



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/43

Paper 4 Theory (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word / phrase in brackets is not required, but sets the context
- underline actual words given must be used by the candidate (or grammatical variants of them)

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| Question | Answer | Mark | Guidance |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1(a)(i) | A: vagina; B: oviduct/Fallopian tube; D: sperm/male gamete; | 3 | |
| 1(a)(ii) | to remove, egg cells/ova/female gametes; | 1 | |
| 1(b)(i) | follicle stimulating hormone/FSH; luteinizing hormone/LH; | 1 | |
| 1(b)(ii) | start of new cycle/days 1–10/during menstruation/AW; | 1 | |
| 1(b)(iii) | X positioned anywhere in uterus (wall/lining); | 1 | |
| 1(c) | <ol style="list-style-type: none"> 1 allows infertile couples/single parents/same sex couples (to have children); 2 religious/legal/moral/ethical, concerns about IVF; 3 may not treat infertility successfully; 4 expense of fertility treatment; 5 may lead to multiple births; 6 <i>idea of</i> genetic screening before implanting is possible; 7 storage of, eggs/embryos, is possible (during chemotherapy); 8 qualification of an religious/ethical/legal/moral, issue; 9 has allowed stem cell research on embryos; 10 AVP; | 4 | <p>A high chance of miscarriage/stress A cost to health services/cost means restricted availability</p> |
| | | Total: 11 | |

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| Question | Answer | Mark | Guidance |
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| 2(a) | 1 enzymes are proteins; 2 enzymes can be reused / are unchanged in a reaction; 3 enzymes are specific; 4 (enzymes are) catalyst / speeds up reaction; 5 lowers (activation) energy needed for the reaction; 6 successful collisions; 7 enzyme-substrate complex / ESC; 8 <u>active site</u> ; 9 (enzyme and substrate) complementary shape / AW; 10 ref. to <u>optimum</u> , temperature / pH; 11 too much heat results in denatured enzymes; 12 too little kinetic energy / heat, less (successful) reactions; 13 incorrect pH results in denatured enzymes; 14 (substrate) is <u>pectin</u> / cell wall; 15 results / product, is clear juice; 16 mass / cheaper / more (volume) / yield, juice production; | 6 | R cellulose |
| 2(b) | read at eye level / avoid error of parallax; read bottom of meniscus; place measuring cylinder on a level / flat, surface; remove funnel / ensure all drops have fallen to the bottom; | 2 | A parallel / horizontal to meniscus |
| 2(c)(i) | 19 ÷ 10 or 17.5 ÷ 10; 2 (cm ³ per min); | 2 | |

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| Question | Answer | Mark | Guidance |
|-----------------|--------------------------------------------------------------------------------|------------------|-------------------------|
| 2(c)(ii) | A / 0.5 (cm ³ cubes); large(st) surface area (to volume); | 2 | A smallest cubes |
| | | Total: 12 | |

| Question | Answer | Mark | Guidance |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| 3(a) | human / largest mammal, has the longest / bat has the shortest (small intestine); (small intestine of) rat and cat are very similar in length; comparative data, quote / calculation with units at least once; negative correlation between length and length relative to body mass; | 3 | A relative to body mass bat much larger than other three animals / smallest length relative to body mass is in humans |
| 3(b) | movement into / out of / through, (epithelial) cells / villi; into, capillaries; across cell membranes; by active transport; through protein carriers; against a concentration gradient; using energy; | 3 | I walls I into blood |
| 3(c)(i) | (insect-eating) bat; | 1 | |

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| Question | Answer | Mark | Guidance |
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| 3(c)(ii) | ratios are higher in the duodenum; higher (inner) surface area (than ileum); data comparison (for any one animal); more villi; more microvilli; | 3 | |
| 3(d) | <u>emulsification</u> ; increased surface area of fat (globules); faster, digestion / break down (of fat by enzymes); by lipase / to fatty acids <u>and</u> glycerol; neutralises (stomach) acid / chyme; provides alkaline medium for, pancreatic enzymes / lipase; denatures, pepsin / stomach, enzymes; AVP; | 4 | I faster break down of fats unqualified |
| | | Total: 14 | |

| Question | Answer | Mark | Guidance |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|
| 4(a) | (nicotine is) a (chemical) substance taken into the body; that modifies / affects / influences, (chemical reactions in) the body; addictive / can cause withdrawal symptoms (when stopped) / AW; | 2 | |

