UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

General notes

Symbols used in mark scheme and guidance notes.

/ separates alternatives for a marking point

; separates points for the award of a mark

A accept – as a correct response

R reject – this is marked with a cross and any following correct statements do not gain any marks

I ignore / irrelevant / inadequate – this response gains no mark, but any following correct answers can gain marks.

( ) the word / phrase in brackets is not required to gain marks but sets context of response for credit. e.g. (waxy) cuticle. Waxy not needed but if it was described as a cellulose cuticle then no mark.

Small underlined words – this word only / must be spelled correctly

ORA or reverse argument / answer

ref. answer makes appropriate reference to

AVP additional valid point (e.g. in comments)

AW alternative words of equivalent meaning

MP marking point (number)

Question	Expected Answers	Marks	Additional Guidance
1 (a)	*animals written in the correct boxes in the food web* (Ruppell's) vulture ; cheetah ; mice / mouse ;	[3]	
(b)	(primary) <u>producer</u> ; <u>primary</u> / <u>first</u> <u>consumer</u> ;	[2]	
(c) (i)	Sun / sunlight / light ;	[1]	
(ii)	(lost) to the atmosphere / (lost as) infra red (radiation) / heat / AW ;	[1]	**R** reflect **R** 'lost' only – needs qualifying
(d) 1 2 3 4 5 6 7 8 9 10	*idea that* **small** percentage of energy from sun is 'fixed' by photosynthesis ; most energy from sun not available / reference to wrong wavelength / AW ; energy is lost, between / within, trophic levels / along food chain ; ref. to 10% energy transfer / ORA ; ref. to material that is, inedible / not digestible ; energy lost, in respiration / heat / (named) metabolic process / decomposers ; ref. to (small) total percentage reaching fourth trophic level ; not enough energy in fourth trophic level to support another level ; except parasites ; ref. to another problem of animal that would prey on, top carnivores / scavengers ;	[max 3]	**NB**: **MP3** is for loss with no reference to magnitude, also award **MP4** if magnitude given e.g. '90% lost between trophic levels' is 2 marks **MP5 A** ref to faeces examples for **MP10** animal would have to be very large, would need much energy to catch a cheetah, there would be very small populations

Question	Expected Answers	Marks	Additional Guidance
(e) 1	feed is expensive / fish is sold at high price ;		No credit for energy losses along the chain as already given in Question 1d
2	more energy efficient to feed humans on, crops / producers / animals used to make the fish food ;		
3	waste from salmon / excess feed, causes eutrophication ;		
4	diseases / parasites, spread easily in (high density of) salmon ;		
5	diseases spread to, wild fish / other organisms ;		
6	chemicals used to control disease also pollutants ;		
7	escapees breed with wild fish ;		
8	*idea of* genetic pollution of wild fish ;		
9	escapees compete with wild fish ;		
10	extinction of wild fish ;		
11	AVP ;	[max 3]	AVP e.g. chemicals / antibiotics / hormones in feed passed on e.g. less waste if humans could eat high protein 'fish food' instead e.g. low quality stock compared with wild (less competition)
		[Total : 13]	

Question	Expected Answers	Marks	Additional Guidance
2 (a) 1 2 3 4 5 6 7	muscular contraction / movement / pump blood ; maintenance of body temperature ; active transport / described / (passage of) nerve <u>impulses</u> ; metabolic reactions / named example (e.g. excretion / biosynthesis / digestion) growth / replacement / repair ; mitosis / nuclear division / cell division ; making, gametes / sperm ;	[max 3]	**MP1 A** maintain posture **R** 'sitting' unqualified **R** breathing unqualified **MP2 R** heat unqualified **MP4 R** respiration
(b)	aerobic ; respiration ;	[2]	
(c) 1 2 3 4 5 6 7 8 9 10 11	<u>oxygen debt</u> ; oxygen not supplied fast enough (from lung / heart) / ORA more O_2 supplied; to muscles ; removal of excess carbon dioxide ; <u>anaerobic</u> respiration (in muscles) ; lactic acid / lactate ; builds up in muscle / not carried away fast enough in blood ; lowers blood pH ; makes person feel tired / muscle stiffness / fatigue / AW ; muscle cannot contract any more ; lactic acid is, broken down / respired / converted to glucose ;	[max 4]	**A** lactic acid, converted to CO_2 and water / lactic acid oxidised

