Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **March 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- 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 word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

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Question	Answer	Marks	Guidance
1(a)(i)	**L** – atrioventricular valve **;** **M** – septum **;** **O** – semi-lunar valve **;**	**3**	
1(a)(ii)	**N / P ;** **J / K ;** **J ;**	**3**	
1(b)(i)	**1** blood from pulmonary vein / K, enters left atrium **;** **2** atria contract **;** **3** atrioventricular valve / L, <u>opens</u> due to pressure from blood **;** **4** blood forced into left ventricle **;** **5** ventricle contract **;** **6** atrioventricular valves / L, shut to prevent blood entering atrium **;** **7** semi-lunar valves / O, open **;** **8** blood forced into, aorta / J **;** **9** AVP**;**	**5**	
1(b)(ii)	left ventricle wall contains more muscle **;** left ventricle pumps blood further **;** left ventricle has to overcome more resistance **;** left ventricle pumps blood at higher pressure **;**	**2**	

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Question	Answer	Marks	Guidance
2(a)	no nucleus ; cell wall ; loop of DNA ; AVP ;;	**2**	
2(b)(i)	overall increase in number of cases of MRSA ; largest increase, between 2004–2005 / exponential ; data quote including the number of cases and the year / data manipulation ;	**2**	
2(b)(ii)	**1** correct ref to mutation of bacteria ; **2** variation in ability of bacteria to survive antibiotic treatment ; **3** bacteria with no / little resistance, die ; **4** bacteria with resistance, survive and breed ; **5** passing on resistant allele ; **6** ref to natural selection ; **7** AVP ; e.g. ref to strengthening of cell wall	**4**	
2(c)	more responsible use of antibiotics ; improved, detection / screening to avoid spread ; ref to improved cleanliness ; isolating infected patients ; development of new antibiotics / treatment ;	**2**	

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Question	Answer	Marks	Guidance
3(a)	<table><tr><td>part of the eye</td><td>function</td></tr><tr><td>rod cells</td><td>night vision / detects low light ;</td></tr><tr><td>cone cells</td><td>colour vision ;</td></tr><tr><td>sensory neurone</td><td>transmits nerve impulses to brain ;</td></tr></table>	**3**	1 mark for each correct row
3(b)	**1** more rod cells than cone cells in the retina ; **2** ref to uneven distribution of rod cells either side of fovea ; **3** no rod cells and no cone cells at blind spot ; **4** optic nerve enters / leaves retina at blind spot ; **5** only cone cells at the fovea / no rod cells at the fovea ; **6** maximum number of cone cells are at the, fovea / 0 degrees ; **7** maximum number of rod cells at 20–21 degrees ; **8** data quote include units ; **9** AVP ; **10** AVP ;	**5**	
3(c)	more males affected than females / **ora** ; only females are carriers / males are affected or not ;	**2**	
3(d)	<table><tr><td>correct gametes ; correct offspring genotypes ; correct offspring phenotypes ; correct percentage ;</td><td>X^B,Y +X^b, X^b ; X^BX^b, X^BX^b, X^bY, X^bY; carrier female, carrier female, colour-blind male, colour-blind male ; 50 % ;</td></tr></table>	**4**	offspring phenotype must be linked to the correct offspring genotype

Question	Answer	Marks	Guidance
4(a)	carbon dioxide ; light energy ; chlorophyll ;	**2**	
4(b)	(2 ÷ 13) x 100 ; 15(%) ;	**2**	
4(c)(i)	increased rate of transpiration ; greater concentration of water vapour inside the leaf than outside ; more water vapour diffuses out of the leaf ; through stomata ; more water is drawn up through xylem / transpiration pull ;	**3**	
4(c)(ii)	by osmosis ; the soil has a higher water potential than the root cells ; water moves from an area of higher water potential to lower water potential ; across a partially permeable membrane ; ref to root hair cell ;	**3**	**A** down a water potential gradient
4(d)	**1** loss of habitat ; **2** population decrease / migration ; **3** extinction / endangerment, of species ; **4** loss of biodiversity ; **5** less food ; **6** disruption of, food chains / food webs ;	**4**	

Question	Answer	Marks	Guidance
5(a)(i)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$;;	**2**	
5(a)(ii)	liver ;	**1**	
5(b)	correct ref to active site ; enzyme must be complementary shape to, substrate / alcohol ; to make enzyme – substrate complex / to allow substrate to bind to enzyme ; ref to only fits one substrate / specific to one substrate ;	**3**	**A** 'lock and key'
5(c)(i)	increased kinetic energy ; molecules move faster ; increased frequency of collisions ; increased number of successful collisions ;	**3**	
5(c)(ii)	pH ;	**1**	
5(d)(i)	length of DNA ; that codes for a protein ;	**2**	
5(d)(ii)	mRNA passes through ribosomes ; ribosomes assemble amino acids into proteins ; order of amino acids is determined by the sequence of bases in mRNA ; AVP ;	**2**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(a)</td><td>
<table>
<tr><td>enzyme</td><td>substrate</td><td>product / s</td><td>location of enzyme production</td><td></td></tr>
<tr><td>(salivary) amylase</td><td>starch</td><td>maltose</td><td>salivary glands</td><td>;</td></tr>
<tr><td>maltase</td><td>maltose</td><td>glucose</td><td>small intestinal wall</td><td>;</td></tr>
<tr><td><u>pepsin</u></td><td>protein</td><td>amino acids</td><td>stomach (wall)</td><td>;</td></tr>
<tr><td><u>trypsin</u></td><td>protein</td><td>amino acids</td><td>small intestinal (wall)</td><td>;</td></tr>
<tr><td>lipase</td><td>fats</td><td>fatty acids and glycerol</td><td>pancreas / small intestinal wall</td><td>;</td></tr>
</table>
</td><td>5</td><td>A polypeptides for protein

A peptides for protein</td></tr>
<tr><td>6(b)</td><td><u>emulsif</u>ication ;
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 ;</td><td>3</td><td></td></tr>
<tr><td>6(c)</td><td>the movement of small food molecules and ions ;
through the <u>wall</u> of the intestine ;
into the blood ;</td><td>3</td><td></td></tr>
</table>

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Question	Answer	Marks	Guidance
6(d)	marasmus / kwashiorkor ;	1	
6(e)	reduces, calorie / energy intake ; reduces obesity ; reduces chances of CHD ; AVP ;;	3	

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