GradeMax

**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 ;<br>**B** nucleus ; | [2] | |
| (ii) | forms a barrier between the cell and its surroundings ;<br>keeps contents of cell inside ;<br>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 ;<br>more surface for respiration ;<br>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 ;<br>2 liver cell / heart cell, is very active / use lots of energy / respire more ;<br>3 e.g. function of liver cell or heart cell ;<br>4 sperm cells, are active / swim / beating flagella ;<br>5 sperm cells have few mitochondria, as they are small ;<br>6 red blood cells, full of haemoglobin / more space for oxygen / AW ;<br>7 red blood cells, use less energy / do not actively move ; | [max 4] | **mpt 1 I** respiration **R** anaerobic<br>**mpt 3** e.g. active transport / making enzymes / making bile / muscle contraction / heart pumping<br>**mpt 4 I** move unqualified<br>**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 ;<br>**2** from / in, vesicles / sacs ;<br>**3** neurotransmitter <u>diffuses</u> ;<br>**4** across synaptic <u>cleft</u> / <u>gap</u> ;<br>**5** neurotransmitter binds with receptors ; | [max 3] | **A** named neurotransmitter<br><br>**mpt 3/5 R** impulse |
| (c) (i) | sleeplessness ;<br>hallucinations ;<br>muscle cramps / restless legs ;<br>nausea ;<br>vomiting ;<br>headaches ;<br>sweating ;<br>aggression / agitation / restlessness / anxiety / mood swings / panic attacks ;<br>AVP ; e.g. shivering / diarrhoea | [max 2] | **I** symptoms of use |
| (ii) | (addicts) turn to crime to finance their addiction / AW ;<br>more opportunity to become drug dealers / mule/ AW ; | [max 1] | |
| (d) (i) | **1** harmless / dead / weakened / attenuated, (named) pathogen / microorganisms ;<br>**2** injected / ingested ;<br>**3** *ref to* antigens ;<br>**4** antigen / vaccine, triggers antibody production ;<br>**5** by lymphocytes ;<br>**6** memory cells are produced ;<br>**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 **;**<br>**2** no immune response / immediate protection / no memory cells produced / no antibodies produced by the body **;**<br>**3** from antibodies, acquired from elsewhere / AW **;**<br>**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<br>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 **;**<br>line starts at origin **;** | [2] | tolerance of ½ small square<br>**mpt 1**:<br>• no touching / crossing, lines<br>• if line continues past beyond 6.0, must not drop or go above 4.1 $cm^3$ per min<br>• no feathery line |
| (iii) | enzymes denatured **/** yeast died **;** | [max 1] | **R** enzyme killed / yeast denatured |
| (c) | (named) alcohol production **;**<br>producing biofuels / ethanol **;**<br>production of yeast extract **;**<br>GM yeast **;** | [max 1] | **I** fermentation / baking |

