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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the March 2017 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

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**	

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**	

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><u>correct gametes ;</u> <u>correct offspring genotypes ;</u> <u>correct offspring phenotypes ;</u> <u>correct percentage ;</u></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 <u>water potential</u> 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**	

Question	Answer	Marks	Guidance
6(a)	<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>pepsin</td><td>protein</td><td>amino acids</td><td>stomach (wall)</td><td>;</td></tr><tr><td>trypsin</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>	**5**	**A** polypeptides for protein **A** peptides for protein
6(b)	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 ;	**3**	
6(c)	the movement of small food molecules and ions ; through the wall of the intestine ; into the blood ;	**3**	

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