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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
- <u>underline</u> 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 *idea of* 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 active site; 9 (enzyme and substrate) complementary shape / AW; 10 ref. to optimum, 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 pectin / 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)	emulsification; increased surface area of fat (globules); faster, digestion / break down (of fat by enzymes); by lipase / to fatty acids and 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)	*carbon monoxide:* binds to haemoglobin (permanently); Accept carboxyhaemoglobin reduced oxygen (transport); *tar (max 3):* 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)	double helix; (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 protein;	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)	$6CO_2 + 6H_2O$ (LHS); $C_6H_{12}O_6 + 6O_2$ (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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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; protein / DNA, needed for growth; to make DNA / RNA / nucleotides / bases; other suitable named use of organic nitrogenous compounds found in plants;	**3**	
		Total: 14	

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