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| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (d) (i) | *stirrer*<br>keeps microorganism suspended / prevent it from sinking ;<br>enables microorganisms to always have access to nutrients ;<br>maintain even temperature ;<br>to create uniform / even / homogenous mixture ;<br>to form pellets of fungus / avoid mat formation ;<br><br>*water-filled jacket*<br>reduces heat energy / temperature ;<br>maintains, a constant / suitable / optimum, temperature ;<br><br>*probes*<br>monitor / detect / measure, temperature / pH / gas concentration / pressure / nutrients ; | [1+1+1]<br><br>[3] | max 1 from each part<br>*stirrer*<br>**I** mixing unqualified<br>**I** providing microorganisms with nutrients<br><br>*water-filled jacket*<br>**A** regulates temperature<br>**I** cooling<br><br>*probes*<br>**I** controls / ensures |
| (ii) | prevent contamination ; | [1] | **I** ref to purity / impurities |
| | | **[Total: 11]** | |
| 4 (a) | **1** overall carbon dioxide concentration increases ;<br>**2** at a steady rate ;<br>**3** there are minor fluctuations in carbon dioxide concentration ;<br>**4** the fluctuations occur, regularly / yearly / seasonally ;<br>**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.<br>**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 ;<br>2 (named) short-wave radiation passes through carbon dioxide layer ;<br>3 re-radiated / reflected, from the ground as long-wave radiation / infrared / heat energy ;<br>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<br><br>mpt 3 A re-emitted</td></tr>
<tr><td>(c)</td><td><table>
<tr><th>mineral ion</th><th>function in plants</th><th>effect of ion deficiency on plants</th></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<br><br>I chloroplasts</td></tr>
<tr><td>(d)</td><td>1 fertiliser / nutrients, leached into / enter, rivers / streams / lakes ;<br>2 causing algal bloom / algae growth ;<br>3 algae block sunlight from entering water ;<br>4 so rooted plants unable to photosynthesise ;<br>5 so plants die ;<br>6 bacteria, decompose / feed, on dead plants ;<br>7 so bacterial population increase ;<br>8 bacteria respire aerobically ;<br>9 bacteria use up the oxygen in the water ;<br>10 organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ;</td><td>[max 6]</td><td>A decomposers for bacteria<br>R if incorrect reason<br>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*<br>piercing / tearing the food ;<br><br>*molar*<br>chewing / grinding the food ; | [2] | **A** ripping / pulling<br>**I** cutting / biting |
| (b) (i) | 1 tiger has more pointed incisors / rabbit has less pointed incisors ;<br>2 tiger has canines / rabbit has no canines ;<br>3 tiger has jagged, premolars / molars ;<br>4 tiger has fewer molars **/** rabbits have more molars ;<br>5 rabbit has a diastema / (larger) gap between incisors and pre molars ; | [max 2] | **mpt 1 I** flat<br>**mpt 1 A** chisel / wedge- shaped<br>**mpt 2 I** tiger has more canines<br>**mpt 3 A** rabbits have flat, premolar / molars<br>**A** tigers have no, diastema / smaller gap between incisors and pre molars<br>**I** ref to size (photo are not to scale) |
| (ii) | canines ;<br>jagged, premolars / molars ;<br>eyes positioned at the front of the skull ;<br>pointed ridge / crest, on skull ; | [1] | **I** ref to incisors<br>**A** carnassial **/** sharp for jagged<br>**I** ref to absence of diastema |
| (c) (i) | 12 / 44 × 100<br>27 ;; | [2] | |
| (ii) | *arguments for carnivore:*<br>**1** has same number of incisors as, other carnivores / 5 / 6 ;<br>**2** has same number of canines as, other carnivores 5 / 6 ;<br>**3** has same number of molars as, 6 / a carnivore ;<br><br>*arguments against carnivore:*<br>**4** same number of premolars as, herbivores / 3 / 4**;**<br>**5** 1 / 2 / 3 / some herbivores / omnivores, also have 12 incisors ;<br>**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 **;**<br>**2** kills, microorganisms / (named) pathogens **;**<br>**3** optimum pH for <u>pepsin</u> activity **;**<br>**4** proteins are digested / broken down, to (poly)peptides / amino acids **;** | [max 3] | **R** kills enzymes<br>**R** denatures |
| (e) | **1** villi lining / epithelium, only one cell thick / thin **;**<br>**2** good blood supply / many capillaries **;**<br>**3** <u>microvilli</u> **;**<br>**4** large surface area **;**<br>**5** lacteal for fats / fatty acid, absorption **;**<br>**6** protein channels **;**<br>**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 **;**<br>2 <u>malnutrition</u> / <u>deficiency disease</u> **;**<br><br>3,4 named, nutrient deficiency / effect, with deficient nutrient **;;;**<br>&5 e.g. anaemia → iron / vitamin B12<br>kwashiorkor → protein ;<br>marasmus → all nutrients<br>scurvy → vitamin C<br>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 **;**<br>**2** cross-links between the strands **;**<br>**3** A joins with T / C joins with G **;**<br>**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 ;<br>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 ;<br>**2** mRNA travel from the nucleus ;<br>**3** to the ribosome / cytoplasm ;<br>**4** order of amino acids depends on the sequence of bases in mRNA / AW ; | [max 3] | |

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