



General Certificate of Secondary Education

Biology (Human) 3415/H

Mark Scheme

2005 examination – June series

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.

Biology (Human) Higher Tier 3415/H

3415/H Q1

question	answers	extra information	mark
(a)(i)	liver		1
(ii)	<u>on diagram:</u> ‘X’ on liver	must be unambiguous (eg not overlapping gall bladder) intersection of X in liver	1
(b)	stomach <u>small</u> intestine	accept duodenum or ileum extra wrong answers cancel the mark, eg small intestine (colon) = no marks	1 1
(c)	amylase not produced by stomach acid / low / wrong pH in stomach or enzyme would be denatured in stomach or amylase only works in neutral / alkaline conditions	accept no starch digesting enzymes in the stomach accept correct enzyme not in stomach accept <u>only</u> proteases in stomach do not accept protease does not digest starch incorrect extra information cancels mark do not accept amylase does not work in the stomach	1 1
(d)	any three from: • non-digestible / insoluble matter in faeces or fibre / roughage in faeces • <u>water</u> absorption / <u>water</u> removed (into blood) • by <u>large</u> intestine / colon / rectum • by osmosis / diffusion	ignore ‘solid’ accept cannot be broken down cancel mark if list of materials	3
total			9

3415/H Q2

question	answers	extra information	mark
(a)	A = nucleus	accept phonetic spelling only	1
	B = (cell) membrane	accept plasma membrane	1
(b)	any one from: photosynthesis <u>makes</u> sugar / starch / carbohydrate / organic material traps or absorbs light	accept ' <u>makes</u> food' do not accept makes chlorophyll ignore stores starch / food / light / chlorophyll	1
(c)	any two from: Plant cell • (has) vacuole or has cell sap • (has) wall/ cellulose • (stores) starch or doesn't store glycogen Animal cell • no vacuole or small / temporary vacuole or no cell sap • no wall / cellulose or <u>only</u> membrane • doesn't store / have starch or stores glycogen	ignore reference to shape must be clear indication in all four boxes ignore reference to chlorophyll	2
total			5

3415/H Q3

question	answers	extra information	mark
(a)	burning fossil fuels / coal / gas / oil	accept driving <u>vehicles</u> / eg cars accept coal-fired power station accept car emissions ignore combustion unqualified do not accept power station unqualified do not accept <u>using</u> fossil fuels	1
(b)(i)	(SO ₂) makes it acidic / makes acid rain / lowers pH		1
(ii)	any one from: (SO ₂) kills leaves reduces number of leaves reduces leaf area or smaller leaves causes fewer leaves to grow	ignore correct extras, eg withered, yellow etc	1
(c)	any two from: (fewer leaves / less leaf S.A) so less photosynthesis less food / less sugar / less starch (supplied to roots / to stems) (SO ₂) lowers pH of soil / makes soil acidic ions (/minerals / salts / nutrients) less available (to plants)	accept don't get enough nutrients	2
total			5

3415/H Q4

question	answers	extra information	mark
(a)	shoot A grew or got longer / taller / larger	accept B didn't grow	1
	(in A) auxin moves / spreads down / through the stem or moves away from tip		1
	auxin <u>stimulates (/ causes)</u> growth / elongation	allow grew <u>because of</u> hormone	1
	in B no auxin / little auxin / or auxin supply removed		1
(b)(i)	towards shade / away from light	ignore 'to the left' accept 'towards R'	1
(ii)	R		1
(c)	any two from: <u>rooting</u> of cuttings or as a rooting powder (control of) fruit / seed ripening weedkiller accept: seedless fruit formation inhibition of (lateral) bud growth for tissue culture	accept either delays or promotes ignore wrong qualification accept 'to save having to trim hedges'	2
total			8

3415/H Q5

question	answers	extra information	mark
(a)(i)	remains of an organism in rock / amber / coal / ice / tar or remains of an organism which lived long ago	accept bones, shells or impression for 'remains'	1
(ii)	<ul style="list-style-type: none"> • fossils show changes • <u>over</u> time 	do not accept just 'evolved'	1
		not just a past event	1
(b)	<p>Quality of written communication</p> <p>for correct use of at least two scientific terms eg mutation, resistant (not just 'antibiotic-resistant', not 'immune') / selection / natural selection / survival / reproduction / gene / allele / DNA</p> <p>any two from:</p> <p>mutation occurs in bacteria or change in DNA / gene occurs</p> <p>(when antibiotic used) only resistant bacteria survive or non-resistant bacteria are killed or reference to 'natural selection'</p> <p>resistant bacteria pass on the gene / allele</p>	cancel if mutation 'caused by' antibiotic	1
		allow pass on the mutation do not accept just 'pass on resistance'	2
total			6

