UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

0610 BIOLOGY

0610/32 Paper 32 (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.

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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.
<u>Small</u>	underlined words – this word only/must be spelled correctly
ORA	or reverse argument/answer
ref./refs.	answer makes appropriate reference to
AVP	additional valid point (e.g. in comments)
AW	alternative words of equivalent meaning
MP	marking point (number)

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Question	Mark scheme	Comments
1 (a)	feature / bacterium / virus / fungus produces spores / ✓ / × / ✓ hyphae / × / × / ✓ capsule / ✓ / × / × nucleus / × / × / ✓ [3]	one mark per row treat blank spaces and crossed ticks as crosses – if ticks and crosses and blanks in the same row, treat as incorrect allow 'yes' and 'no' for ticks and crosses
(b)	*treat independently* 1 (feeding) hypha(e) **;** **R** roots **ignore** mycelium 2 branched / branching **;** 3 has a large surface (area) **;** 4 grow, over / through / on / into, (named) food / substrate **;** 5 produce / release, enzymes **;** 6 external / extracellular / described, digestion **;** 7 absorb, food / nutrients / products / glucose / AW **;** [3 max]	*fungus may be saprotrophic or parasitic* **ignore** 'roots' when awarding points 2 to 7 *MP3 refers to fungus not food* **A** 'spread across' food, **A** substrate for food **R** excrete enzymes **R** digestion unqualified, **A** external implied **R** obtain **A** absorbed even if no digestion
(c)	1 spores **;** 2 carried in the, wind / air / atmosphere **;** **A** sporangium / 'sack' / AW, bursts / opens 3 grow, longer / more, (feeding) hyphae / mycelium spreads [2 max]	**A** blown / floats – as suggests in the air **A** new mycelium forms / mycelium increases in size *ecf for roots from **(b)***
	[Total: 8]	

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2 (a)	**A** epithelium / (epithelial) lining / single layer of cells **;** **B** lacteal **;** **A** lymph(atic), vessel / duct / tube **;** **C** capillary / blood vessel **;** [3]	**R** epidermis **R** lymph unqualified / lymph(atic) system
(b)	*microvilli* 1 increases / large, surface (area) **;** 2 for absorption **;** *mitochondria* 3 (for) respiration **;** 4 provide, energy / ATP **;** **A** 'cells need energy' 5 for active, uptake / transport **;** [4]	**A** diffusion / active transport (into villus) **R** produce / make, energy **A** movement of, vesicles / vacuoles **A** descriptions of AT e.g. against concentration gradient **R** microvilli 'sway' *or* 'waft' / movement of villi
(c) (i)	1 longer, shelf life / storage time **;** 2 enhances / improves, flavour / taste **;** 3 improves / AW, colour / appearance **;** 4 improves, texture / AW **;** **A** ref to emulsifiers / 'free running' 5 AVP **;** [2 max]	**A** 'food keeps longer' / preserves food / AW **A** refs to preventing decay / 'kills bacteria' **A** prevent / slows, oxidation **A** 'makes food more attractive' / 'stops food separating', comments on consistency e.g. tenderiser
(ii)	hyperactivity / described (in children) **;** **R** 'poor behaviour' tantrums / mood swings **;** cancer **;** **A** 'they are carcinogenic' migraines / headaches **;** dizziness / nausea / vomiting / diarrhoea **;** allergies **;** asthma / described as breathlessness or AW **;** nettle rash / urticaria / skin rash / eczema / dermatitis **;** rhinitis / runny nose / 'sniffling' **;** damage to fetus / birth defect **;** AVP **;** [4 max]	*there are no marks in **(i)** or **(ii)** for naming food additives; ignore names look for health risks only* **R** obesity, heart disease, tooth decay, circulatory problems, diabetes **A** difficulty with breathing **R** 'addiction' e.g. ulcers *or* liver / kidney / brain / nerve, damage
	[Total: 13]	

