OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

General Certificate of Secondary Education

Unit **A142/02:** Unit 2: Modules B2, C2, P2 (Higher Tier)

Mark Scheme for January 2012

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Any enquiries about publications should be addressed to:

Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

❓	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
✖	incorrect response
ECF	error carried forward
⬭	draw attention to particular part of candidate's response
NBOD	no benefit of doubt

R	reject
✔	correct response
L1 , L2 , L3	draw attention to particular part of candidate's response
^	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

e.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✔) in the two correct boxes.	Put ticks (✔) in the two correct boxes.	Put ticks (✔) in the two correct boxes.
☐	☐	☒
☐	☐	☒
☒	☑	☑
☒	☒	☑
☐	☐	☐
This would be worth 1 mark.	This would be worth 0 marks.	This would be worth 1 mark.

c.   The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d.   Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.
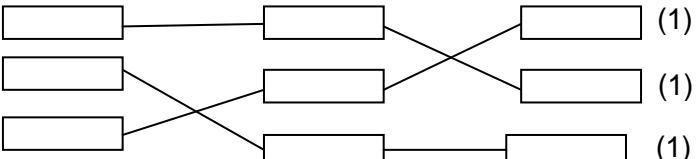Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✔			✔	✔	✔	✔	
Manchester	✔	✘	✔	✔	✔				✔	
Paris				✔	✔		✔	✔	✔	
Southampton	✔	✘		✔		✔	✔		✔	
Score:	2	2	1	1	1	1	0	0	0	NR

Question			Answer	Mark	Guidance
1	(a)		(1) (1) (1)	3	mark horizontally award 1 mark for each correct horizontal sequence
	(b)		cross linking (1)	1	ring around any other answer = 0 marks
			Total	**4**	

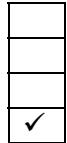| Question			Answer	Mark	Guidance
2	(a)		<table><tr><td></td><td>T</td><td>F</td></tr><tr><td>If you don't feel hot…</td><td></td><td>✓</td></tr><tr><td>Ozone…</td><td>✓</td><td></td></tr><tr><td>..damage cells…</td><td>✓</td><td></td></tr><tr><td>Using a cream…</td><td>✓</td><td></td></tr><tr><td>The British summer…</td><td></td><td>✓</td></tr></table> (2)	2	all correct = 2 marks one error = 1 mark more than one error = 0 marks
	(b)		Prefer pale Sun-tan attractive ✓ (1) Cloudy in summer Afraid of skin cancer Don't think it'll happen ✓ (1)	2	two correct ticks = 2 marks one correct tick = 1 mark three ticks = max 1 mark four of five ticks = 0 marks
			Total	**4**	

4

Question			Answer	Mark	Guidance

3	(a)		**[Level 3]**
			Idea of why control is needed **and** idea of why repeats are needed. Quality of written communication does not impede communication of the science at this level.
			(5 – 6 marks)
			
			[Level 2]
			Idea of why control is needed **or** idea of why repeats are needed. Quality of written communication partly impedes communication of the science at this level.
			(3 – 4 marks)
			
			[Level 1]
			Idea of control or repeats stated. Quality of written communication impedes communication of the science at this level.
			(1 – 2 marks)
			
			[Level 0]
			Insufficient or irrelevant science. Answer not worthy of credit.
			(0 marks)
				6	**This question is targeted at grades up to C**
					
					Jake's plan is the best because:
					
					Indicative points re <u>control</u> may include:
					
					• 1 kg mass: factor controlled that might affect the outcome/idea of fair test
					• pieces of rubber are same length and width/size: factors controlled that might affect the outcome/idea of fair test
					• measures extended length: makes it more accurate/idea of fair test
					
					   ignore 'improved reliability' linked to control
					
					Indicative points re <u>repeats</u> may include:
					
					• repeat test: shows outliers / shows values are repeatable / can calculate best estimate of true value
					
					   ignore 'to calculate mean' without qualification
					
					   ignore idea of improved accuracy (except linked to measuring extended length – see above)
					
					   ignore 'fair test' linked to repeats
					
					allow Lewis for Level 1 max.
					• rubber the same size: factor controlled that might affect outcome/idea of fair test
					
					reject Kylie = level 0
					
					Use the L1, L2, L3 annotations in Scoris; do not use ticks.

