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CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0610 BIOLOGY

0610/42

Paper 4 Theory (Extended), maximum raw mark 80

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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

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Question	Expected answers	Mark	Additional Guidance
1 (a) (i)	A cytoplasm ; B nucleus ;	[2]	
(ii)	forms a barrier between the cell and its surroundings ; keeps contents of cell inside ; allows / controls / (movement of) substances, into / out, of the cell / across membrane ;	[max 1]	
(iii)	irregular shape / rounded shape / not columnar / not cylindrical / not rectangular / no specific shape ;	[1]	A ORA if palisade cell specified
(b)	large surface area ; more surface for respiration ; allows, increased / faster / efficient, respiration ;	[max 1]	A more surface area for enzymes
(c)	1 mitochondria are site of <u>aerobic</u> respiration / production of (most of the) ATP ; 2 liver cell / heart cell, is very active / use lots of energy / respire more ; 3 e.g. function of liver cell or heart cell ; 4 sperm cells, are active / swim / beating flagella ; 5 sperm cells have few mitochondria, as they are small ; 6 red blood cells, full of haemoglobin / more space for oxygen / AW ; 7 red blood cells, use less energy / do not actively move ;	[max 4]	mpt 1 I respiration R anaerobic mpt 3 e.g. active transport / making enzymes / making bile / muscle contraction / heart pumping mpt 4 I move unqualified mpt 7 I do not need any energy
		[Total: 9]	

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Question	Expected answers	Mark	Additional Guidance
2 (a)	ADCFBGE	[1]	
(b)	1 <i>ref to</i> chemical neurotransmitter ; 2 from / in, vesicles / sacs ; 3 neurotransmitter <u>diffuses</u> ; 4 across synaptic <u>cleft</u> / <u>gap</u> ; 5 neurotransmitter binds with receptors ;	[max 3]	A named neurotransmitter mpt 3/5 R impulse
(c) (i)	sleeplessness ; hallucinations ; muscle cramps / restless legs ; nausea ; vomiting ; headaches ; sweating ; aggression / agitation / restlessness / anxiety / mood swings / panic attacks ; AVP ; e.g. shivering / diarrhoea	[max 2]	I symptoms of use
(ii)	(addicts) turn to crime to finance their addiction / AW ; more opportunity to become drug dealers / mule / AW ;	[max 1]	
(d) (i)	1 harmless / dead / weakened / attenuated, (named) pathogen / microorganisms ; 2 injected / ingested ; 3 <i>ref to</i> antigens ; 4 antigen / vaccine, triggers antibody production ; 5 by lymphocytes ; 6 memory cells are produced ; 7 long-term immunity / rapid immune response ;	[max 4]	mpt 7 R resistance I permanent

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Question	Expected answers	Mark	Additional Guidance
(ii)	1 short-term defence against pathogens ; 2 no immune response/immediate protection/no memory cells produced / no antibodies produced by the body ; 3 from <u>antibodies</u> , acquired from elsewhere / AW ; 4 e.g. across placenta / breast-feeding / breast milk / colostrum / antitoxin / antivenom / tetanus injection / immunoglobulins ;	[max 2]	
		[Total: 13]	
3 (a)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$;;	[2]	1 mark for correct equation 1 mark for correct balancing
(b) (i)	4.1 (cm ³ per min) ;	[1]	
(ii)	a single line below the original curve on the graph and following the same shape ; line starts at origin ;	[2]	tolerance of ½ small square mpt 1: - no touching / crossing, lines - if line continues past beyond 6.0, must not drop or go above 4.1 cm³ per min - no feathery line
(iii)	enzymes denatured / yeast died ;	[max 1]	R enzyme killed / yeast denatured
(c)	(named) alcohol production ; producing biofuels / ethanol ; production of yeast extract ; GM yeast ;	[max 1]	I fermentation / baking