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| 4(b) | <p><i>carbon monoxide:</i> binds to haemoglobin (permanently); Accept carboxyhaemoglobin reduced oxygen (transport);</p> <p><i>tar (max 3):</i> carcinogenic / causes lung cancer; sticks to / blocks / damages, alveoli / cilia; produce more mucus; making prone to (named) respiratory infections; reduced, diffusion / gas exchange;</p> | 4 | A irritates, gas exchange surface / airways / emphysema |
| 4(c)(i) | <ol style="list-style-type: none"> 1 more men smoked (between 1950–1998 than women); ORA 2 both decrease overall / between 1950 and 1998; 3 (overall) drop in men is more (than in women); ORA Ignore data 4 (1950)–<u>1970</u>: men decreasing and women increasing; 5 <u>1970</u> onwards : both genders decreasing; 6 larger difference in numbers / %, before 1970s / earlier OR smaller difference in numbers / %, after 1970s / later; AW 7 maximum (implied) for women was 50% and 82% for men; 8 comparative data quote between men and women with units stated once; | 4 | |

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| 4(c)(ii) | number of deaths by (lung) cancer shows similar trend as percentage smokers; (correlation) in both men and women / AW; lag in the death rate trend (compared with smokers) / AW; relevant data quote from both graphs; trend more obvious in men / death rate in women is increasing overall; impossible to show conclusive link; (because) cannot control experimental conditions / other lifestyle factors; AVP; | 4 | e.g. lag in/ drop of 7–8 years in men |
| 4(d) | toxins / AW, in smoke can cross the placenta; increased risk, of miscarriage / still birth / premature birth / low birth weight / deformities; reduces oxygen available to the foetus / foetal brain damage; increased risk, of reduced lung, function / infection, in foetus / infants; babies more likely to become addicted / have withdrawal symptoms; AVP; | 3 | |
| | | Total: 17 | |

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| Question | Answer | Mark | Guidance |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------|
| 5(a)(i) | <u>double helix</u> ; (strands) contain, bases / A and T and C and G; A joins with T / C joins with G; strands / bases, join / pair up, by crosslinks / hydrogen bonds; AVP; | 3 | A labelled drawing or description |
| 5(a)(ii) | codes for a <u>protein</u> ; | 1 | |
| 5(b) | respiration; aerobic (respiration); release energy / make ATP; | 2 | R produce energy |
| 5(c) | cytoplasm; cell membrane; single celled / unicellular; no (true) nucleus / no nuclear membrane; loop of DNA / chromosome / naked DNA; no, (membrane-bound) organelles / mitochondria / chloroplasts; (peptidoglycan / murein) cell wall; AVP; e.g. plasmids | 2 | A nucleoid R cellulose cell wall I flagella, pili, mesosomes, capsules |
| 5(d) | B and D in box 1 and 2 (any order); C in box 3; A and F in box 6 and box 7 (any order); | 3 | |

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| 5(e) | it is (more) accurate (than traditional classification systems); easi(er)/cheap(er)/quick(er)/(more) efficient/to use (than other (named) identification methods); ora allows large-scale identification (of many species simultaneously); only trace samples are required; (DNA sequences) within a species are very similar; | 1 | A samples do not need to purified A early identification of (pathogenic bacteria) for infections |
| | | Total: 12 | |

| Question | Answer | Mark | Guidance |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------|
| 6(a) | (branching) veins; ora shape/broad (leaves); ora | 1 | I petioles |
| 6(b) | it is (made of a group of) tissues working together to perform specific function(s); | 1 | |
| 6(c) | 6CO ₂ + 6H ₂ O (LHS); C ₆ H ₁₂ O ₆ + 6O ₂ (RHS); energy/light/chlorophyll; | 3 | |
| 6(d)(i) | palisade (mesophyll/tissue/cells/parenchyma); tightly packed/contain many chloroplast/stacked upright; | 2 | A lots of chlorophyll |
| 6(d)(ii) | (upper) epidermis/epidermal cells; transparent/allows light to pass through/thin; | 2 | |

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| 6(d)(iii) | spongy, mesophyll / tissue / cells / parenchyma / layer; air spaces / loosely packed / gas exchange / diffusion of gases; | 2 | Mark points are not linked |
| 6(e) | nitrates are useable source of nitrogen; needed to make amino acids; (amino acids) to make proteins; <u>protein</u> / <u>DNA</u> , needed for growth; to make DNA / RNA / nucleotides / bases; other suitable named use of organic nitrogenous compounds found in plants; | 3 | |
| | | Total: 14 | |