

GCSE 2004

June Series



Mark Scheme

Science: Double Award

Specification B (Co-ordinated)

3462/1H

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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SCIENCE: DOUBLE AWARD CO-ORDINATED

INFORMATION FOR 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 / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer.

On the script, the QoWC tick should be identified by a ‘q’ written next to it.

3.2 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

3.3 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.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 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;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 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.

3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

- (a) A candidate who calculates average speed using $\text{speed} = \text{time}/\text{distance}$ **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.
- (b) A candidate who incorrectly calculates average speed using $\text{speed} = \text{distance}/\text{time}$ and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

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.

3.8 Phonetic spelling

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

3.9 Brackets

(.....) is 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.

3.10 Interpretation of marginal points

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

3.11 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.



**Double Award
Higher Tier 3462/1H**

3462/1H Q1

question	answers	extra information	mark
(a)(i)	protease	accept peptidase or named protease e.g. pepsin / trypsin allow 'proteinase'	1
(ii)	amino acids	accept peptides / polypeptides / peptones	1
(b)	points plotted accurately	$\pm \frac{1}{2}$ square deduct 1 mark per error	2
	best fit curve or ruled point-to-point	if double line within $\frac{1}{2}$ square allow sharp apex do not allow single straight line if no points line defines points if (5,0) not plotted only penalise 1 mark bar graph wide bars – no marks bar graph $\pm \frac{1}{2}$ square max 2 for points	1
(c)(i)	2 or correct from candidate's graph	$\pm \frac{1}{2}$ square	1
(ii)	stomach		1
(d)	proteins are large / product is small		1
	proteins (may be) insoluble / product is soluble		1
	cannot be absorbed / cannot enter blood or cannot pass through gut lining	accept reverse referring to product	1
total			10

3462/1H Q2

question	answers	extra information	mark
(a)(i)	any one from: <ul style="list-style-type: none"> • <u>chemical</u> messenger • <u>chemical</u> / <u>substance</u> released in one part to have effect elsewhere in body • <u>chemical</u> / <u>substance</u> which affects another / target organ / tissues / cells 	allow <u>chemical</u> from <u>endocrine</u> gland	1
(ii)	in blood / circulatory system / any named part including plasma	extra wrong answer would cancel example not red blood cells	1
(b)	<p>Quality of written communication: correct use of at least two relevant scientific terms spelt phonetically</p> <p>any three from:</p> <p><u>Oral contraceptives:</u></p> <p>(benefit)</p> <ul style="list-style-type: none"> • prevent (unwanted) pregnancy or prevent egg release • regulate menstrual cycle / periods <p>(problems)</p> <ul style="list-style-type: none"> • prolonged use may prevent later ovulation / cause infertility • named side-effect on female body e.g. circulatory problems / weight gain / nausea / headache / breast cancer / mood swings • increased promiscuity / increase in STD's / STI's • named side-effect on environment e.g. feminisation of fish or lowered sperm count in human males <p><u>Fertility drugs:</u></p> <p>(benefit)</p> <ul style="list-style-type: none"> • can enable woman to have children or to become pregnant or stimulates egg release <p>(problem)</p> <ul style="list-style-type: none"> • multiple births 	<p>e.g. pregnancy, ovulation, FSH, oestrogen, progesterone, ovary, follicle, circulation, thrombosis, feminisation, sperm count, STD</p> <p>Q ✓ or Q X</p> <p>for full marks must score at least one re contraceptives and at least one re fertility drugs</p> <p>if unclear which type of hormone maximum 2 marks from 3</p>	<p>1</p> <p>3</p>
total			6

3462/1H Q3

question	answers	extra information	mark
(a)	burning fossil fuels / named example	accept <u>driving</u> cars / lorries etc burning fuels in power stations ignore combustion unqualified do not accept catalytic converter on its own or emissions from power stations	1
(b)(i)	pollutants / smoke <u>breathed in</u>		1
(ii)	SO ₂ and deaths rise (and fall) at same times or SO ₂ and deaths parallel each other / show same pattern		1
(iii)	no – could be due to some other factor / pollutant / to smoke or correlation not precise / described	explanations must come to a conclusion named examples must be plausible allow ‘coincidence’	1
total			4