3415/H Q6

question	answers	extra information	mark
(a)	345 to 350	ignore working or lack of working use of 355 to 360 and 10 for 1 mark	2
(b)	any two from: more sweating (at 37.6°C) more water loss or dehydration <u>occurs</u> blood becomes (more) concentrated / (more) salty or need to replace water stimulation of the hypothalamus	'more' at least once in the first 2 points do not accept prevents dehydration only	2
(c)	any three from: evaporation of <u>water</u> cools skin or uses heat from skin cools blood / heat from blood (passing through skin)	do not accept just water loss unqualified related to sweating cooling the blood ignore vasodilation	3
total			7

3415/H Q7

question	answers	extra information	mark
(a)(i)	B – shows steady growth or cannot be A because curve goes above 100% or nearly to 200% then falls / shrinks	accept A grows bigger than adult size then falls / shrinks accept A goes above 100%	1
(ii)	70	accept range of 68 – 71	1
(iii)	11 – 13 because reproductive organs show sudden increase or big increase or develop	accept reproductive organs start to grow do not accept just change in reproductive organs do not accept if any figures given outside the range	1
(b)	shows one tooth growing or forming below another tooth or shows a permanent tooth or adult tooth below a milk tooth or juvenile tooth top tooth or milk tooth is ready to come out or milk tooth has not yet come out	accept shows two teeth in same socket accept other name for teeth such as top and bottom, old and new, first and second accept two teeth present accept top tooth or milk tooth has root dissolving or root breaking down	1 1
total			5

3415/H Q8

question	answers	extra information	mark
(a)(i)	blood forced out (into ventricle / C)	accept blood passes / goes as alternative to forced	1
(ii)	(when ventricle contracts) some blood passes back into atrium	accept not all blood enters arteries accept does not stop backflow ignore reference to naming incorrect artery	1
(iii)	it contracts	accept presses on blood or squeezes on blood do not accept pushes	1
(b)	adrenalin		1
	increase		1
total			5

3415/H Q9

question	answers	extra information	mark
(a)(i)	soft parts decay or all other parts decay or bones and teeth are too hard to decay or take a long time to decay	accept rot or decompose or breakdown for decay or soft parts are eaten	1
(ii)	find age of fossils	accept dating of fossils accept older fossils have less radioisotopes or radiation	1
(b)	Quality of written communication any two from: primate A eyebrows or ridges over eyes similar in size to those of <i>Homo sapiens</i> or only slightly larger or primate B has bigger eyebrows or ridges over eyes than <i>Homo sapiens</i> or primate A primate A lower jaw similar in size or shape to that of <i>Homo sapiens</i> or primate B has bigger lower jaw or heavier lower jaw than <i>Homo sapiens</i> or primate A canine teeth in <i>Homo sapiens</i> and primate A small or not pointed or in primate B long or pointed <i>Homo sapiens</i> and A have a nose or B does not have a nose <i>Homo sapiens</i> and A have a similar size brain or cranium or B has a differently sized brain or cranium	for correct linking of corresponding parts or features on <i>Homo sapiens</i> and primates A and B and identifying them on each accept eyebrows or ridges over eyes similar size or shape in <i>Homo sapiens</i> and primate A or smaller than primate B accept lower jaw similar size in <i>Homo sapiens</i> and primate A or smaller than in primate B accept canine teeth similar size or shape in <i>Homo sapiens</i> and primate A or long or pointed in primate B or B has bigger teeth than <i>Homo sapiens</i> and A or <i>Homo sapiens</i> and A have similar teeth or in B the teeth are different	1 2
total			5

