CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0610 BIOLOGY

0610/32

Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- R reject
- A accept (for answers correctly cued by the question)
- I ignore as irrelevant
- ecf error carried forward
- **AW** alternative wording (where responses vary more than usual)
- AVP alternative valid point
- **ORA** or reverse argument
- <u>underline</u> actual word given must be used by candidate (grammatical variants excepted)
- () the word / phrase in brackets is not required but sets the context
- max indicates the maximum number of marks

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Question	Expected answers	Mark	Additional Guidance
1 (a)	unsegmented; A no segments soft bodies; (muscular) foot; ignore feet mantle; visceral mass; AVP;	[max 2]	ignore no (exo)skeleton no backbone no bones radula bilaterally symmetrical shell / exoskeleton
(b)	(8) legs / tentacles / arms / limbs / AW; (large) eye; has a head; no shell / (completely) soft body / no exoskeleton / no external skeleton; suckers (on tentacles);	[max 2]	R any internal features (see the question) R feelers / hands ignore no (muscular) foot / feet A suction pads
(c)	look for an adaptation for attachment and an adaptation for survival when exposed to air allow ecf from part (a) attachment threads / (muscular) foot / sticky fluid; survival in the air either shell / exoskeleton, prevents / reduces, water loss / or shell / exoskeleton, protects against (named) predator(s);	[max 2]	A any suitable description of the threads e.g. fibres, projections, extensions, tentacles, etc. R suckers A slime / mucus for sticky fluid ignore protection unqualified ignore anything to do with gas exchange ignore camouflage if named must not be an aquatic predator

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Question	Expected answers	Mark	Additional Guidance
(d) 1 2 3 4 5 6 7	has no, competitor(s) / predators (therefore increase in numbers); has no, pathogens / parasites / disease-causing organism(s); competes with existing species for, food/nutrients/space/oxygen; could be a, predator / consumer, of other species; A feeds on (many) other species could introduce, disease / parasite, for native species cause migration of native species; AVP; e.g. reduces biodiversity causes extinction decrease in numbers, higher in food web / at higher trophic levels		
	increase in predators of zebra mussels	[max 3]	
(e) 1	do not move about / stay in one place, so exposed to pollutant (continuously);		D man a constant
2	pollutant, kills them / reduces their numbers / prevents them breeding :		R more accurate
3	so presence / absence, is a good indicator;		
4	pollutant accumulates (in animal's body);		
5	pollutant, detectable when concentrations are low / no longer present		ignore easy to, see / collect;
6	AVP; they are filter feeders do not need to know what the pollutant is (as would be the case for a chemical test) no need for lab facilities / no need for equipment / can be done in the field	[max 2]	quicker to do skills / training needed / cheaper

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Question	Expected answers	Mark	Additional Guidance
(f)	non-biodegradable plastics		
1 2 3 4 5	swallowed / ingested / eaten / cannot be digested; caught around / trapped / entangled; choke / blocks gut / smother / suffocate / injure / cut / trap / stuck in / AW; plastic blocks light for photosynthesis; may, contain / release, (oil-soluble) toxins / poisons;		ignore kills / dies unqualifiedA organism is poisoned (by toxins)R 'plastics are toxic'
6 7 8	large pieces of plastic may block flow of water (in a river); that reduce concentration of dissolved oxygen; effect of loss of organism at a trophic level;		A suffocate in MP3 as a consequence of MP4 MP6 and MP7 are linked
9	AVP ; e.g. any other consequence for organisms	[max 3]	

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Question	Expected answers		Mark	Additional Guidance
2 (a) (i)	stimulus receptor cells effector response	(blue) light / (change in) light intensity / dim to bright light; cones / rods; (circular) muscle, of / in, iris; pupil, gets smaller / constricts / AW;	[4]	ignore retina (as it is a tissue) R ciliary muscle R radial muscle R muscle / pupil, contracts ignore muscle contraction
(ii) 1 2 3 4 5	reflexes, then mark to max 3 (nervous / electrical) impulses sent by / initiated by, (named) in R if optic nerve, sends / initial / along / through, sensory in to, brain / CNS / grey matter;	receptors / sensory cells / retina ; tiates / AW, the impulse neurone(s) / optic nerve		MP1 – M5 ignore 'signals' / 'messages' / AW ignore relay / connector / inter-, neurone; ignore 'impulses to brain' after the response has happened
			[max 4]	

