



Cambridge International Examinations
Cambridge Ordinary Level

BIOLOGY

5090/22

Paper 2 Theory

May/June 2016

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Mark schemes will use these abbreviations:

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|------------------|---|
| ; | 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 |
| <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 answers | Additional guidance | Marks |
|-----------|--|--------------------------|--|
| 1 (a) (i) | sepals / calyx ; petals / corolla ; nectaries ; | | [max 2] |
| (ii) | <i>type of pollination</i> : self / wind ; <i>reason for wind</i> : exposed / large + stamens / anthers ; <i>reason for self</i> : position of anthers relative to stigma / carpel ; <i>reason for either</i> : no petals / nectaries to attract insects ; | | [1] [max 1] |
| (b) (i) | seed / cotyledon ; | | [1] |
| (ii) | bird / animal / herbivore ; sweet / sugary / coloured (skin) / juicy / succulent / taste / smell ; eaten / consumed / food ; spits out or drops / undigested / passes out with faeces ; at a distance from parent plant / elsewhere AW ; | R reference to excretion | [max 3] |
| (c) (i) | yeast / fungus ; | R bacterium | [1] |

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| Question | Expected answers | Additional guidance | Marks |
|-------------------|---|--|---------|
| (ii) | sugar (or named)/correct formula ; fermenter/ fermentation / <u>anaerobic</u> respiration (or description of) ; reference to suitable temperature/warmth ; reference to enzymes ; | A sugar is broken down in the absence of oxygen | [max 3] |
| [Total 12] | | | |
| 2 (a) | C/D/E ; C/D ; F ; E ; | | [4] |
| (b) (i) | heroin/ alcohol/ nicotine/ named addictive drug ; | | [1] |
| (ii) | lg reference to named drug / substance (e.g. CO, tar) mother's blood ; <u>diffusion</u> ; across or through placenta ; fetus/ baby/ embryo + blood ; umbilical cord/ umbilical vein ; | R umbilical artery | [max 4] |
| [Total 9] | | | |
| 3 (a) (i) | mineral salts/ fibre/ roughage ; | | [1] |
| (ii) | fat/ lipid ; | | [1] |

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| Question | Expected answers | Additional guidance | Marks |
|-------------------|---|---------------------|---|
| (b) | <p><i>constituent:</i> <u>water</u> ;</p> <p><i>reasons for importance:</i> solvent/ constituent of urine / reference to chemical reactions / constituent cells OR cyto-, proto- plasm OR blood / temperature regulator OR sweating / transporter / osmoregulator AW / prevents dehydration / lubrication / prevents constipation ;;</p> <p><i>constituent:</i> (named) vitamin ;</p> <p><i>reasons for importance:</i> prevent deficiency disease AW / reference to correct specified benefit of any vitamin ;;</p> | | <p>[1]</p> <p>[max 2]</p> <p>[1]</p> <p>[max 2]</p> |
| (c) | <p>little or no <u>starch</u> in diet / cannot digest <u>starch</u> AW ; relies on sugar or named sugar AW ; (needs to) eat fruit / animals / fewer plants ; may rely on fat / protein (for energy) ;</p> | | [max 2] |
| [Total 10] | | | |
| 4 (a) | <p><i>process:</i> <u>photosynthesis</u> ;</p> <p><i>explanation:</i></p> <ol style="list-style-type: none"> 1. leaves flat ; 2. face the sun / horizontal ; 3. large / maximum / increased + surface area ; 4. (for) trapping / absorbing / converting + light (energy) ; 5. (for) CO₂ absorption / reference to stomata ; 6. presence of chlorophyll / chloroplasts ; 7. reference to transparent cuticle / epidermis / thin leaves ; 8. reference to intercellular spaces / mesophyll cells ; 9. reference to veins to bring water / take away products ; | | <p>[1]</p> <p>[max 2]</p> |

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| Question | Expected answers | Additional guidance | Marks |
|----------|--|---------------------|---------------------------|
| (b) | <p><i>effect:</i> reduces (transpiration) ; lg wilting</p> <p><i>explanation:</i> <u>stomata</u> ; (mostly) on lower surface ;</p> <p>any two of: humidity build up / reduced diffusion gradient / reduced evaporation (rate) / reduced surface area / (stomata / guard cells) close ;;</p> <p>protection from breeze / wind ;</p> | | <p>[1]</p> <p>[max 3]</p> |
| (c) (i) | <p>reduced light levels ;</p> <p>photosynthesis slowing down ;</p> <p>less O₂ produced / lost AW ;</p> <p>stomata closing / closed AW ;</p> | | [max 2] |

