an increase as before lungs do not have to work as hard / fast **or** oxygen moved around the body / to the muscles more easily		1 1
Total			**9**

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Question 8

Question	Answers	Extra information	Mark
8(a)	$CaCO_3$	accept CO_3Ca	1
8(b)(i)	any **one** from: • heat • thermal decomposition	 do **not** accept answer with addition of other materials do **not** accept burning / combustion / melting	1
8(b)(ii)	carbon dioxide	accept CO_2 / O_2C	1
8(b)(iii)	global warming / greenhouse effect	accept rising sea level / climate change / extreme weather ignore pollution ignore greenhouse gas ignore acid rain	1
8(c)(i)	 CaO $Ca(OH)_2$	must be in correct order accept OCa accept $(OH)_2Ca$	 1 1
8(c)(ii)	gives out energy / heat		1
8(d)	sand sodium carbonate	accept silicon dioxide / SiO_2 accept Na_2CO_3	1 1
Total			**9**

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Question 9

Question	Answers	Extra information	Mark
9(a)(i)	Jupiter plotted at (780, –150) Pluto plotted at (5910, –220)	± one square ignore any plots around (3000, –200) for calculating Uranus in **9(a)(ii)**	1 1
9(a)(ii)	–190	accept range of –185 to –195 do **not** accept 190 without minus sign if no answer given look in table	1
9(a)(iii)	Venus (it) is closer to the Sun	must be a comparison accept Venus has a higher CO_2 concentration	1
9(a)(iv)	water would freeze		1
9(b)	any **two** from: • above clouds / fog / mist • no light pollution • can use 24 hours a day	accept less atmospheric pollution / distortion if qualified	2
9(c)(i)	stars / galaxies are moving away	accept correct reference to red shift accept the wavelength is stretched accept light appears more red **or** is shifted towards red end of the spectrum do **not** accept light is red	1

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Question 9 continued

Question	Answers	Extra information	Mark
9(c)(ii)	(Universe) is expanding	accept Universe is getting bigger / larger	1
Total			**9**
			Overall mark = 90