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Question	Expected answers	Mark	Additional Guidance
(b) 1	increase in, heart / pulse, rate ;		R 'lots of heart beats' unqualified / increases heart beat
2	increase in, breathing rate / depth of breathing;		moreages ficall beat
3	more oxygen, taken in / absorbed; linked to MP2		MP3 accept oxygen taken in faster
4	for (increase rate of) aerobic respiration;		MP4 ignore metabolic rate increases
5	more energy released; R energy produced		_
6	vasodilation in / arteries widen in / more blood to, muscle / brain;		MP6 accept faster blood supply to muscle
7	more oxygen to muscles; linked to MP1 or MP6		MP7 accept faster supply of oxygen to
8	vasoconstriction in / less blood to, gut / skin ;		muscle
			MP8 accept slower blood supply to gut / skin
9	stimulates, breakdown / conversion, of glycogen to glucose in liver;		MP9 ignore glycogen to glucose in
10	increases glucose (concentration) in the blood;		muscle
			MP10 does not have to be linked to MP9
11	dilates pupils ;		
12	lets more light into eye;		
13	heightened sensitivity / increased mental awareness / AW;		MP13 R 'excited'
14	AVP; e.g. increased width of (named) airways, increase in blood		WP13 R excited
14	pressure	[max 5]	
	pressure	[max o]	
(c)	assume answers are about involuntary unless told otherwise		
`´ 1	automatic / no conscious decision / does not involve thought / involves decision making;		ignore voluntary / involuntary responses can / cannot be controlled unqualified
2	higher centres / AW, of brain not involved;		Can / Cannot be controlled unqualified
3	faster / immediate;		
4	response always the same ;		
5	involves, one / small number of, muscle(s);		
6	may involve glands;		
7	they are protective / AW;	[max 2]	

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Question	Expected answers	Mark	Additional Guidance
3 (a) (i) 1 2 3 4 5 6 7	kills, / destroys, (all) bacteria / microorganisms; A viruses to prevent contamination / remove contaminants (of the milk / yoghurt); competition with the two bacteria added; disease / might be pathogens / any suitable e.g. (TB / food poisoning); production of toxins; alteration of the, flavour / taste; AVP;		ignore 'remove' / 'gets rid of' / 'eliminates' ignore 'harmful' ignore impurities / make milk pure kills harmful bacteria = 1 mark kills bacteria that cause disease = 2 marks kills bacteria that might contaminate the milk = 2 marks
(ii) 1 2 3 4 5 6 7	best / optimum / ideal, temperature; for bacterial, growth / division / reproduction; A bacteria grow quickly ref to enzymes; R if enzymes are denatured at 45 °C ref to, kinetic energy / collisions; produce most lactic acid in the shortest time; A 'lactic acid production takes too long at lower temperatures' ref to cost; bacteria killed / enzymes denatured, at higher temperatures /	[max 2]	R 'speeds up the reaction' unqualified A enzymes are not denatured / bacteria are not killed, at this temperature