3415/H Q10

question	answers	extra information	mark
(a)(i)	contraction of muscle A will cause bending of joint or movement in one direction		1
	contraction of muscle B will cause straightening of joint or movement in other direction	accept contraction of two muscles are needed to move the bone in opposite directions for 2 marks accept when one contracts the other relaxes for 1 mark accept one muscle moves bone in one direction, other muscle in other direction for 1 mark	1
(ii)	(X – osteoarthritis) joint stiff or does not move easily or rough / uneven cartilage rubs together or bone surfaces rub together or swelling of joint or <u>joint</u> painful	accept allows friction	1
	(Y – osteoporosis) bones brittle or may break easily or weak or bones less flexible or pain	accept pain as answer once only	1
(b)	(strong) holds bones together or prevents dislocation	accept it does not break easily accept keeps joints together	1
	(elastic) allows bones to move (in joint) or allows joint to move	accept can stretch (slightly) to allow movement do not accept descriptions of contraction	1
total			6

3415/H Q11

question	answers	extra information	mark
(a)(i)	haemoglobin / oxyhaemoglobin	must be phonetic	1
(ii)	carries oxygen or forms oxyhaemoglobin	ignore references to CO ₂ / iron cancel if extras like food / glucose	1
	from lungs to tissues		1
(b)	no nucleus or biconcave disc (described)	ignore references to size ignore vague references to being 'round' / 'donut' shaped etc.	1
(c)	any three from: <ul style="list-style-type: none"> • combines with haemoglobin / with red pigment • irreversibly • <u>less</u> oxygen transport or <u>less</u> oxygen (to fetus) • <u>less</u> energy release or <u>less</u> respiration (in fetus) • <u>less</u> growth of fetus or <u>lower</u> birth mass 	do not accept any wording suggesting zero oxygen do not accept 'does not grow properly'	3
total			7

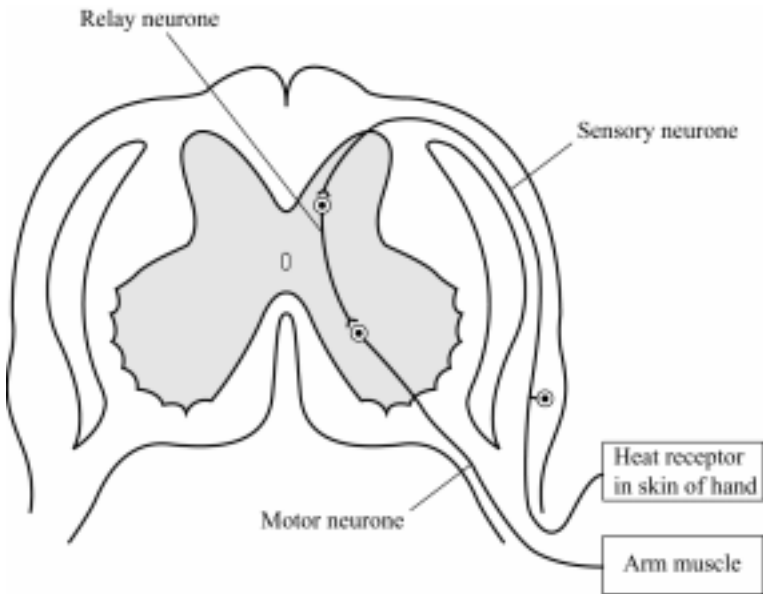
3415/H Q12

question	answers	extra information	mark
(a)	1.67 / $1\frac{2}{3}$	accept 1.6 to 1.7 ignore working or lack of working $\frac{400 \times 100}{24000}$ for 1 mark	2
(b)	any three from: lost as heat or keeping body warm lost in respiration movement not eaten parts or individuals / non-edible parts / dead leaves / wood / bones / faeces / urine	deduct only 1 mark for any mention of in carnivore lost in metabolic functions is not enough do not accept ' <u>used for</u> respiration' ignore 'waste' ignore references to growth / reproduction	3
total			5

3415/H Q13

question	answers	extra information	mark
	<p>any three from adaptation and effect:</p> <p>few leaves / no leaves / little growth above ground / low surface area above ground so less water loss</p> <p><u>deep</u> roots so can reach water or because surface soil is likely to dry out</p> <p>roots near surface so can obtain water when it does rain</p> <p>widespread roots or many roots so can obtain water from a large area</p> <p>swollen stem so can store water</p>	<p>ignore references to ions throughout ignore animals eating plant</p> <p>do not accept zero water loss</p> <p>accept 'moisture' for water</p>	<p>3</p>
<p>total</p>		<p>3</p>	

