



Cambridge International Examinations
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) |
| lg | 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 |
| <u>underline</u> | 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) | <p><i>stage A:</i> decreases ;</p> <p><i>stage B:</i> decreases ;</p> <p><i>explanation for A/B:</i> food store used ; reference to respiration ; reference to enzyme / named enzyme action ;</p> <p><i>stage C:</i> increases ;</p> <p><i>explanation for C:</i> reference to photosynthesis ; reference to production of named food compound ; reference to more cells made / tissue growth ;</p> | maximum 3 marks for A/B and maximum 3 marks for C | [max 6] |
| (c) | <p>oxygen ;</p> <p>reference to respiration ;</p> <p>energy + for growth ;</p> <p>suitable / correct temperature ;</p> <p>reference to enzyme ;</p> <p>breaks down food store AW ;</p> | | [max 4] |
| | | | [Total: 12] |

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

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

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

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| Question | Expected Answer | Additional Guidance | Mark |
|----------|--|-------------------------------------|-------------------|
| 5 (a) | mosquito / <i>Anopheles</i> ; | | [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) | <u>stomach</u> ; | | [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) | <u>hydrogen</u> ; <u>oxygen</u> ; <u>nitrogen</u> ; | | [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) | <i>production of crops:</i> increases / increased yield ; (due to) improved <u>growth</u> ; increased profit / AW ; <i>environment:</i> 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] | | | |

| 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 |
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| 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 |
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| (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] |