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Question	Expected answers	Mark	Additional Guidance
(d) (i)	<i>stirrer</i> keeps microorganism suspended/prevent it from sinking ; enables microorganisms to always have access to nutrients ; maintain even temperature ; to create uniform/even/homogenous mixture ; to form pellets of fungus/avoid mat formation ; <i>water-filled jacket</i> reduces heat energy/temperature ; maintains, a constant/suitable/optimum, temperature ; <i>probes</i> monitor/detect/measure, temperature/pH/gas concentration/pressure/ nutrients ;	[1+1+1] [3]	max 1 from each part <i>stirrer</i> I mixing unqualified I providing microorganisms with nutrients <i>water-filled jacket</i> A regulates temperature I cooling <i>probes</i> I controls/ensures
(ii)	prevent contamination ;	[1]	I ref to purity/impurities
		[Total: 11]	
(a)	1 overall carbon dioxide concentration increases ; 2 at a steady rate ; 3 there are minor fluctuations in carbon dioxide concentration ; 4 the fluctuations occur, regularly/yearly/seasonally ; 5 use of comparative figures with year and concentration with units ;	[max 3]	A gradual I constant
(b) (i)	methane ;	[1]	I carbon dioxide/carbon monoxide/ water unqualified. A other correct greenhouse gases

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Question	Expected answers	Mark	Additional Guidance
5 (a)	<i>canine</i> piercing/tearing the food ; <i>molar</i> chewing/grinding the food ;	[2]	A ripping / pulling I cutting / biting
(b) (i)	1 tiger has more pointed incisors / rabbit has less pointed incisors ; 2 tiger has canines / rabbit has no canines ; 3 tiger has jagged, premolars / molars ; 4 tiger has fewer molars / rabbits have more molars ; 5 rabbit has a diastema / (larger) gap between incisors and pre molars ;	[max 2]	mpt 1 I flat mpt 1 A chisel / wedge- shaped mpt 2 I tiger has more canines mpt 3 A rabbits have flat, premolar / molars A tigers have no, diastema / smaller gap between incisors and pre molars I ref to size (photo are not to scale)
(ii)	canines ; jagged, premolars / molars ; eyes positioned at the front of the skull ; pointed ridge / crest, on skull ;	[1]	I ref to incisors A carnassial / sharp for jagged I ref to absence of diastema
(c) (i)	$12/44 \times 100$ 27 ;;	[2]	
(ii)	<i>arguments for carnivore:</i> 1 has same number of incisors as, other carnivores / 5/6 ; 2 has same number of canines as, other carnivores 5/6 ; 3 has same number of molars as, 6/a carnivore ; <i>arguments against carnivore:</i> 4 same number of premolars as, herbivores / 3/4 ; 5 1/2/3 / some herbivores / omnivores, also have 12 incisors ; 6 1/2/3 / some herbivores / omnivores, also have 4 canines ;	[max 4]	

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Question	Expected answers	Mark	Additional Guidance
(d)	1 denatures enzymes in microorganisms ; 2 kills, microorganisms / (named) pathogens ; 3 optimum pH for <u>pepsin</u> activity ; 4 proteins are digested / broken down, to (poly)peptides / amino acids ;	[max 3]	R kills enzymes R denatures
(e)	1 villi lining / epithelium, only one cell thick / thin ; 2 good blood supply / many capillaries ; 3 <u>microvilli</u> ; 4 large surface area ; 5 lacteal for fats / fatty acid, absorption ; 6 protein channels ; 7 mitochondria for active transport ;	[max 3]	I villi is 1 cell thick
(f)	1 weight loss / poor growth / lack of energy / stomach pain / abdominal pain / cramps / diarrhoea / weaker immune system ; 2 <u>malnutrition</u> / <u>deficiency disease</u> ; 3,4 named, nutrient deficiency / effect, with deficient nutrient ;;; &5 e.g. anaemia → iron / vitamin B12 kwashiorkor → protein ; marasmus → all nutrients scurvy → vitamin C night blindness → vitamin A / retinol	[max 3]	I weak / sluggish
		[Total: 20]	
6 (a)	<u>Osteocephalus</u> ;	[1]	
(b) (i)	1 two strands twisted to form helix ; 2 cross-links between the strands ; 3 A joins with T / C joins with G ; 4 all labels correct ;	[max 3]	A base / sugar / deoxyribose / phosphate / hydrogen bond / nucleotide / crosslinks / double helix

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Question	Expected answers	Mark	Additional Guidance
(ii)	the sequence of bases in DNA are used ; base sequences / DNA / genes, that are more similar mean that organisms are more closely related ; ORA	[2]	I genetic material
(c) (i)	<u>gene</u> ;	[1]	
(ii)	1 mRNA carries a copy of the gene / DNA / base pair sequence ; 2 mRNA travel from the nucleus ; 3 to the ribosome / cytoplasm ; 4 order of amino acids depends on the sequence of bases in mRNA / AW ;	[max 3]	