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

0610/31 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	Mark	Additional Guidance
1 (a)	*from the top* capillary ; epithelium / goblet cell(s) ; lacteal / lymph(atic) vessel / lymph(atic) capillary ;	[3]	***ignore*** *blood vessel* ***ignore*** any qualification of epithelium e.g. ciliated epithelium **R** lymph unqualified
(b) 1	(contracts to) move villus ; *MP 2, 3 and 4 must be linked to the idea of movement*		**A** side to side / up and down / waves about **R** 'push the food along', 'support', 'keeps it in place'
2	*idea that* exposes villus to more food / changes surface area ;		**A** change the shape
3	increases / helping / AW, absorption ;		absorption must be qualified in some way
4	increase / maintain, diffusion / concentration, gradient ;		***ignore*** assimilation
5	(helps to) empty lacteal / move blood / move lymph ;	[max 2]	
(c)	*either* active transport ; **A** absorption against concentration gradient / uses energy / needs ATP / ref. to carrier molecules / ref. to protein pumps ; *or* respiration ; used for energy / release of energy ; **R** produce energy	[max 2]	*one mark for the process and one mark for the explanation* *allow idea that the concentrations are the same (initially) so can't be diffusion / must be active transport*

Question	Expected answers	Mark	Additional Guidance
(d)	*small intestine*		*if bag not identified assume 'it' is the small intestine*
1	*idea that* glucose, taken up by cells / moved outside bag **;**		
2	lower water potential outside bag **; A** ora		
3	water, moves / diffuses, out of bag **;**		
4	by osmosis **;**		
	Visking tubing		
5	no difference in, water potential / concentration **;**		
6	no (net), osmosis / diffusion of water **; R** 'no diffusion'	[max 3]	
(e) (i)	stomach **;**	[1]	
(ii)	small intestine / ileum / duodenum **;**	[1]	
(iii) 1	for breakdown of (large / insoluble) food (molecules) / hydrolysis **;**		
2	(used in) chemical digestion **;**		
3	solvent / for dissolving, enzymes / named secretion **;**		**A** alkali / bile (salts) / named enzyme(s)
4	solvent / for dissolving, food **; A** named small food molecule(s) *could be either soluble components of food or products of digestion*		glucose / sugar / amino acids / fatty acids / glycerol / vitamins / minerals / ions
5	softens food **;**		
6	makes it easier to move food (in alimentary canal) / AW **;**		**A** acts as a lubricant
7	makes it easier to, chew / swallow / egest **;**	[max 3]	
(iv)	*prevents*		***if none of the expected answers accept***
1	loss of, large volume of / lots of water **;**		**5** any function of water in the body for max 1
2	loss of, ions / salts (in solution) **;**		e.g. transport / sweating / excretion / solvent / medium for reactions / reactant
3	diarrhoea **;**		**R** 'turgidity of cells' / respiration
4	dehydration / ora **;**	[max 2]	
		[Total: 17]	

