CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0610 BIOLOGY

0610/33 Paper 3 (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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Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- R reject
- I ignore (mark as if this material was not present)
- A accept (a less than ideal answer which should be marked correct)
- AW alternative wording
- underline words underlined must be present
- max indicates the maximum number of marks that can be awarded
- mark independently the second mark may be given even if the first mark is wrong
- A, S, P, L Axes, Size, Plots and Line for graphs
- O, S, D, L Outline, Size, Detail and Label for drawings
- (n)ecf (no) error carried forward
- ( ) the word / phrase in brackets is not required, but sets the context
- ora or reverse argument.
- AVP any valid point

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1 (a)</td><td>
<table>
<tr><th>structural feature</th><th>animal cell</th><th>plant cell</th></tr>
<tr><td>cell wall</td><td>×</td><td>✓</td></tr>
<tr><td>nucleus</td><td>✓</td><td>✓;</td></tr>
<tr><td>(cell) membrane</td><td>✓</td><td>✓;</td></tr>
<tr><td>cytoplasm</td><td>✓</td><td>✓;</td></tr>
<tr><td>chloroplast</td><td>×</td><td>✓;</td></tr>
<tr><td>(large) vacuole</td><td>×</td><td>✓;</td></tr>
<tr><td>vacuolar sap</td><td>×</td><td>✓;</td></tr>
<tr><td>vacuolar membrane / tonoplast</td><td>×</td><td>✓;</td></tr>
<tr><td>nuclear membrane</td><td>✓</td><td>✓;</td></tr>
<tr><td>nucleolus</td><td>✓</td><td>✓;</td></tr>
</table>
</td><td>max 4</td><td>mark nucleus and next 3 answers

R chlorophyll</td></tr>
</table>

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(b)	water moves (in) by <u>osmosis</u>; down a water <u>potential</u> gradient / from high water <u>potential</u> to low water <u>potential</u>; through partially permeable membrane; (both cells / vacuole) enlarge / swell / increase in volume; <u>animal</u> cell bursts; <u>plant</u> cell becomes turgid / AW;	**max 4**	**I** water concentration **A** semi / selectively **A** cell wall prevents bursting
(c) (i)	phloem;	**1**	
(ii)	(transport of sucrose out of the leaves) is low(er) in, **B** / magnesium-deficient plants; **ORA** any data quote about **B**; (sucrose concentration in the leaves) is high(er) in, **B** / magnesium-deficient plants; **ORA** any data quote about **B**;	**4**	assume "it" refers to B A – B = 2.4 – 2.6, A is 3 – 4 times more B > 100, A – B = approx 90, A approx 10 times more
(iii)	max 2 for symptoms yellowing leaves / chlorosis / necrosis; less / stunted, growth; more sugar in leaves**;** max 2 for explanation plants that are deficient in magnesium make, less / no, chlorophyll; less photosynthesis; less (named) sugar available to plant (due to reduce photosynthesis / reduced sucrose transport);	**max 3**	**I** stunted roots **A** magnesium is part of chlorophyll **I** energy / food (for sugar)
		[Total: 16]	

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2 (a) (i)

genetic term	example used in the passage
an allele	Hb^N / Hb^S;
a heterozygous genotype	Hb^NHb^S;
a homozygous genotype	Hb^S Hb^S;
phenotype	fatigue / extreme pain / sickle cell anaemia / mild symptoms;

4

A N / S, **R NS** and **N** × **S**

A NS

A SS

A the disease

(ii)

malaria, is severe disease / may be fatal;

idea that it is the selective agent / ref to (natural) selection;

people with sickle cell anaemia / Hb^S are resistant to malaria;

Hb^NHb^N / homozygous dominant, susceptible to malaria;

Hb^NHb^N more likely to die (of malaria) before have children (to pass on genes);

Hb^N Hb^S / sickle cell carriers, do not die from sickle cell anaemia;

Hb^N Hb^S / sickle cell carriers, have children (and pass on genes);

and pass on the (Hb^s) allele;

description of sickle cells are less prone to infection;

idea that no advantage of Hb^S in areas where no malaria;
AVP;

max 5

A reference to selective advantage for MP2
R immune for resistance (but **ECF** after first time)

A carrier for sickle cell trait

AVPs:
2 in 4 / ½ , have advantage of resistance to malaria;
(if Hb^N Hb^S × Hb^N Hb^S) 1 in 4 chance of, Hb^S Hb^S / homozygous recessive;

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(b)	(chromosome) mutation; an extra chromosome; non-disjunction / failure during meiosis / translocation;	**max 1**	**A** trisomy 21 **R** more than one chromosome **I** older mothers, inherited
(c)	discontinuous variation – influenced by genes alone; **ORA** discontinuous variation – no effect of the environment / does not change over (life)time; **ORA** discontinuous variation, is discrete / has no intermediates / is qualitative / AW; **ORA** limited number of <u>phenotypes</u>;	**max 3**	assume answer is about discontinuous unless stated otherwise continuous variation influenced by gene and environment = 2 marks (**MP1** and **MP2**) **A** continuous is measurable
		[Total: 13]	
3 (a)	increase in size / AW; increase in <u>dry</u>, mass / weight;; increase in number of cells; reference to permanent;	**max 3**	increase in dry mass = 2 marks **I** development **A** reference to cell division / mitosis / reproduction of cells or tissues **R** reproduction unqualified
(b) (i)	**A** – uterus; **B** – cervix; **C** – vagina;	**3**	**I** womb
(ii)	**D** – mitosis / cell division; **E** – implantation / AW;	**2**	**A** embedding / attachment **R** attachment to placenta **I** into uterus wall
(iii)	<u>peristalsis</u>; (waves of) contractions; ciliary action / described; movement of fluid (in oviduct);	**max 2**	**A** movement by (tiny) hairs **R** villi / microvilli
		[Total: 10]	

