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

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.

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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

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]	

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

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

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

<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>

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]	

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

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]	