Question	Expected answers	Mark	Additional Guidance
2 (a)	**A** – excretion / egestion / defaecation **;** **B** – nitrification / oxidation **;**	[2]	**R** death **A** 'nitrify' / ***ignore*** bacteria
(b) 1	root nodules contain, bacteria / *Rhizobium* **;**		***ignore*** incorrect name or type of bacteria
2	(bacteria) fix nitrogen / nitrogen fixation / nitrogen fixing **;**		**R** if root nodules fix nitrogen
3	form, ammonia / ammonium (ions) **;**		***ignore*** nitrate / **R** if occurs in soil
4	provide, fixed nitrogen / ammonia / amino acids, to rest of, plant **;** **R** via soil		***ignore*** 'useful' nitrogen **A** useable nitrogen
5	(fixed nitrogen etc) needed for growth **;**		***ecf*** provide nitrate to plant if penalised in **MP3**
6	used to make, amino acids / proteins / DNA / RNA / chlorophyll / AW **;**		
7	(so) nitrogen made available to, animals / other organisms **;**		
8	AVP **;** *only for detail of any of the points above*	[max 4]	**R** chloroplast *do not allow anything for events that occur after bacteria or plants die*
(c)	*proteins in* ***cells***		
1	enzymes **;**		
2	control / catalyse, reactions / AW **;**		
3	e.g. respiration / photosynthesis **; A** ref. to any specific reaction(s)		**R** digestion unless clearly **inside** cell, e.g. in a phagocyte
4	(part of cell) membranes **;**		
5	carrier proteins / description of role allowing movement in and out of cell **;**		**A** protein pumps
6	haemoglobin **;**		**R** antibodies / hormones / collagen / keratin
7	transport of, oxygen / carbon dioxide / gases **;**		
8	making cytoplasm / (cell) growth **;**		
9	AVP **;** e.g. chloroplast / named organelle / providing energy	[max 3]	***ignore*** repair **R** produce / make energy
10	*DNA in* ***cells***		
11	ref. to, genes / alleles / genetic information / genetic code **;**		
12	control functions of the cell **;**		**R** hereditary material / AW
13	code for proteins **;**		**A** 'sends messages to the cytoplasm' / 'tells the cells what to do'
	AVP **;** e.g. a specific feature of cells / cell division / mitosis / meiosis	[max 2]	**A** ref. to mRNA

Question		Expected answers	Mark	Additional Guidance
(d)	1	<u>eutrophication</u> ;		
	2	growth of algae / algal bloom / weed growth ;		
	3	reduces light reaching other plants ;		
	4	algae / plants, die ;		e.g. from lack of light / no resources
	5	bacteria, decompose / feed on, dead plants ; **A** dead animals / 'eat'		**A** decomposers / fungi / microorganisms for bacteria
	6	<u>aerobic</u> respiration ; **A** aerobic bacteria		
	7	(bacteria cause) oxygen (concentration in water) to decrease ;		**R** decrease in oxygen if linked to less photosynthesis
	8	(so) fish / invertebrates / animals, suffocate / die / migrate ;		**R** change in pH / toxins as cause of death
	9	AVP ; e.g. any further detail or consequence of any of the above marking points, e.g. reduces biodiversity / destroys food chains	[max 4]	must be linked to shortage of oxygen (however caused)
			[Total: 15]	

Question	Expected answers	Mark	Additional Guidance
3 (a) 1	(amniotic) sac, contains / secretes, the amniotic fluid ;		**A** holds
2	sac, prevents entry of pathogens (from vagina) ; **A** 'disease'		
	amniotic fluid or amniotic sac		
3	supports fetus ;		**A** 'the baby'
4	protects / cushions, against, damage / sudden movements / bumps / AW ;		**A** 'shock absorber'
5	provides constant temperature / protects against fluctuating temperature ;		***ignore*** pH, **A** 'keeps the fetus warm'
6	allows fetus to move ;		**A** correct / suitable, temperature
7	needed for, bone / muscle, growth / development ;		
8	helps, lungs / gut, develop ;		
9	collects fetal, urine / waste / excretion(s) ;		***ignore*** egest
10	provides sterile environment / AW ;	[max 4]	
(b)	*functions of the placenta – one mark per line*		
1	ref to barrier between blood systems / prevention of maternal and fetal blood mixing ;		
2	*idea that* protection against mother's immune system ;		
3	supply of oxygen (to fetus) ;		
4	loss of carbon dioxide (from fetus) ;		award one mark for idea of exchange if no ref. to any substance
5	loss of, urea / waste ; **R** urine		
6	protection against, pathogen(s) / named pathogen(s) ; **A** disease		**R** breathing
7	transfer of antibodies (from mother) ;		
8	supply of, nutrients / named nutrient(s) ; ***ignore*** 'food'		
9	supply / removes, water ;		
10	secretes, hormone(s) / named hormone(s) ;	[max 3]	progesterone / oestrogen / HCG
(c)	**A** – dilates / widens / expands / stretches ;		**ignore** 'relaxes' / 'opens'
	B – contracts ;	[2]	

