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)	**A**DCFBG**E**	[1]	
(b)	**1** *ref to* 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** *ref to* 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 antibodies, 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 cm^3 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)	*stirrer* 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 ; *water-filled jacket* reduces heat energy / temperature ; maintains, a constant / suitable / optimum, temperature ; *probes* monitor / detect / measure, temperature / pH / gas concentration / pressure / nutrients ;	[1+1+1] [3]	max 1 from each part *stirrer* **I** mixing unqualified **I** providing microorganisms with nutrients *water-filled jacket* **A** regulates temperature **I** cooling *probes* **I** controls / ensures
(ii)	prevent contamination ;	[1]	**I** ref to purity / impurities
		[Total: 11]	
4 (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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<table>
<tr><th>Question</th><th>Expected answers</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>(ii)</td><td>1 radiation / light from the Sun hits, Earth / atmosphere ;
2 (named) short-wave radiation passes through carbon dioxide layer ;
3 re-radiated / reflected, from the ground as long-wave radiation / infrared / heat energy ;
4 long-wave radiation / infrared / heat energy, trapped / prevented from escaping from atmosphere by carbon dioxide ;</td><td>[max 3]</td><td>I climate change

mpt 3 A re-emitted</td></tr>
<tr><td>(c)</td><td><table>
<tr><td>mineral ion</td><td>function in plants</td><td>effect of ion deficiency on plants</td></tr>
<tr><td>nitrate</td><td>make amino acids / proteins / DNA / RNA / enzymes / chlorophyll ;</td><td>poor growth / lower leaves die early ;</td></tr>
<tr><td>magnesium</td><td>used to make chlorophyll / pigments ;</td><td>yellow leaves / chlorosis ;</td></tr>
<tr><td>phosphate</td><td>used for making DNA</td><td>poor root growth</td></tr>
</table></td><td>[4]</td><td>I reference to yields

I chloroplasts</td></tr>
<tr><td>(d)</td><td>1 fertiliser / nutrients, leached into / enter, rivers / streams / lakes ;
2 causing algal bloom / algae growth ;
3 algae block sunlight from entering water ;
4 so rooted plants unable to photosynthesise ;
5 so plants die ;
6 bacteria, decompose / feed, on dead plants ;
7 so bacterial population increase ;
8 bacteria respire aerobically ;
9 bacteria use up the oxygen in the water ;
10 organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ;</td><td>[max 6]</td><td>A decomposers for bacteria
R if incorrect reason
I bacteria breed unqualified</td></tr>
<tr><td></td><td></td><td>[Total: 17]</td><td></td></tr>
</table>

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Question	Expected answers	Mark	Additional Guidance
5 (a)	*canine* piercing / tearing the food ; *molar* 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 × 100 27 ;;	[2]	
(ii)	*arguments for carnivore:* **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 ; *arguments against carnivore:* **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)	gene ;	[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]	

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