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Question	Expected answers	Mark	Additional Guidance
(iii) 1	lag phase / numbers increase slowly / low rate of growth; ignore 'numbers stay the same'		accept (cell) division / (binary) fission / reproduction for growth for MP1 and MP3
2	(while) bacteria, make proteins / increase in size;		Toproduction growth for internation of
3	log phase / exponential phase / numbers increase quickly; A rapid rate of growth / bacteria divide faster than die		
4	plenty of, food / nutrients / oxygen; ignore raw materials		MP4 A 'availability of food / AW'
5	stationary phase / numbers stay constant; A 'birth' rate = death rate		in the arangemy of reed / / in
6	death phase / increase in death rate / decrease in numbers / bacteria be		
7	(because of) lack of, food/nutrients/oxygen or decrease in pH / accumu		
8	ref to <u>limit</u> ing factors;		
9	AVP ; e.g. Lactobacillus bulgaricus increases first	[max 5]	
(iv) 1	need different bacteria to, carry out different processes / produce		A both needed to make lactic acid A 'work differently'
2	idea that each bacterium needs something produced by the other;		77 Work dimorothay
3	Streptococcus (thermophilus) does not make lactic acid;		
4	Lactobacillus (bulgaricus) needs formic acid produced by		If MP4 awarded then also award MP2
5	each stage requires a different (specific) enzyme; A enzymes work on different substrates		A S. thermophilus
6	idea that each bacterium cannot make all the enzymes needed;		A L. bulgaricus
7	AVP;		
		[m. a.v. 0]	
		[max 2]	

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Question	Expected answers	Mark	Additional Guidance	
(b)	preservative / acidity regulator / pH regulator; antioxidant; colouring / food dye; flavouring; emulsifier; sweetener; thickener; stabiliser;	[max 3]	ignore names and/or (E) numbers of additives e.g. MSG, tartrazine, sunset yellow, etc.	fruit chocolate nutrients any named nutrient, e.g. food starch / corn starch (named) vitamin(s) (named) mineral(s) salt calcium supplement

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Question	Expected answ	ers		Mark	Additional Guidance
4 (a)	pea plant	D	E		
	substance transported	sucrose	phosphate ions		
	transport	phloem;	xylem;		ignore any vessels / tubes / etc
	sink	growing tip / flower / fruit / seed / stem / root;	growing tip / flower / fruit / seed / stem / leaves / chloroplasts;	[4]	A growing point / meristems / areas where growth occurs
(b)	amino acids ; R proteins			[1]	A (named) plant hormones
(c) 1 2 3 4	light (energy) is, carbon dioxide reto make glucose	, absorbed / trapped, by cheacts with water in the pre	sence of light (energy);	[max 3]	A word equation / balanced equation if MP3 not written out do not award MP3 if 'broken down' A formula for glucose in an equation MP5 do not award if glucose is broken down unless already penalised in MP3
(d) 1 2 3 4 5	energy for a suit unqualified converted to star converted to cell used to make ne	ed to provide energy / used table process; R 'produce rch for (energy) storage; lulose to make cell walls; ectar to attract, pollinators of a attract animals (for seed	ce energy' A respiration	[max 2]	e.g. energy for, growth / active transport R to make fruit / seed unqualified

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Question	Expected answers	Mark	Additional Guidance
(e) 1 2 3 4 5 6	root hairs / root hair cells; active transport; against, concentration / diffusion, gradient	[max 3]	ignore diffusion / movement down a concentration gradient / osmosis ignore gradient in 'from low concentration gradient to high concentration gradient'

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Question	Expected answers	Mark	Additional Guidance
5 (a)	halves the number of chromosomes / diploid to haploid; ignore halves the genetic material		accept produces haploid, nuclei / cells / gametes ignore prevents doubling of chromosome number
	produces variation / AW;	[2]	
(b) (i)	question is discounted	[2]	
	 (only) one fertilisation / one zygote / one fertilised egg; zygote / fertilised egg / (cells in) embryo, divides / splits in two; by mitosis; 		R 'from a single cell' but allow ecf for other MPs R egg divides
	into two (groups of) genetically identical cells;	[2]	A same , genetic material / genetic make- up / genome R similar
(c)	increase in, complexity / AW; ref to specialisation / differentiation; ref to different types of cells; ref to, tissues / organs;	[max 2]	ignore (rapid) growth / change in shape A 'legs / arms / AW, start to grow'
(d)	1. X ^h Y; 2. X ^H X ^h ; 3. X ^H X ^H ;	[3]	do not accept male genotypes for MP2 and MP3