Question	Expected Answers	Marks	Additional Guidance
(d)	*at start of run*		**NB:** All marks should be qualified by reference to stage of the run
1	vasoconstriction;		
2	(constriction / AW) of arterioles ; **A** arteries		
3	decrease in supply of blood to skin capillaries ;		
4	ref. to shunt vessels ;		
5	to increase supply of blood to muscles ;		
6	no / little sweat ;		**R** constriction of capillaries / blood vessels / veins
	later as body temperature increases		
7	vasodilation ;		
8	(relaxation / AW) of arterioles ; **A** arteries		
9	increase in supply of blood to skin capillaries ;		
10	(causes) loss of heat ;		
11	by, conduction / convection / radiation ;		**R** constriction of capillaries / blood vessels / veins
12	increase in blood flow to sweat glands ;		
13	increase production of sweat ;		
14	loss of heat by evaporation ;	[max 5]	
		[Total:14]	

<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3 (a)</td><td>NB: <u>one</u> mark for <u>sites of production</u>
<u>one</u> mark for <u>two</u> 2º sexual characteristics for <u>testosterone</u>
<u>one</u> mark for <u>two</u> 2º sexual characteristics for <u>oestrogen</u>
<table>
<tr><td>sex hormones</td><td></td><td>testosterone</td><td>oestrogen</td></tr>
<tr><td>site of production</td><td></td><td>testis / testes / testicles</td><td>follicle / ovary ;</td></tr>
<tr><td>secondary sexual characteristics</td><td>1</td><td>any two
• hair on face
• body / pubic, hair
• increase in muscles
• growth of genitals</td><td>any two
• growth of breasts
• body / pubic, hair
• hips widen
• fat deposition ;</td></tr>
<tr><td></td><td>2</td><td>• growth of vocal cords / larynx / deep voice
• broad shoulders;</td><td></td></tr>
</table></td><td>[3]</td><td></td></tr>
<tr><td>(b) (i)</td><td>pituitary (gland) ;</td><td>[1]</td><td></td></tr>
<tr><td>(ii)</td><td>ovary ;</td><td>[1]</td><td></td></tr>
<tr><td>(c) (i) 1
2
3
4
5</td><td>increasing concentration, days 0 to 2 / 3 ;
(then) decreases until day 10 –13 ;
peak at, ovulation / middle of the cycle / day 14 ;
decreases / low concentration from days 14 to 22 / 23 / 24 ;
(then) increases from day 23 / 24 ;</td><td>[max 3]</td><td>A ref. to levelling out 6 –10 / 11 as part of overall decrease MP2

MP3 need peak / max / highest / AW not just up / down</td></tr>
<tr><td>(c) (ii) 1
2
3
4
5
6</td><td>FSH stimulates follicle (cells) ;
to grow ;
to secrete oestrogen ;
ref. to, development / maturation of egg ;
correct reference to subsequent effect on, oestrogen / LH at ovulation ;
low FSH after ovulation, prevents further follicle stimulation ;</td><td>[max 3]</td><td></td></tr>
<tr><td colspan="2"></td><td>[Total: 11]</td><td></td></tr>
</table>

Question	Expected Answers	Marks	Additional Guidance
4 (a) 1 2 3	A^C A^Y ; A^CA^Y ; orange-red ;	[3]	**R** – A^cA^c etc **A** – A^c , A^c **MP2** relies on correct **MP1**, allow ECF **MP3** stands alone (**A** orange)
(b)	cross / genotypes of offspring 2 offspring x offspring / A^CA^C , A^YA^Y , A^CA^Y ; 3 offspring x crimson-flowered plant / A^CA^C , A^CA^Y ; 4 offspring x yellow-flowered plant / A^YA^Y, A^CA^Y ;	[3]	Allow ECF from Question 4a
(c) 1 2 3 4 5 6 7	phenotype of A^CA^Y (offspring of cross 1) is different from either parent / homozygote genotype / AW ; the phenotype, was intermediate / mixture of two colours ; both alleles are expressed ; co / incomplete dominance ; offspring of cross 2 gives three phenotypes not two ; offspring of crosses 3 and 4 both give two phenotypes ; if dominance then cross 3 or 4 would give one phenotype only ;	[max 3]	**MP2** orange / red must be qualified **MP3 R** genes

Question	Expected Answers	Marks	Additional Guidance
(d) 1	transfer of pollen from, anthers / stamen , to stigma ;		**R** fertilisation
2	self = within same flower (or flower on same plant);		
3	cross = between flowers on different plants (of same species) ;	[2]	**MP2**, **3** need ref to **flowers** at some point
(e) 1	limited / little, variation ;		**R** no variation
2	offspring become homozygous (over time) / AW ;		**MP2** – **A** ref to inbreeding / limited gene pool
3	variation is due to mutation ;		
4	low chance that mutations will be expressed / AW ;		
5	offspring will be well adapted to conditions, locally / near parent ;		
6	if environment does not change ;		
7	limited / no, opportunity for evolution, if environment changes / example of change / will not be able to adapt to change in the environment ;		**MP7 A** ref to disease in context (as a change)
8	AVP ; e.g. some variation due to meiosis / reduced variation leads to intraspecific competition locally	[max 4]	**R** parents resistant, therefore offspring resistant /AW
	[Total: 15]		

