



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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This document consists of **11** printed pages.

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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)	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	A high chance of miscarriage/stress A cost to health services/cost means restricted availability
		Total: 11	

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Question	Answer	Mark	Guidance
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
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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Question	Answer	Mark	Guidance
4(b)	<i>carbon monoxide:</i> binds to haemoglobin (permanently); Accept carboxyhaemoglobin reduced oxygen (transport); <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;	4	A irritates, gas exchange surface / airways / emphysema
4(c)(i)	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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Question	Answer	Mark	Guidance
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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Question	Answer	Mark	Guidance
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)	$6\text{CO}_2 + 6\text{H}_2\text{O}$ (LHS); $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (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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Question	Answer	Mark	Guidance
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	