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| Question | Expected answers | Additional guidance | Marks |
|-------------------|--|--|---------|
| (ii) | reference to darkness/low light intensity ; photosynthesis stops ; O ₂ used/absorbed/gained/uptake AW ; (for) respiration ; | | [max 2] |
| [Total 11] | | | |
| 5 (a) | ✓ diffusion into the alveoli (<i>box 2</i>) ; ✓ the diaphragm relaxes (<i>box 4</i>) ; ✓ the ribs fall (<i>box 8</i>) ; ✓ pressure in the thorax increases (<i>box 9</i>) ; | | [4] |
| (b) | 1. any stated difference between inspired and expired % O ₂ ; 2. O ₂ used in respiration ; 3. Person J – the most/more (than normal) O ₂ absorbed/used ; 4. Person J - active/taking exercise/athlete/pregnant/high respiratory rate/high blood cell or red blood cell count AW ; 5. Person K – moderate activity/normal ; 6. Person L – low O ₂ absorption/use ; 7. Person L – (named) lung disease/anaemia/smoker/inactive/sleeping/elderly/dying/low respiratory rate/reference to low red blood cell count/carboxyhaemoglobin ; | A any disease that would restrict O ₂ uptake | [4] |
| [Total 8] | | | |

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| Question | Expected answers | Additional guidance | Marks |
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| 6 (a) | <p><i>structure:</i></p> <ol style="list-style-type: none"> cell wall thick / cell membrane thin ; cellulose in cell wall ; fat / protein in cell membrane ; cell wall surrounds OR protects cell membrane ORA ; <p><i>function:</i></p> <ol style="list-style-type: none"> wall <u>permeable</u> + membrane semi-<u>permeable</u> AW ; cell wall no control / cell membrane has control over what enters cell ; cell wall involved in turgor / support / protection / shape / prevents bursting ; osmosis (only) through membrane ; active transport (only) through membrane ; | | [max 6] |
| (b) | <ol style="list-style-type: none"> (cell) the unit of life AW ; tissues are made up of cells AW ; cells in tissues have common / specific function ; organs are made up of tissues AW ; working / combining together ; one example each of a named <u>cell</u> identified as such + a named <u>organ</u> identified as such ; | <p>A for tissue examples including: blood, muscle, nervous, epithelial, connective, xylem, phloem, palisade, epidermis</p> <p>A for organ examples including: muscle, heart, leaf, flower, root, stem</p> | [max 3] [1] |
| | | | [Total 10] |

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| Question | Expected answers | Additional guidance | Marks |
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| 7 (a) | <p><i>Each importance must be linked to a condition in order to score credit.</i></p> <ol style="list-style-type: none"> oxygen ; for respiration / energy <u>release</u> ; growth / mitosis / cell division ; water ; solvent / reference to chemical reaction / transport ; to rupture / break / soften testa (seed coat) ; reference to temperature qualified e.g. suitable / warm ; for enzyme action ; digestion AW + of food / named food (stores) ; seed must be viable / alive / no longer dormant ; | | [max 6] |
| (b) | <ol style="list-style-type: none"> amino acids / sucrose or sugar ; as a result of photosynthesis ; in or from leaves / source / storage organ of parent – or parent clearly implied ; in solution ; translocated / in phloem ; in veins / vascular bundles ; functional reference to cotyledon / endosperm OR sink ; | | [max 4] |
| | | | [Total 10] |

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| Question | Expected answers | Additional guidance | Marks |
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| 8 (a) | <ol style="list-style-type: none"> sterilised / aseptic technique ; <u>fermenter</u> ; bacterium / fungus / algae / named example ; substrate / cultured medium or named / broth / any two chemicals in the medium ; oxygen / air ; bubbles / sparger / aerator / paddle / stirrer AW ; temperature regulation / control / cooling jacket ; pH ref ; optimum or best for growth or reproduction of organism ; filtration / collection / harvesting / separating (the product) ; name / use of product e.g. mycoprotein / meat substitute / cattle feed ; | | [max 8] |
| (b) | <ol style="list-style-type: none"> size reference / extremely small AW ; reproduce only in living cells / pathogenic AW / parasitic ; specific ; may need to separate them from living tissue / difficult to isolate ; | A named viral disease | [max 2] |
| [Total 10] | | | |
| 9 (a) (i) | <ol style="list-style-type: none"> allele(s) ; responsible for a character(istic)/trait ; only one needs to be present / reference to heterozygote AW ; for the character to appear / be expressed (in phenotype) AW ; e.g. $I^A I^O$ + group A / $I^B I^O$ + group B / $I^A I^B$ + dominant to I^O ; | A A, B, O instead of I^A , I^B , I^O | [max 3] |
| (ii) | <ol style="list-style-type: none"> <u>two</u> alleles ; neither being recessive / (equally) dominant ; both have an effect / are expressed / phenotype intermediate ; reference to heterozygote AW ; $I^A I^B / AB$; | | [max 3] |

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| (b) | <ol style="list-style-type: none"> 1. number of chromosomes in a gamete is half those in a somatic or body cell ORA/one versus two sets of chromosomes ; 2. correct use of the terms haploid + diploid ; 3. 46 v. 23 ; 4. gametes/haploid cells are the result of meiosis/reduction division ; 5. somatic/body cells occur in/produced by mitosis ; 6. (diploid) number restored + at fertilisation ; 7. each parent has equal share in genotype of offspring AW ; | A sex cell = gamete/one named gamete | [max 4] |
| | | | [Total 10] |