3462/1H Q4

question	answers	extra information	mark
(a)	A = protein (coat)	accept capsid / capsomere	1
	B = DNA / gene(s) / genetic material / nucleic acid	allow RNA do not allow chromosome	1
(b)(i)	any two from: <ul style="list-style-type: none"> • skin • scabs / clot • mucus • stomach acid / gut protease 	allow tears	2
(ii)	diagram shows extensions of intact cell membrane around viruses		1
(iii)	antibodies	allow enzymes re (ii) allow interferon ignore antitoxins / proteins	1
(c)	<u>virus</u> is transferred		1
	(virus in) blood / body fluids – transfer (via needles)		1
total			8

3462/1H Q5

question	answers	extra information	mark
(a)(i)	lower – B loses less (water / mass) than C or described in terms of petroleum jelly	accept converse re Leaf C	1
(ii)	yes - B and C lose less than D or B and C lose more than A or D loses the <u>most</u> or A loses the <u>least</u>	do not accept just ‘all leaves lose some weight’	1
(b)(i)	X = stoma Y = guard cell	accept stomata / stomatal pore do not accept air space	1 1
(ii)	petroleum jelly blocks stomata / pores or petroleum jelly prevents water loss or petroleum jelly waterproofs water (mainly) lost via stomata / pores / X or stomata on lower surface only	allow pores are blocked in B	1 1
total			6

3462/1H Q6

question	answers	extra information	mark
(a)	<p>Quality of written communication: ideas given in a <u>sensible order</u></p> <p>any three from:</p> <ul style="list-style-type: none"> • microorganisms / bacteria / fungi / saprotrophs • digest / break down organic matter / leaves / decompose / reference decomposers / decay / rot • use of enzymes / correct named example • absorption by <u>diffusion</u> / <u>active transport</u> • respiration / combustion • release of carbon dioxide • CO₂ can be used (by trees) in photosynthesis 	<p>broken down giving products (could be CO₂, minerals or gas) (used by trees)</p> <p>Q ✓ or Q X</p> <p>accept saprophytes / saprobionts / detritivores (named)</p> <p>must be of breakdown <u>products</u></p> <p>do not accept CO₂ taken in by roots</p>	<p>1</p> <p>3</p>
(b)	<p>any two from:</p> <ul style="list-style-type: none"> • warmth / suitable temperature • damp / water / rain / humid / moisture • oxygen • suitable pH 	<p>do not accept heat / hot weather</p>	<p>2</p>
total		<p>6</p>	

3462/1H Q7

question	answers	extra information	mark
(a)(i)	respiration		1
(ii)	9600	if correct answer, ignore working / lack of working $\frac{80 \times 12000}{100}$ for 1 mark	2
(b)	any three from: <ul style="list-style-type: none"> • dilates / widens or muscle in wall relaxes or sphincter opens • more blood flows near skin surface or more blood through capillaries • heat lost by radiation / convection / conduction • heat loss from blood / cools blood 	do not accept expands or just gets bigger ignore evaporation	3
(c)	hypothalamus / brain		1
total			7

3462/1H Q8

question	answers	extra information	mark
(a)	chromosome	accept chromosomes	1
(b)	<u>drawing shows:</u> <u>just 2 chromosomes</u> one long + one short		1 1
total			3

3462/1H Q9

question	answers	extra information	mark
(a)(i)	sensory / afferent		1
(ii)	<u>on diagram:</u> arrow (next to neurone A) pointing towards spinal cord and arrow (next to neurone B) pointing towards muscle		1
(b)	chemical (released) or neurotransmitter or by diffusion	accept correct named example of a neurotransmitter	1
(c)	<u>on diagram:</u> X labelling muscle or motor end plate	do not accept on stretch receptor	1
total			4