3415/H Q14

question	answers	extra information	mark
(a)	 <p>sensory neurone correctly drawn and labelled</p> <p>motor neurone correctly drawn and labelled</p>	<p>from receptor + via dorsal root + cell body in ganglion + synapse to relay neurone</p> <p>to muscle + via ventral root + same shape as relay neurone + synapse with relay neurone</p> <p>OR correct <u>pathways</u> for both neurones given (ie without synapse or cell bodies) and labelled, or correctly <u>drawn</u> but unlabelled = 1 mark for this part)</p>	<p>1</p> <p>1</p>
(b)	<p>any two from:</p> <p>reference to synapses / gaps between neurones</p> <p>extra time for release / movement of chemical</p> <p>extra time for development of muscle 'tone' / tension</p>		<p>2</p>
total			<p>4</p>

3415/H Q15

question	answers	extra information	mark
	<p>any three from:</p> <p>FSH stimulates growth / maturing of follicle(s) / eggs</p> <p>FSH stimulates oestrogen release</p> <p>oestrogen stimulates development of uterus lining</p> <p>oestrogen stimulates LH <u>release</u> / <u>production</u></p> <p>LH stimulates ovulation / egg release</p>		3
total			3

3415/H Q16

question	answers	extra information	mark
(a)(i)	Aa or aA		1
(ii)	allele / gene for vestigial wings / a is recessive or vestigial is recessive or A is dominant or A would override the effect of a or A present gives long wings		1
(b)	parental genotypes correct – both Aa gametes correctly derived from P genotypes offspring genotypes correctly derived from gametes 3:1 ratio recognised	N.B. can pick up chain of logic at any point correctly derived from candidate's previous point wrong cross and not 3:1 ratio = max 2	1 1 1 1
total			6

3415/H Q17

question	answers	extra information	mark
(a)(i)	<p>any two from:</p> <p>sprayed / sprinkled through the <u>air</u> or droplets through the <u>air</u></p> <p>(large) air spaces (between stones)</p> <p>thin film of sewage on stones</p> <p>large surface area of stones</p> <p>slow flow rate / trickles over stones</p>		2
(ii)	<p>L.H.S. – oxygen</p> <p>R.H.S – carbon dioxide + water</p>	<p>accept words or correct symbols O_2, CO_2, H_2O</p>	<p>1</p> <p>1</p>
(b)	<p>any two from:</p> <p>at depth - no light</p> <p>- no photosynthesis</p> <p>- no chlorophyll (produced in dark)</p>	<p>accept converse for surface</p>	2

cont...

3415/H Q17 cont...

(c)	<p>Quality of written communication for 2 points relating cause and effect</p> <p>any three from:</p> <p>dead plants / sewage used by bacteria / food for bacteria / broken down by bacteria</p> <p>number of bacteria increases / large number of bacteria present</p> <p>oxygen from water used (by bacteria) / less oxygen for other organisms</p> <p>particles (of sewage / bacteria) block light or growth of surface plants blocks the light</p> <p>less light (for plants) for photosynthesis</p> <p>plants produce less oxygen</p> <p>other organisms cannot respire / get energy</p> <p>organisms killed</p>	<p>1 3</p> <p>accept microorganisms / microbes do not accept 'germs'</p> <p>ignore suffocate / cannot breathe do not accept wrong context – eg 'algae use up oxygen'</p> <p>ignore references to disease / toxins ignore 'eutrophication'</p>
total		10

3415/H Q18

question	answers	extra information	mark
(a)	(before exercise) – 9 to 11 and (after exercise) – 12 or 13	both correct	1
(b)	0.75 to 0.90	ignore working or lack of working eg. 2.35 – 1.55 or $\frac{(2.35 - 1.0) \times 60}{100}$ or other suitable figures for 1 mark	2
(c)	any four from: still need to remove <u>extra</u> carbon dioxide still need to remove heat / to cool (some) anaerobic respiration (in exercise) lactic acid made (in exercise) oxygen needed to break down lactic acid or suitable reference to oxygen debt lactic acid broken down to CO ₂ and water or lactic acid changed into glucose		4
total			7

3415/H Q19

question	answers	extra information	mark
(a)(i)	A = xylem	accept phonetic only	1
(ii)	B = phloem	accept phonetic only	1
(b)	(radioactive CO ₂ used in) <u>photosynthesis only in the light</u> glucose / sucrose / sugar / organic molecules are made (organic molecules) transported (out of leaf) <u>via phloem</u> / <u>via tissue B</u> / via candidate's name in (a)(ii)	accept converse	1 1 1
total			5

