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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

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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
- <u>underline</u> 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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Question	Answer	Marks	Additional Guidance
1 (a)		max 4	mark nucleus and next 3 answers **R** chlorophyll

structural feature	animal cell	plant cell
cell wall	×	✓
nucleus	✓	✓;
(cell) membrane	✓	✓;
cytoplasm	✓	✓;
chloroplast	×	✓;
(large) vacuole	×	✓;
vacuolar sap	×	✓;
vacuolar membrane / tonoplast	×	✓;
nuclear membrane	✓	✓;
nucleolus	✓	✓;

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(b)	water moves (in) by osmosis; down a water potential gradient / from high water potential to low water potential; through partially permeable membrane; (both cells / vacuole) enlarge / swell / increase in volume; animal cell bursts; plant 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) <u>allele</u>;

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 phenotypes;	**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 dry, 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)	peristalsis; (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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(ii)	lag phase: (dry) yeast adapting to the environment / AW; yeast are reproducing / dividing; log phase: no limiting factors; enough / plenty of, (named) nutrients; stationary phase: no more reproduction; limiting factors; none / reduction in, (named) nutrients; build-up of, toxic waste / alcohol; reference to carrying capacity;	**max 3**	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
(e)	(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;	**max 2**	**A** brewing / wine **I** baking unqualified
		[Total: 17]	
5 (a) (i)		**3**	**A** % carbon dioxide

	light intensity / a.u.	limiting factor
A	20	light intensity;
B	20	temperature;
C	20	carbon dioxide concentration;
D	5	light intensity

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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 <u>aerobic</u> 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)	<u>carbon dioxide enrichment</u>; 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 contracts and, lowers / flattens / AW; rib cage rises / moves, upwards / outwards; external intercostal muscles contract;	**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 more needs to be apparent at least once for **MP2** and **MP3** **A** carbon dioxide is acidic
		[Total: 6]	

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