Question	Expected Answers	Marks	Additional Guidance
5 (a)	*for*		**NB:** Max 2 (argument for)
1	(fluoride) helps to strengthen tooth <u>enamel</u> ;		
2	available to all / treats whole population ;		
3	free (to people) / cheap to supply ;		
4	AVP ;		
	against		**NB:** Max 2 (argument against)
5	ref. to allergies / qualified side effects ;		
6	bad taste (in water) ;		**MP5** ONLY accept these possible side effects: gastric disturbance / AW, cardiovascular problems, headache, fits
7	dosage not controlled for individuals / no individual choice ;		
8	mottled / discoloured teeth / fluorosis ;		
9	AVP ;	[max 3]	**MP8 A** any colour effect here
(b)	*sugar consumption*		
1	Chile – increased to 1997, decreased (slightly) ;		**MP1 A** peaks in 1997
2	Australia – increased to 2000, decreased / decrease till 1995, then steady ;		**MP2 A** peaks in 2000
3	any **two** figures with units **and** years ; *either for the same country or for both countries*		**MP3 A** units given only once
	tooth decay		
4	Chile – decreases 1977 to 1990, then increases to 1995 ;		
5	Chile – decreases from 1995 / AW ;		**MP4 A** peaks in 1995
6	Australia – keeps decreasing (from 1977) ;		
7	**any** two figures **with** units and years ; *either for the same country or for both countries*	[max 4]	**MP7 A** units given only once **A** a difference in tooth decay for any two years

Question	Expected Answers	Marks	Additional Guidance
(c) **1**	sugar remains on teeth ;		
2	bacteria, grow on teeth / feed on sugar / form plaque ;		
3	bacteria respire ;		
4	(lactic) acid formed ;		
5	wear away <u>enamel</u> ;		
6	exposes softer dentine ;		
7	AVP ;	[max 4]	
(d)	*similarities (tooth decay decreases in both countries)*		**NB:** All explanations should be qualified
1	decrease in tooth decay is not related to decrease in sugar consumption ;		
2	better, oral hygiene / dental care / awareness / AW ;		
3	diet contains less sugar / reduction in sugary drinks for children ;		
4	fluoride toothpastes ;		
5	AVP ;		
	differences (tooth decay in Australia decreases before that in Chile / tooth decay in Australia is lower than in Chile)		
6	fluoridation (of water supply) in Australia may be responsible ;		**MP6** – ORA Chile
7	better dental service / awareness / education in Australia / AW ;		
8	AVP ;	[max 3]	
		[Total: 14]	

<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>6 (a) 1
2
3</td><td>broad leaves ;
network of veins ;
five petals ;</td><td>[3]</td><td></td></tr>
<tr><td>(b)</td><td>one mark for mesophyll cells, one mark for guard cell

NB: Each extra tick (over 3) penalise by one mark

<table>
<tr><th>features</th><th>cells that carry out photosynthesis</th></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td>✓</td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td>✓ ;</td></tr>
<tr><td>F</td><td>✓ ;</td></tr>
<tr><td>G</td><td></td></tr>
</table></td><td>[2]</td><td>NB: B + E = 1 mark
F = 1 mark</td></tr>
</table>

Question	Expected Answers	Marks	Additional Guidance
(c) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	upper epidermis is transparent / thin ; lets light through to palisade, cells / mesophyll ; palisade cells with many chloroplasts ; **A** lots of chlorophyll absorb as much light as possible / AW ; palisade cells arranged lengthways ; less cell walls to scatter light / AW ; palisade cells close together ; absorb as much light as possible ; spaces in spongy mesophyll ; allow (diffusion of) carbon dioxide to mesophyll cells ; **A** each cell has surface for gas exchange guard cells / stomata ; allow (diffusion of) carbon dioxide into leaf ; xylem ; to provide water (as raw material) ; phloem ; to remove products of photosynthesis ;	[2 + 2]	**NB:** Paired MPs (i.e. explanation must be linked to correct feature) If a letter is given rather than named feature then allow the explanation mark if relevant **MP3** – need ref. to **more**, lots of / AW **MP4** – light qualified – much as possible etc.
(d) (i)	<u>sucrose</u> ; **R** sugar amino acids ; hormones / plant growth substances / auxin(s) ;	[max 2]	
(ii)	leaf ; two of the following for one mark stem, root, bud, flower, fruit, seed, storage organ ;	[2]	
		[Total: 13]	