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4 (a)	have a nucleus; different composition of cell wall; can reproduce sexually; reproduce (asexually) by budding; larger in size; have mitochondria;	**max 1**	**I** hyphae **A** cell wall made of chitin **A** bacteria use binary fission
(b)	2 CO_2 ; 2 C_2H_5OH ;	**2**	**A** 2 C_2OH_6
(c) (i)	maintain constant temperature / prevent the temperature increasing or decreasing too much; prevents the enzymes (in yeast) being denatured; respiration (by yeast) releases heat;	**max 2**	 **A** for optimum temperature for, enzymes / (yeast) growth /fermentation **A** prevents yeast being killed by high temperature **A** reaction is exothermic
(ii)	used to make, amino acids / proteins; amino acids used to make proteins; e.g. enzymes;	**max 2**	**I** source of proteins / amino acids
(iii)	control pressure; allows carbon dioxide to escape; prevents oxygen entering; to keep respiration anaerobic; prevents entry of, bacteria / viruses / contaminants;	**max 2**	 **I** air / gas unqualified **A** anaerobic conditions **R** 'keep in clean' / AW
(d) (i)	lag phase / described; log / exponential, phase / described; stationary / plateau, phase / described; key data quote with mass <u>and</u> time;	**max 3**	units need to be used at least once 0 h, 1 g dm^{-3} (start) 0 – 1 h, 1 – 1.2 g dm^{-3} (lag) 1 h – 10 h, 1.2 – 6.5 g dm^{-3} (log) 10 h, 6.5 g dm^{-3} (stationary)

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<table>
<tr><td>(ii)</td><td>lag phase:
(dry) yeast adapting to the environment / AW;
yeast are reproducing / dividing;

log phase:
no <u>limiting factors</u>;
enough / plenty of, (named) nutrients;

stationary phase:
no more reproduction;
<u>limiting factors</u>;
none / reduction in, (named) nutrients;
build-up of, toxic waste / alcohol;
reference to carrying capacity;</td><td>max 3</td><td>e.g. glucose, sugar, ammonia, ammonium (compounds), minerals
A low alcohol / toxin, concentration / correct pH

A no growth of yeast (cells)

A competition for nutrients
A wrong pH</td></tr>
<tr><td>(e)</td><td>(named) alcohol production (for consumption);
alcohol for fuel;
bread making / making dough rise;
yeast extract / probiotics / nutrient supplements; e.g. vegemite
production of carbon dioxide;
bioremediation;</td><td>max 2</td><td>A brewing / wine

I baking unqualified</td></tr>
<tr><td></td><td></td><td>[Total: 17]</td><td></td></tr>
<tr><td>5 (a) (i)</td><td><table>
<tr><th></th><th>light intensity / a.u.</th><th>limiting factor</th></tr>
<tr><td>A</td><td>20</td><td>light <u>intensity</u>;</td></tr>
<tr><td>B</td><td>20</td><td>temperature;</td></tr>
<tr><td>C</td><td>20</td><td>carbon dioxide <u>concentration</u>;</td></tr>
<tr><td>D</td><td>5</td><td>light intensity</td></tr>
</table></td><td>3</td><td>A % carbon dioxide</td></tr>
</table>

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(ii)	factor in / aspect of, the environment; short supply; restricts / prevents, a (named) process;	**max 2**	**A** external / outside, factor **A** restriction in context of a named process e.g. photosynthesis
(b) (i)	allows oxygen to enter the compost; (decomposition by) bacteria / fungi / microorganisms; use aerobic respiration; allow liquid to drain out / avoid waterlogging;	**max 2**	**A** gas / air **I** carbon dioxide
(ii)	urea (from animal waste); (decomposers) break down proteins to amino acids; proteins / amino acids converted to ammonia; by deamination (to produce ammonia);	**max 2**	
(c) (i)	control; for a comparison / how much more carbon dioxide is available; improve validity of the investigation;	**max 2**	
(ii)	with compost, CO_2 (concentration) reaches a peak; at 24–26 days / 600 – 610 ppm; without compost, CO_2 (concentration) remains constant; at about 200 ppm;	**max 3**	units must be given at least once **A** increases and decreases **A** very slight fluctuations
(d)	carbon dioxide enrichment; increase in, growth rate / yield / production, of the vegetables; most effective for lettuce; reference to comparative figures that show an increase in production of at least one named crop; composting increases carbon dioxide concentration; therefore carbon dioxide not (as) limiting; (carbon dioxide required) for photosynthesis**;**	**max 4**	**A** any crop is about 3 times more in composting unit
		[Total: 18]	

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6 (a)	diaphragm <u>contracts</u> and, lowers / flattens / AW; rib cage rises / moves, upwards / outwards; external intercostal muscles <u>contract</u>;	**max 3**	**A** increases in volume / expands
(b)	pH decreases; increased rate of aerobic respiration; more carbon dioxide (into blood plasma); forms (carbonic) acid; anaerobic respiration occurs (during strenuous exercise); lactic acid produced;	**max 3**	idea of <u>more</u> needs to be apparent at least once for **MP2** and **MP3** **A** carbon dioxide is acidic
		[Total: 6]	

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