Question	Expected answers	Mark	Additional Guidance
(d)	*advantages to max 3* provides, best / complete / most suitable / AW, food ; easy to digest ; no additives ; contains antibodies / ref. to colostrums / provides passive immunity ; provides protection against, pathogens / diseases / microorganisms ; further detail, e.g. diseases that the mother has had / common diseases ; sterile / no risk of infection from, formula milk / bottled milk ; is at, body / correct, temperature ; no preparation / always available ; bonding with mother ; it's free / 'cheap' ; reduce risk of allergies ; protects against, breast cancer / ovarian cancer ; helps the body to return to 'normal' ; e.g. weight loss / restores uterus contraceptive effect ; *possible disadvantages to max 3* transfer of, viruses / HIV / hepatitis B ; painful / sore nipples / mastitis ; stressful / may be embarrassing / AW ; mother may not be able to produce enough milk ; cannot see how much baby has consumed ; task cannot be shared with other parent ; medications / drugs / alcohol, can pass to baby ; AVP ;	[max 4]	**A** any suitable comment about nutrients **A** right composition for humans **A** temporary immunity / AW **A** named microorganism(s) **R** 'fights' disease **A** less likely to get diarrhoea
		[Total: 13]	

Question	Expected answers	Mark	Additional Guidance
4 (a)	**A – B**		
1	urea (concentration) decreases **;**		**A** 'passes out of blood' / 'passes into blood' / removed / taken out / diffuses in / diffuses out
2	water (content) increases / decreases **;**		
3	salt (concentration), decreases **;**		
4	ref to, glucose / sugar **;** *could be increase, decrease or stays the same*	[max 2]	**A** minerals / any named salt *or* ion
(b)	*advantages of transplants*		
1	long term solution / person no longer needs (regular) dialysis **;**		**A** 'doesn't need to go to clinic / hospital'
2	an example of a disadvantage of dialysis **;** **A** pain / tiring / discomfort / takes a long time / fails eventually		**MP2** is medical issue **A** any appropriate blood borne disorder
3	increased freedom / better quality of life / ora **;**		**MP3** is social issue
4	better / more efficient, control of composition of blood **;**		
5	can have wider diet / ora **;**		
6	ref. to cost or economic benefit – to health service *or* to individual **;**	[max 3]	**MP6 R** cost unqualified **A** 'dialysis machine available for others'
(c) (i)	I^AI^O x I^BI^O **;** *accept:* AO x BO **;**		**R** one I for the genotypes, e.g. I^{AO}
	I^A , I^O + I^B , I^O **;** A , O + B , O **;**		gametes must be derived correctly from the parental genotypes
	I^OI^O , (blood group) O **;** OO , (blood group) O **;**		written explanation may be written in terms of parents pass on the allele I^O ***ignore*** gene for allele
	(allele) I^O recessive to I^A and I^B **;** (allele) O recessive to A and B **;**		
	parents must both, have I^O / O / be heterozygous **;**	[max 4]	
(ii)	25% / 0.25 / ¼ / 1 in 4 **;**	[1]	**R** a ratio e.g. 1:3
		[Total: 10]	

Question	Expected answers	Mark	Additional Guidance
5 (a)	$6CO_2 + 6H_2O$; → $C_6H_{12}O_6 + 6O_2$; correctly balanced ; if no marks for the balanced equation allow one mark for correct word equation if given	[3]	*correct equation = 3 marks* *if formulae of molecules are correct but equation is not correctly balanced = 2 marks* *with one mark for each side of the equation*
(b)	features / functions **A** transparent to allow light to penetrate into the leaf **B** *max one* open / close, stoma(ta) ; allow movement of, gas(es) / oxygen / carbon dioxide / <u>water vapour</u> ; allows / controls rate of, transpiration ; ***ignore*** gas exchange / movement of air **C** absorbs light / photosynthesis / starch *or* sugar production ; **D** buoyancy / floating / diffusion *or* movement of gas *or* named gas ;	[3]	*if more than one function given in a box, take the first answer. If this is contradicted by the second answer then award 0.* **A** controls size of stoma(ta) **A** for (named) gas to, enter / leave ***ignore*** gas exchange **R** gas(es) in and / or out

