Cambridge O Level

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Cambridge Ordinary Level

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes will use these abbreviations:

;	separates marking points
/	alternatives
()	contents of brackets are not required but should be implied
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
Ig	ignore (for incorrect but irrelevant responses)
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given
+	statements on both sides of the + are needed for that mark

Question	Expected Answer	Additional Guidance	Mark
1 (a) (i)	Label line **X** on xylem on transverse section of root **;**		[1]
(ii)	vascular bundle drawn towards outside of transverse section of stem **;** vascular bundle divided into two sections **;** three or more vascular bundles drawn **;**		[max 2]
(iii)	label line **P** drawn in correct location (outer side of vascular bundle) **;**		[1]
(b)	translocation **;** transport **;** dissolved / in solution **;** sugar(s) / sucrose / products of photosynthesis **;** amino acids **;** reference from source **+** to sink / leaves to roots **AW ;**		[max 3]
			[Total: 7]

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Question	Expected Answer	Additional Guidance	Mark
2 (a)	radicle / root ; testa / seed coat ;		[2]
(b)	*stage **A***: decreases ; *stage **B***: decreases ; *explanation for **A** / **B**:* food store used ; reference to respiration ; reference to enzyme / named enzyme action ; *stage **C***: increases ; *explanation for **C**:* reference to photosynthesis ; reference to production of named food compound ; reference to more cells made / tissue growth ;	maximum 3 marks for **A** / **B** and maximum 3 marks for **C**	[max 6]
(c)	oxygen ; reference to respiration ; energy **+** for growth ; suitable / correct temperature ; reference to enzyme ; breaks down food store **AW** ;		[max 4]
			[Total: 12]

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Question	Expected Answer	Additional Guidance	Mark
3 (a)	*diagram **G:*** amylase ; mouth / small intestine / duodenum ; *diagram **H:*** small intestine / duodenum ; fat / lipid / oil ; fatty acid (s) ; glycerol ;		[6]
(b)	reference to absorption / diffusion ; villi ; capillary ; blood / plasma ; reference to hepatic portal vein ;		[max 4]
			[Total: 10]

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Question	Expected Answer	Additional Guidance	Mark
4 (a) (i)	in nucleus (human) / within nuclear membrane **ORA ;** in cytoplasm (bacteria) **;** thread **+** plasmid(s) (bacteria) **;** correct reference to chromosomes **AW ;** genes / chromosomes paired (human) **;**		[max 3]
(ii)	(cell) wall **;** (cell) membrane **;**		[2]
(iii)	*type:* asexual / binary fission / mitosis **;** *explanation:* genetically **+** identical (cells produced) OR clones **;** all capable of producing insulin / same product **;**	**A** to produce insulin in large quantities / to produce a large number of bacteria / produce bacteria quickly	[3]
(iv)	diabetes **;**		[1]
(v)	fermenter **;**	**A** bioreactor	[1]

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Question	Expected Answer	Additional Guidance	Mark
(b)	*potential advantages:* increased yield / more profitable / grow quicker / reduce famine **AW ;** able to grow in environmental extremes / grow in new areas **;** more predictable results than selective breeding / more certain **;** able to transfer (beneficial) genes / features between species **;** nutritionally improved / visually improved / desirable outcome e.g. uniform shape **;** disease / pest resistance **;** *potential dangers:* risk of genetic spread to other species **;** may be patented / costs too much **;** possible (unknown) risk to health of other species **;** possible (unknown) risk to genes of other species **;**	Max 3 marks for each of advantages / dangers.	[4]
			[Total: 14]

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Question	Expected Answer	Additional Guidance	Mark
5 (a)	mosquito / *Anopheles* ;		[1]
(b) (i)	drain swamps / prevent stagnation of water **AW** ; add oil on water ; reference to biological control / fish or bacteria into ponds ; release irradiated males ;		[max 2]
(ii)	(resistant) reproduce ; reference to (resistant) allele / gene ; inherited / passed on ; reference to repetition over many generations ; (resistant) become more common ; reference to <u>evolution</u> ;	**A ORA** for each marking point	[max 4]
			[Total: 7]

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Question	Expected Answer	Additional Guidance	Mark
6 (a) (i)	stomach ;		[1]
(ii)	enzyme and substrate are lock and key ; reference to optimum pH / (hydrochloric) acid (in stomach) ; active site ; complementary **AW** ; substrate ; if pH changes / alkaline ; enzyme denatured / changes shape **AW** ; (substrate) no longer fits ;		[max 6]
(b)	hydrogen ; oxygen ; nitrogen ;		[3]
			[Total: 10]

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Question	Expected Answer	Additional Guidance	Mark
7 (a)	fix / convert / change / turn (nitrogen in air) ; reference to lightning ; reference to bacteria ; legumes (peas / beans) / root nodules ; to ammonium ; to nitrates ; (nitrates) absorbed **+** by plants ; reference to amino acids (in either plants or animals) ; plants **+** eaten by animals ; protein digested (in animals) ;		[max 5]
(b)	*production of crops:* increases / increased yield ; (due to) improved growth ; increased profit / **AW** ; *environment:* reference to positive effect on environment e.g. more photosynthesis reduces CO_2 / increases O_2 / more wild plants for insects ; growth of weeds ; leaching (into water sources) **AW** ; eutrophication or process described ; death of aquatic life ; possible contamination / pollution of (drinking) water ;		[max 5]
			[Total: 10]

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Question	Expected Answer	Additional Guidance	Mark
8 (a)	spinal cord ; nerves / neurones ; named receptor / sense organ ;		[2]
(b)	**R +** medulla ; control of heart rate / breathing / involuntary actions ; relay of impulses between brain and spinal cord ; **S +** pituitary gland ; secretes / releases hormone(s) ; example of named hormone released **+** correct function ; **T +** cerebrum / cerebral hemispheres ; voluntary movement or example of ; thought / memory / any other acceptable function ; **U +** cerebellum ; coordination of movement ; maintenance of posture / balance ;	**A** functions only if linked to correct named part of the brain e.g. TSH released which stimulates the thyroid gland to secrete thyroxine.	[max 8]
			[Total: 10]

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Question	Expected Answer	Additional Guidance	Mark
9 (a)	externally administered ; substance / chemical ; (that) modifies / affects / changes ; (the) chemical reactions (in the body) ;		[max 3]
(b) (i)	nicotine ; addictive ; carbon monoxide ; reduced oxygen carrying capacity of blood ; reference to underweight babies **AW** ; tar ; cough / emphysema / bronchitis ; explanation of mechanism of one of the above e.g. cilia damaged / alveoli damaged / mucous lining blocked by tar ; correctly named cancer (e.g. lung / throat) ; reference to cardiovascular disease / increases blood pressure ;		[max 5]

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Question	Expected Answer	Additional Guidance	Mark
(ii)	passive smoking or described e.g. effect on asthmatics / concerns around smoking near children / pregnant mothers ; reference to unpleasant odour / clothes smell ; reference to high cost ;		[max 2]
			[Total: 10]

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