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3 (a)	1 kept temperature, constant / the same ; 2 water bath + thermometer ; 3 light intensity, constant / the same ; 4 bench lamp + fixed distance / 150 mm / same distance ; *also accept* 5 same volume of, water / hydrogen carbonate solution ; 6 keep for same length of time ; 7 same, species / type, of (pond) plant ; 8 same age of pond plant ; 9 similar / same, size / mass / number of leaves on, pond plant ; [4 max]	**A** 'thermostatic water bath' **R** light unqualified **A** same water level
(b) (i)	10 ; [1]	
(ii)	all points plotted accurately ; curved line of best fit / straight lines between points ; **R** one straight line of best fit [2]	 ***I*** *if line continues beyond first and last points because of* ***(d)***
(c)	*note that rate of photosynthesis is in the question* rate of photosynthesis / it, increases / AW ; carbon dioxide is, raw material / needed for photosynthesis ; <u>limiting</u> (factor) ; [2 max]	**I** comments on rate after 0.4% **R** positively correlated
(d)	**A** 19 – 23 ; [1]	**A** single number or range within 19 to 23 or three numbers within the range (if they think that they need to include repeats)
	carbon dioxide no longer the limiting (factor) ; other factor / light <u>intensity</u> / temperature / AW, is limiting (factor) ; ref. to extrapolating on the graph (to arrive at answer) ; [2]	**A** a description of this point in terms of an increase in the concentration of CO_2 not causing a change **R** water
(e)	*ideas that* carbon dioxide, (dissolved / present) in (tap) water ; carbon dioxide (dissolves) from the air above apparatus / AW ; carbon dioxide from (plant) respiration ; [1 max]	**A** 'it' for water as it's in the question
	[Total: 13]	

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4 (a)	**P** glomerulus / Bowman's capsule ; **Q** first convoluted tubule ; **R** collecting duct ; [3]	**R** if the letter is in white space around the diagram **R** if label line for **Q** ends in a capillary
(b)	osmosis ; **A** diffusion down / AW, (water) potential gradient ; **A** high to low antidiuretic hormone / ADH ; increases permeability of collecting duct walls ; [2 max]	***ignore*** osmoregulation **R** across / along gradient unless clear from use of 'high(er)' or 'low(er)' in the answer
(c)	<u>ureter</u> ; peristalsis ; stored in bladder ; <u>urethra</u> ; urination / micturition / correct ref to sphincter (muscle) [2 max]	*if two structures given, then they must be in the correct sequence*
(d)	deamination / described ; <u>excess</u> amino acids ; makes ammonia ; ammonia → urea / urea produced ; breakdown of, red blood cells / haemoglobin ; makes bile (pigments) / appropriate ref to bile ; production of carbon dioxide in respiration ; *max 2 for* breakdown of, hormones *or* drugs *or* alcohol *or* poisons *or* hydrogen peroxide ;;	**A** removal of, NH_2 / N-containing part ***ignore*** excess protein *note that ammonia must come from something* **R** bile salts **A** toxins / toxic materials / toxic substances, as alternatives for poisons
	[Total: 10]	

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5 (a)	phenotype **;** gene **;** haploid **;** mitosis **;** [4]	
(b)	*if there is an error in the genetic diagram allow ecf even if final phenotypes are NOT all different as stated in the question* $I^A I^o \times I^B I^o$ **;** $I^A, I^o + I^B, I^o$ **;** $I^A I^o, I^A I^B, I^B I^o, I^o I^o$**;** A AB B O **;** *blood types must match genotypes* [4]	**accept** IA, IB and IO for alleles A, B and O for alleles MP2 and 3 in Punnett square **ignore** spaces, commas or dots in diploid genotypes very little space between gamete genotypes **reject** I^{AB} etc as genotypes for parents or children I without A, B and o
(c)	1 two (or more) alleles **;** **R** two blood groups 2 two / both, are expressed / equally dominant / both dominant / give different phenotype **;** 3 in heterozygous / described (individual) **;** 4 AB, $I^A I^B$ (as example) **;** [3 max]	**A** two (or more) implied, e.g. 'neither' / 'each other' / 'both' **ignore** ref. to genes 'neither is fully expressed' = 1 mark for MP1 'neither is dominant over the other' = 2 marks **R** ref. to recessive <u>and</u> dominant **A** *idea* 'when both alleles are present in the genotype' **A** refs. roan cattle, pink flowers as other correct examples