Question	Expected answers	Mark	Additional Guidance
(c) 1 2 3 4 5 6 7 8	large air spaces / large spongy mesophyll ; **A** alternatives for large for, buoyancy / floating ; leaves float ; efficient at absorbing light / 'gets more light' / AW ; stomata in upper, surface / epidermis ; **A** ora diffusion / movement, of gas / gases (from the air) ; **R** 'stops entry of water' thin cuticle ; no need to reduce water loss by transpiration ;	[2 max]	*mark **first** 'way' only* *marking points are in pairs – only one pair is needed to gain the two marks* ***ignore*** gas exchange in this question **A** 'top of the leaf' / 'at top' **R** transpiration ref. ***ignore*** ref. to stomata on lower surface and uptake of water
(d) (i)	*effect of decreasing concentration of magnesium salt* fewer plants / smaller number of plants / reduction in number / less (asexual) reproduction ; **R** ref. to survival *data quote* number of plants from two stated concentrations with unit ; plants, were yellow / had yellow spots (at lower concentrations) / ora ; ref. to yellow spots at 0.15 *or* 0.10 / nearly all yellow at 0.05 mg dm^{-3} ;	[max 3]	must be a clear statement that this is about the number of plants, do not accept numbers alone for this point **A** 'highest' and 'lowest' concentrations without units
(ii) 1 2 3 4	magnesium required for making <u>chlorophyll</u> ; <u>chlorophyll</u> gives (leaves) green colour / without <u>chlorophyll</u> (leaves) are yellow ; less photosynthesis / cannot produce (much), food / glucose ; (so) less, food / glucose / AW, therefore less growth ;	[max 3]	**A** 'magnesium is needed for chlorophyll' **A** (less magnesium) less chlorophyll is made **A** 'no photosynthesis' **R** chlorophyll is needed for photosynthesis **A** 'no food, therefore no growth'
	[Total: 14]		

Question	Expected answers	Mark	Additional Guidance
6 (a) (i)	*either* insects 1 and 2, are in the same genus / have the same generic name ; (both have) *Vespula* ; *or* insect 3 is in a different genus ; (its name is) *Callicera* ;	[max 2]	***ignore*** any references to the species
(ii)	*insects 1 and 2* have two pairs of wings ; have antennae that are, long(er) / same shape / thick ; have small(er) eyes ; have stripes / have a pattern / have similar markings ; any correct reference to size ; e.g. 'they have similar size' AVP ; e.g. similar shape of abdomen	[max 2]	**R** any feature of 1 and 2 that is said to be 'similar' unless qualified **A** four wings **R** two wings **A** 'feelers' / bent shape **R** stripes on thorax **R** similar shape unqualified
(b)	predators / other animals, mistake it for, *Vespula* / *V. flavopilosa* ; predators / other animals, recognise, warning appearance / stripes / AW ; 'fear of' painful sting / frightened of being stung ; do not eat it / avoid it / do not attack it / do not go near it ;	[max 2]	
(c) 1 2 3 4 5 6 7 8	mutation ; gives stripes ; (some) stripey insects were not, eaten / killed (by, predators / other animals) ; survived ; to, breed / reproduce / mate ; pass on the allele(s) for stripes (to next generation) ; **A** gene(s) non-stripey insects, did not survive / became extinct / died out ; (natural) selection ; **A** ref. to selected for / selected against	[max 5]	**R** camouflage
	[Total: 11]		