Question			Answer	Mark	Guidance
3	(b)	(i)	**any two from:** outlier should be used unless there is a reason to doubt its accuracy; accuracy could be doubted if bad measuring; should not discard if it is variation in the samples; it is impossible to measure without some variation in values / uncertainty in measuring; should measure it again if possible (2)	2	**allow** discard because value out of range of others or very different from the mean **allow** accept because value near range of others or very similar to the mean
		(ii)	(2.1+1.2+2.4+2.2+2.1)/5 (1) = 2.0 and no/not suitable (1)	2	correct answer and decision without working = 2 marks correct working with wrong answer and any decision = 1 mark correct answer (with or without working) and wrong decision = 1 mark
			Total	10	

Question			Answer	Mark	Guidance
4	(a)		petroleum / gas: small molecules / short chain length (1) so small (intermolecular) forces and low BP (1) liquid / fuel oil / oil: large molecules / long chain length (1) so large (intermolecular) forces and high BP (1)	4	comparison allowed for 2 marks if petroleum gas and fuel oil mentioned
	(b)		(propane) 1 (1) (ethene) 2 (1)	2	
			Total	6	

Question	Answer	Mark	Guidance

Question			Answer	Mark	Guidance
5	(a)		**E...B**	1	must be in correct order
	(b)		A+C+E=B ☑ (1)	1	one correct tick = 1 mark two or more ticks = 0 marks
			Total	**2**	

Question			Answer	Mark	Guidance
6	(a)		infra red / IR visible / light ultraviolet / UV (1)	1	all three required in the correct order for the mark
	(b)	(i)	absorbs emits reflects transmits ☑ (1)	1	one correct tick = 1 mark two or more ticks = 0 marks
		(ii)	microwaves are not absorbed (1) lower photon energy = lower frequency (1)	2	**allow** go through the atmosphere **allow** transmit through the atmosphere **do not allow** transmit by the atmosphere **allow** references to radio waves

Question			Answer	Mark	Guidance
6	(c)		**any two from:** lower frequency/photon energies are all absorbed; at higher frequencies/photon energies there is less absorption; for higher frequencies/photon energies the absorption varies / is not linear (1)	2	**allow** lower frequencies are not transmitted **allow** higher frequencies are transmitted **allow** different gases absorb different frequencies **allow** at lower frequencies/lower photon energies there is more absorption
	(d)		X-rays and gamma rays are ionising radiation <u>because</u> the photons have high energy (1) interaction with / to break up atoms/molecules in the atmosphere (1)	2	**ignore** comments about the ozone layer must have a molecule/atom explanation to gain this mark
			Total	**8**	

Question			Answer	Mark	Guidance
7	(a)		**[Level 3]** Distinction between analogue and digital signals, probably with sketch graphs. Noise understood as random superposition on a signal. Realises that noise becomes incorporated into an analogue signal and is hard to remove. Appreciates that digital signals can be cleaned up/are not susceptible to noise. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Understanding of the difference between, analogue and digital signals. Recalls that noise decreases the quality of signals. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Understanding of analogue and digital signals, which may be just graphs. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A/A*** **Indicative scientific points at Level 3 may include:** • analogue is continuously varying • digital is on & off / 0 & 1 • noise is a random superimposed variation • noise becomes part of the analogue variation and indistinguishable from normal variations in the signal • noise is superimposed on the digital signal and is insignificant compared with the on/off difference • noise can be easily cleaned/rejected in digital signals • noise is amplified in analogue signals. • noise is removed by regenerator/decoder in digital signals because only 0 and 1 is recognised **Indicative scientific points at Level 2 may include:** • analogue is continuously varying • digital is on & off / 0 & 1 • noise is a random superimposed variation • knows that noise is unwanted radio wave affecting the signal received. **Indicative scientific points at Level 1 may include:** • analogue is continuously varying • digital is on & off / 0 & 1 **reject** any confusion with sound **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	6	