3415/H Q20

question	answers	extra information	mark
(a)(i)	meiosis and mitosis	both names needed correct spelling	1
(ii)	meiosis halves chromosome number in sperm and egg or ensures sperm and egg have 23 chromosomes	accept occurs in gamete formation accept keeps chromosome number correct do not accept occurs in gametes	1
	in mitosis zygote or results of fertilisation has 46 chromosomes which are copied in growth / formation of body cells	accept mitosis causes growth (by producing genetically identical cells) or makes copies of cells or zygote divides by mitosis	1
(b)	(HCG) – from embryo or placenta maintains corpus luteum or yellow body or causes corpus luteum or yellow body to produce or secrete progesterone	both site and effect are needed	1
	(oxytocin) – from pituitary gland starts or makes uterus (wall / muscles) contract	both site and effect are needed do not accept causes contractions pituitary – phonetic spelling accepted	1
	(progesterone) – from ovary or corpus luteum or yellow body or placenta stops production of oxytocin or prevents menstruation or stops uterine lining breaking down	both site and effect are needed accept stops abortion of baby accept causes growth of uterine lining or growth of blood vessels in uterine lining or maintains lining if no horizontal line awarded allow 1 mark if one vertical line is correct, ie three correct answers in vertical line under heading Produced by or three correct answers in vertical column headed One effect of the hormone .	1
total			6

3415/H Q21

question	answers	extra information	mark
(a)(i)	C		1
(ii)	origin – bone / skull insertion – eyeball / eye		1
	when muscle contracts eyeball moves (insertion) or bone / skull does not move (origin)	accept movement occurs at insertion or movement does not occur at origin ignore reference to where muscle begins	1
(b)	any three from: contractile units in fibre contract fibre shortens muscle fully contracted when all fibres shortened / contracted muscle partially contracted when some fibres shortened / contracted	accept suitable description of contraction accept fibre contracts but do not accept this if first point awarded accept contraction of all fibres causes full or maximum bending of joint accept references to partial bending of joint	3
total			6

3415/H Q22

question	answers	extra information	mark
(a)(i)	contracts continuously or not fatigued or not voluntary or contraction stimulated in heart or rapid contraction and relaxation or contraction not sustained or long refractory period or contraction occurs automatically	accept contracts for life of person accept any reverse statement for skeletal muscle if identified accept never tires accept cardiac muscle does not pull on bone	1
(ii)	all cells near blood supply or allows maximum exchange of substances or good exchange	accept cells can receive nutrients or named nutrient easily / quickly accept large surface area for exchange	1
(b)(i)	cholesterol present or fatty deposits present	accept not enough or less blood can get through or lumen is small	1
(ii)	increased blood pressure or high blood pressure increases rate of cholesterol forming on wall	accept high blood pressure causes cholesterol to form on wall accept atheroma or description of this restricts blood flow causing increased or high blood pressure accept uses high pressure to drive blood through accept same amount of blood passes through smaller space or area (so puts up pressure) accept heart cannot push out as much blood so pressure builds up	1
(iii)	insufficient blood or oxygen or suitable nutrient (to cardiac muscle or heart wall for energy release)	accept not enough energy for increased contraction accept blood cannot reach heart (wall or muscles) <u>any faster</u>	1
(iv)	pain in chest or tight feeling in chest	accept pain in arms	1
total			6

3415/H Q23

question	answers	extra information	mark
(a)	47.2	if answer incorrect allow 1 mark for correct working $425 \times 100 \div 900$ or $(1325 - 900) \times 100 \div 900$	2
(b)	<i>Homo erectus</i> to <i>Homo sapiens</i> shows highest or greatest (% growth of) brain	accept just <i>Homo sapiens</i> both statements needed for mark	1
(c)	any three from: (evolution of brain allowed) development of speech (evolution of brain allowed) development of writing growing food meant did not have to search for food or obtained better food supplies or could store surplus or no lack of food not all people involved in obtaining food or some people free for other developments / activities larger brain meant increase in intelligence	accept settle differences without aggression accept could record events or form laws accept could communicate with other groups or get knowledge or ideas from other people or groups for 1 mark as alternative to above two points accept were not nomadic accept more time for developing customs or ceremonies or meetings	3
total			6