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(d)	*accept converse statements* 1 used to treat diabetes (wherever in answer) **;** 2 insulin the same as human / uses human DNA / human gene / AW **;** 3 not rejected **;** **A** 'people not allergic' 4 no risk of, infection / disease (from animals) **;** 5 GE insulin can be, modified / improved / AW **;** 6 animals not killed / suitable for vegans **;** 7 cheaper / more readily available / produced quickly / constantly / large amounts / large scale **;** **R** 'easier' 8 ref. to bacteria reproduce quickly **;** 9 increasing numbers of people with diabetes / don't produce insulin **;** **A** don't respond to insulin [3 max]	MP2: e.g. animal insulin is 'foreign' / bovine insulin has three different amino acid residues from human insulin / porcine has only one different / insulin from dead animal, is not the same as human amino acid sequence can be modified **A** religious / ethical objections to using animals, but **not** to using GE insulin MP7 is related to production **A** animal insulin has to be obtained from animal soon after its death **R** refs. to side effects
(e) (i)	*note that this is 2 marks* plasmid **;** DNA / genes **;** [2]	**R** plasmic / plasma **R** nucleic acid unqualified by DNA
(ii)	(restriction) enzyme / endonuclease **;** **ignore** restrictive, etc human / insulin, gene / DNA **;** [1]	**R** incorrect enzyme, e.g. ligase **R** gene unqualified
	[Total: 17]	

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6 (a)	carbon ; hydrogen ; oxygen ; nitrogen ; sulfur ; [4 max]	**R** CHONS
(b)	1 N / nitrogen, fixation ; 2 bacteria / *Rhizobium* ; **R** 'nodules are bacteria' 3 convert, nitrogen / N_2 / AW, into, ammonia / NH_3 / ammonium / NH_4^+ / amino acid(s) ; 4 plants use (fixed) nitrogen to make, amino acids / proteins / AW ; [3 max]	N-fixing bacteria = 2 marks **R** to nitrite / nitrate **A** plants use NH_3 / NH_4^+
(c)	1 (dead plants) eaten by, animals / detritivores / scavengers ; 2 e.g. earthworms / termites / AW ; 3 ref. their faeces / increase in surface area ; 4 decay / decomposition ; **A** decomposers 5 by, bacteria / fungi / saprophytes / saprotrophs ; 6 break down proteins to amino acids ; 7 deamination ; 8 ammonia / NH_3 / NH_4 ; } 9 ammonia to <u>nitrite</u> ; } 10 <u>nitrite</u> to nitrate ; **A** one mark for ammonia to nitrate 11 nitrification / nitrifying bacteria ; 12 *Nitrosomonas* / *Nitrobacter* in correct context of nitrification ; [6 max]	 MP3 must be related to MP1 or 2 **A** even if linked to incorrect organism **R** if wrong type of bacteria (e.g. N-fixing) **A** if in context of MP1 or 2 but do not award twice protein → ammonia / AW = 1 mark if 6, 7, 8 not given **R** 'nitride' unless qualified by NO_2^- **R** nitrate unqualified by nitrite or ammonia

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(d)	1 light intensity ; **A** limited sunlight / lack + of sunlight / sunshine 2 light duration ; **A** day length 3 water / moisture availability ; **A** drought / flood / humidity / soil water 4 carbon dioxide, availability / concentration / tension / level ; 5 temperature ; 6 competition / overcrowding / space / weeds ; 7 grazing / herbivores / predation / primary consumers ; 8 pests ; 9 parasites / disease ; 10 use of (inappropriate) herbicides / nearby use of herbicides ; **A** drift of herbicides / weed killers 11 pollution / sulphur dioxide / acid rain ; 12 soil pH / depth of soil / type of soil / poor soil / oxygen in the soil ; 13 wind speed ; 14 salt concentration of soil ; [3 max]	**R** heat / warmth **R** oxygen unqualified
(e)	*accept ora with population starting to increase about day 40* 1 small population to start with ; 2 takes time for eggs to hatch ; 3 not enough food / soya bean plants not grown enough / AW ; 4 aphids, not sexually mature / cannot breed / finding mates ; 5 too cold / too wet / AW (another appropriate weather condition) ; 6 ref. to, predators / ladybirds ; 7 ref. to, parasites / disease ; 8 ref. to, pesticides / insecticides ; 9 no immigration ; 10 competition (between aphids, with another pest) ; 11 AVP ; [3 max]	*do not expect knowledge of aphid biology* ***I*** *names of phases (lag, log)* ***I*** *'adjusting to surroundings'* refs. to soya must refer to food for aphids **A** few soya plants / competition for food / soya grows slowly **R** unfavourable conditions unqualified (e.g. correct ref. biotic and abiotic factors)
	[Total: 19]	

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