Question			Answer	Mark	Guidance
8	(a)		<table><tr><td>harmful</td><td></td></tr><tr><td>resistant</td><td></td></tr><tr><td>safe</td><td>✓</td></tr></table> <table><tr><td>dead</td><td></td></tr><tr><td>memory</td><td>✓</td></tr><tr><td>stem</td><td></td></tr></table> <table><tr><td>antibiotics</td><td></td></tr><tr><td>antibodies</td><td>✓</td></tr><tr><td>antigens</td><td></td></tr></table> (2)	2	3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks four ticks = max 1 mark five or more ticks = 0 marks
	(b)	(i)	(difference between 2006 and 2009 =) 550 (1) $\underline{550 \times 100} =$ 550% (1) 100	2	
		(ii)	fewer vaccinations leads to increase in measles cases / measles spreading (1) more cases several years later / idea of lag period (1)	2	

Question			Answer	Mark	Guidance
8	(c)		**any one from arguments for:** number of cases are dropping; vaccination uptake is rising / at the highest level it has ever been; a high enough percentage of people are being vaccinated / idea of herd immunity (1) **any one from arguments against:** not a high enough percentage of people are being vaccinated / idea of herd immunity; not all people will want to be vaccinated / dangers of MMR vaccine; immigration issues / AW; complacency in the population because they see infection rates declining; possibility of allergic reactions; measles virus may mutate so vaccine becomes ineffective (1)	2	**credit** max. one argument for and max. one argument against **allow** new vaccine made idea of herd immunity means that 100% vaccination is not needed to wipe out measles
			Total	**8**	

Question			Answer	Mark	Guidance
9	(a)		(G)**AECB** (2)	2	
	(b)	(i)	$\frac{60}{100}$ x 4 = 2.4 / 0.6 x 4 = 2.4 / $\frac{4}{100}$ x 60 = 2.4 and 2.4 + 4 = (6.4) (1)	1	6.4 is given in the question mark is for showing **how** 2.4 is calculated and then this must be added to 4 2.4 + 4 on its own does not get the mark
		(ii)	**any one from:** idea that risk / prediction does not guarantee outcome; there are other risk factors for developing heart disease / correct reference to another specific risk factor; **changes** of lifestyle (of the whole workforce or those who were more likely to get heart disease) to decrease risk; may die from other causes (1)	1	**allow** prediction is a guess / estimate e.g. smoking / poor diet e.g. find time to exercise / stop smoking / improve diet
	(c)	(i)	peer review (1)	1	
		(ii)	the results need to be checked / improvements can be suggested (1)	1	e.g. eradicate mistakes **allow** quality control **ignore** reliable
			Total	**6**	

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Question			Answer	Mark	Guidance
10			**[Level 3]** Describes at least 2 differences in the data and explains why they would be different. Describes how kidneys and ADH balance the water levels in the body. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes and explains differences between the data in the table. The role of kidneys or ADH is described. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes a difference in the data or attempts to explain the difference. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A/A*** **Indicative scientific points may include:** • more water loss as body sweats more during exercise • more water loss due to breathing as breathing rate goes up during exercise • body detects less water in blood plasma • production of ADH controlled by negative feedback • ADH is released from pituitary gland • causes kidney to reabsorb more water • produces more concentrated urine • less volume of urine produced • use terms such as kidney, concentrated, urine, blood plasma, ADH, pituitary, negative feedback. **ignore** references to drinking more water and the effects of drinking more **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

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