CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0438 BIOLOGY (US)

0438/33 Paper 33 (Extended), 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 May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

	Answer	Marks	Guidance for Examiners
1 (a)	DNA / genome is the same / similar ; genes are same ; AVP ; e.g. ref to DNA bases / sequence, same / similar	[max 2]	
(b) (i)	**1** mitosis ; **2** no fertilisation ; **3** budding off (of spores) / fragmentation ; **4** vertical hyphae ; **5** production of spores ; **6** sporangium bursts / opens / releases ; **7** ref to number of nuclei per spore ; **8** method of spore dispersal i.e. air / water / wind ; **9** AVP ; e.g. DNA replication	[max 3]	
(ii)	(named) favourable characteristics of parent passed on ; dense colonies outcompete other species ; rapid ; less, energy / resources used ; no gametes ; *idea of* only one parent required ;	[max 3]	
		[Total: 8]	

2 (a)		NO_x / nitrogen dioxide / nitrous oxide / NO_2 / NO_3 ; carbon dioxide ;	[max 1]	
(b)	1 2 3 4 5 6 7 8	kills / damages (named) plants ; (acidic) soil leaching AW ; released (named) metals ; e.g. aluminium nutrients in soil no longer available to plants ; prevents decomposition ; dissolves limestone / marble / sandstone AW ; acidification of lakes ; (fresh water) fish / invertebrates die ;	[max 3]	
(c)	1 2 3 4 5 6 7 8	scrubbers / flue gas desulfurisation, in power stations / chimneys / neutralise waste gases with lime ; desulfurisation of coal / oil ; use less fossil fuels ; use low sulfur, fuel / petrol / diesel ; use alternative / renewable / sustainable / green sources of energy ; A gas-to-liquid (methane to petrol / diesel) catalytic converters / use electric cars ; any one method to reduce demand for energy ; idea of international treaty for reducing emissions ;	[max 3]	
2 (d) (i)		sharp decrease in both, until 1997 ; more gradual decrease in both, since 1997 ; both follow same trend ; comparative use of data ;	[max 3]	
(ii)		fresh mass changes with water content ; dry mass is less variable / more consistent, for comparison ; dry mass is a measure of growth ; *idea that* percentage standardises changes in tissue concentration for comparison ;	[max 2]	
			[Total: 12]	

3	(a)		(the ability to) detect / sense, changes in the environment / stimuli ; to respond / react (to those changes) ;	[2]	
	(b)		(voluntary action) involves (brain in) decision making / conscious ; (voluntary action) is slower ; (voluntary action) not reflex / automatic ; (voluntary action) can be learned ; (voluntary action) can give different responses to same stimulus ;	[max 2]	
	(c)		sensory (neurone) ;	[1]	
	(d)		1st swimmer(s) slower (than rest) ; appropriate use of data, swimmer 1 v. 2 / 3 / 4 ; (mean) reaction times for swimmers 2 – 4 similar ; AVP ; swimmer 3 team 2 is an anomaly / outlier	[max 3]	
	(e)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11**	heart rate / pulse increase ; increase in breathing rate / depth ; heighten alertness / faster reaction time / AW ; vasodilation in muscle ; vasoconstriction in digestive system ; diverts blood to muscles / away from digestive system ; (leads to) glycogen to glucose (in liver) ; increased blood glucose (concentration) ; airways expand / increased ventilation ; more respiration for more energy for muscle contraction ; enables faster swimming / enhanced physical performance ;	[max 3]	

4 (a) (i)	pollen / male gamete ;	[1]	**R** gamete unqualified
(ii)	chromosome number halved / becomes haploid ; genetic / DNA variation ; new combinations of alleles ; fertilisation restores diploid number in zygote / ensures number of chromosome remains constant in next generation ;	[max 2]	
(b) (i)	pollen from anther to stigma ; between different plants of same species ;	[2]	
(ii)	large petals ; pattern / guide lines on petals ;	[max 1]	
(c) (i)	temperature / warmth ; light ; water availability ; wind ; pollinator life-cycle timings ; CO_2 concentration ; pressure ;	[max 1]	
(ii)	influence by genes and environment ; range of phenotypes / flowering times results ; (flowering time) is measurable ;	[max 2]	