3462/1H Q10

question	answers	extra information	mark
	<p>any five from:</p> <ul style="list-style-type: none"> • genetic variation exists in a population or variation caused by mutation / change in gene / in DNA • larger voles have smaller $\frac{\text{S.A.}}{\text{Vol.}}$ or have more fat • larger voles lose less heat / are better insulated or more energy stored • larger voles survive • larger voles breed • larger voles pass on (beneficial) gene / allele / mutation / DNA 	<p>'they' accept as larger voles</p> <p>ignore characteristic</p>	5
total			5

3462/1H Q11

question	answers	extra information	mark
(a)(i)	one of two (/ of several) forms of <u>a</u> gene or (a variant) form of <u>a</u> gene		1
(ii)	expressed even if only one copy inherited or <u>expressed</u> / <u>seen</u> in heterozygote		1
(b)(i)	nervous	ignore brain	1
(ii)	Man / affected = Hh and Wife / unaffected = hh	N.B. can pick up chain of logic at any point correctly derived from candidate's previous line	1
	correct gametes from Parental genotypes	need full diagram	1
	F ₁ genotypes correctly derived from P gametes		1
	identification of Hh in F ₁ as having Huntington's		1
	correct probability from F ₁ genotypes e.g. $\frac{1}{2}$ / 0.5 / 50% / 1 in 2 / 1:1 / 50:50	not 1:2 or 50/50	1
total			8

3462/1H Q12

question	answers	extra information	mark
(a)	hold <u>cells</u> together or prevent flow of <u>cells</u> or trap <u>cells</u>		1
(b)	12500	if correct answer, ignore working / lack of working $\frac{100}{0.008}$ for 1 mark ignore any units	2
(c)(i)	size RBC approximately same size capillary or no room for more than one cell or <u>only one</u> can fit or RBC is <u>too</u> big	allow use of numbers do not accept capillaries are narrow	1
(ii)	more oxygen released (to tissues) or more oxygen taken up (from lungs) and any two from: • slows flow or more time available • shorter distance (for exchange) or close to cells / capillary wall • more surface area exposed		1 2
(d)	CO combines with <u>haemoglobin</u> or carboxyhaemoglobin formed Irreversibly / more readily reduces oxygen transport / uptake (by the cell)	accept reacts with haemoglobin	1 1 1
total			10

3462/1H Q13

question	answers	extra information	mark
(a)	aerobic respiration		1 1
		'anaerobic respiration' = 1 mark	
(b)	any five from: <ul style="list-style-type: none"> • glucose is a small molecule • glucose passes through filter or glucose is filtered out of blood or glucose enters the capsule / kidney tubule / Q • glucose reabsorption or glucose taken (back) <u>into blood</u> • cells lining tubule have microvilli / shape described or cells lining tubule have large surface area • active transport • up concentration gradient • use of energy / ATP • long tubule for more reabsorption 	do not accept ' <u>filtered</u> ' into blood / out of tubule	5
total			7

3462/1H Q14

question	answers	extra information	mark								
(a)	<table style="border: none; margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 0 10px;"><u>Ampicillin</u></td> <td style="padding: 0 10px;"><u>Tetracycline</u></td> </tr> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">–</td> </tr> <tr> <td style="text-align: center;">–</td> <td style="text-align: center;">–</td> </tr> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> </table>	<u>Ampicillin</u>	<u>Tetracycline</u>	✓	–	–	–	✓	✓	<p>accept blank or cross or –</p> <p>1st: mark by rows to maximum 3 marks</p> <p>2nd: if no marks by rows, mark by columns to maximum 1 mark</p> <p>table completely blank = 0 marks</p>	3
<u>Ampicillin</u>	<u>Tetracycline</u>										
✓	–										
–	–										
✓	✓										
(b)	<p>1st: Yes (no mark)</p> <p>2nd: all formed from same original cell</p> <p>by asexual reproduction / no fusion / not sexual</p> <p>offspring cells are genetically identical or all have a copy of the insulin gene / of the plasmid</p>	<p>if ‘no’ - read on for logical argument e.g. loss of plasmid or gene mutation</p> <p>must be <u>one</u> cell i.e. <u>bacterium</u></p> <p>allow reference to ‘mitosis’</p>	1 1 1								
total			6								