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Question	Expected answers	Mark	Additional Guidance
(e) 1 2	mutation / change in DNA; in the gene, for blood clotting protein / on X chromosome;		MP2 can only be awarded if MP1 is awarded
3	in the mother / mother is a carrier / mother is heterozygous; R parent(s) is / are heterozygous		MP3 A in context of allele passing down the female line for several / many generations (without being expressed in a male)
4	haemophilia is <u>sex linked</u> / shows <u>sex linkage</u> ;		ignore carried on the X chromosome as this
5	idea that the mother's egg with the mutant allele fuses with a Y bearing sperm;		is in the question
6	e.g. cause of mutation; ionising radiation / chemical(s)		
		[max 2]	

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Qı	uestion	Expected answers	Mark	Additional Guidance
6	(a)	there are different forms of one, feature / characteristic; example of a feature shown by Soay sheep; coat / fur, colours		look for a general explanation of 'variation in their phenotype' and an example
		patterns of coat / AW with and without horns lengths of horns ear, length / width / size / shape face, length / width / size / shape body mass body shape / body size / AW	[2]	the example chosen does not have to be visible in Fig. 6.1
	(1.) (2)		[2]	
	(b) (i)	in years with high populations of sheep		
	1 2 3	for all sizes of lambs more lambs died than survived; any comparative data quote using same body mass in high and low population years – units (kg) are not necessary A tolerance given in table for bars between gridlines		looking at sum total of the bars in each graph looking at bars for each body mass e.g. lambs 13-14 (kg), 106 died in high population year against 12 that died in low population year
			[max 2]	see page 18 for table of data

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Question	Expected answers	Mark	Additional Guidance
(ii)	in high population – ora for low population one mark for competition and two marks for marking points 2-11		ignore explanations about why the population is high in some years and low in others – not relevant
1	competition for, shelter / food / grass / resources;	[1]	low in others – not relevant
2	as a result of competition there is shortage of food for each lamb;		
	as a result of competition for food		R competition for mates
3 4 5	lambs do not store enough fat ; ref insulation ; cannot survive the winter ;		
6 7 8	ewes / females, produce less milk; ref to number of lambs per female; ref to, more likely to die of disease / AW; • A disease more likely to spread		
9 10	more small lambs die; (pregnant) ewes / females, are short of food	[max 2]	

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Question	Expected answers	Mark	Additional Guidance
(c)	note that this is not a question about artificial selection		points need to be in correct sequence and in the context of selection
1	variation / AW, among the sheep in the population;		
2	some are better, adapted / suited / AW, than others ; A 'best adapted'		R better animals survive unqualified by adaptation or some example
3	any example of an adaptive feature for survival in the extreme conditions;		'some sheep have thicker coats' = MP1 and MP3 MP3 must be a feature related to survival in extreme conditions, not 'strength', 'fitness' 'healthiness' etc
4	any example of an appropriate selective agent ; ignore 'extreme conditions / weather'		to survive the cold = MP4
5	survive and, breed / have offspring ; A ora		
6	pass on their <u>alleles</u> ;		
8	idea that over time better adapted, features / traits, become more common;	[max 4]	

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body mass / kg	low population years		high population years	
	died	survived	died	survived
3 – 4	0	0	6 (5 – 7)	0
5 – 6	0	2 (1 – 3)	15 (14 – 16)	0
7 – 8	0	7 (6 – 8)	20	3 (2 – 4)
9 – 10	5 (4 – 6)	16 (15 – 17)	56	6 (5 – 7)
11 – 12	12 (11 – 12)	48	94 (93 – 95)	25 (24 – 26)
13 – 14	12 (11 – 12)	57 (56 – 58)	106 (105 – 107)	30 (29 – 31)
15 - 16	12 (11 – 12)	52	48	34 (33 – 35)
17 – 18	6 (5 – 7)	22 (21 – 23)	16	18 (17 – 19)
19 – 20	2 (1 – 3)	12	6 (5 – 7)	2 (1 – 3)
21 - 22	0	0	2 (1 – 3)	0