(d)	1 2 3 4 5 6 7 8 9 10	different environments have different selection / competition pressures ; variation occurs (at fertilization / meiosis) ; ref to mutation ; best adapted organisms most likely to survive ; (those that survive) pass on their alleles / genes ; competition for survival ; cross pollination ensures more variation (than self-pollination) ; reproductive isolation (by different flowering times) ; changes enhanced over generations ; no cross-pollination between low and high altitude plants ;	**[max 5]**	**A** Survive and reproduce *Idea of* best adapted
			[Total:14]	
5 (a)	**E** – cortex ; **F** – medulla ; **G** – ureter ;		**[3]**	
(b)	1 2 3 4 5 6	(ultra)filtration ; high blood pressure assists filtrate to pass through glomerulus / capsule ; proteins / blood cells, too big to move out of capsule / glomerulus ; filtrate / named example, small enough to move through ; filtrate consists of water and dissolved salts / ions / named ion / glucose / urea ; ref to capillaries ;	**[max 3]**	
(c)	movement of (ions / large molecules) through the cell membrane ; (ions/large molecules) against a concentration gradient ; using energy (from respiration) ; use of protein / carrier in membranes ;		**[max 2]**	**R** along the concentration gradient
(d)	water ; salt(s) / ions / minerals / named ion ;		**[max 1]**	

(e) (i)

Substance	Blood before dialysis	Concentration in **used** dialysis fluid	Concentration in fresh dialysis fluid
glucose	normal	same	same ;
salt	high	high	low ;
urea	high	high	none ;
toxins	high	high	low

[max 3]

(ii)

1 dialysis membrane is partially permeable ;
2 minerals / salts / ions / urea, move by diffusion ;
3 from high concentration to low concentration / down a concentration gradient ;
4 water, moves by osmosis ;
5 (osmosis is the movement of water) from high water potential to low water potential across membrane ;
6 proteins / blood cells too large to move across membrane ;
7 glucose is not removed by dialysate (same concentration) ;
8 fresh dialysate maintains a concentration gradient ;

[max 4]

(f)

fewer diet / fluid intake restrictions ;
no need for regular visits to hospital ;
less unwell / tired / nausea / headaches / less pain (after surgery) ;
no needles / no fistula, permanently in arm ;

[max 3]

(g)

avoid rejection ;
stop immune system attacking new kidney ;

[max 1]

[Total: 20]

6 (a)

	part of cycle	carbon compound found in each part
P	atmosphere / air	carbon dioxide / CO_2 ; **R** carbon monoxide
Q	(named) plant(s) / flora / producers	glucose / $C_6H_{12}O_6$ / starch / cellulose / any organic compound found in plants ; **R** glycogen
R	(named) animal(s) / fauna / consumers	glucose / maltose / glycogen / fats / fatty acid / glycerol / amino acid / protein / nucleic acid ; **R** starch
S	(named) decomposer(s) / saprophytes	glucose / glycogen / fats / fatty acid / glycerol / amino acid / protein / nucleic acid ;
T	fossil fuels, e.g. natural gas	Methane

[max 4]

(b)

1 CO_2 enters leaf ;
2 CO_2 diffuses to (cells) ;
3 carbon dioxide and water / $CO_2 + H_2O$;
4 chlorophyll / chloroplasts, traps light energy ;
5 light energy is used to make glucose / carbohydrates ;
6 oxygen is present ;
7 $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$;

[max 5]

(c)	1 2 3	***factor:–*** light intensity **or** duration / carbon dioxide concentration / temperature **;** ***effect of factor:–*** less photosynthesis, due to low light / low CO_2 / non optimum temperature **;** ***explanation:–*** light provides energy / CO_2 substrate for photosynthesis / temperature effects enzyme activity **;** ref to limiting (factor) **;**	**[max 3]**	
(d)		***carbon dioxide (enrichment)*** **–** burning / CO_2 gas cylinder **;** ***light (intensity)*** **–** supplemental / artificial lighting / shading **;** ***temperature*** **–** heating / cooling / ventilation / spray water **;** ***water*** **–** irrigation / watering / hydroponics described **;** ***pests / disease*** **–** (named) pesticides / biological control of pests **;** ***minerals (named)*** **–** hydroponics / added to water supply / soil **;** ***humidity*** **–** limiting ventilation / watering / humidifier or de-humidifier **;** ***pollination*** **–**adding insect (named) pollinators **;**	**[max 3]**	Mark is for the mechanisms of control in each case
			[Total: 15]	