Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **October/November 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)	carbon dioxide / CO_2 **;** water (vapour) **;**	**1**	
1(b)	**1** **B** are cilia **;** **2** **C** is mucus **;** **3** **C / D**, are goblet cells **;** **4** **E** is cartilage **;** **5** **B** / cilia, waft / beat, mucus / **C** (up / out of, the airway) **;** **6** **C** / **D** / goblet cells, secrete, mucus / **C** **;** **7** **C** / mucus, traps, particles / pathogens **;** **8** **B** / **C** / **D** / AW, prevent infections **;** **9** **E** / cartilage, keeps the, airway / trachea, open **;**	**6**	max 2 marks for labels **A** prevent collapse
1(c)(i)	**U** | **P ;** | **T** | **S** | **Q** | **R ;** | **V**	**2**	
1(c)(ii)	**1** for, gas exchange / diffusion / movement of CO_2 and O_2 **;** **2** short distance (for diffusion / gas exchange) **;** **3** fast (gas exchange / diffusion) **;**	**2**	
1(d)	**1** haemoglobin is, abnormal / rigid / AW **;** **2** abnormal haemoglobin carries less oxygen (than normal haemoglobin) **; ora** **3** red blood cells are, sickle shaped / AW **;** **4** (sickle cells) stick together / clot (in blood vessels) **;** **5** fewer red blood cells **;**	**3**	**A** abnormal haemoglobin does not carry O_2 **A** not biconcave **A** blocked vessels / stuck / more red blood cells broken down

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Question	Answer	Marks	Guidance
2(a)(i)	**1** exercise will increase heart rate (from resting rate) **;** **2** after exercise heart rate will, remain high / start decreasing **;** **OR** **3** there is no effect of exercise on heart rate **;** is the null hypothesis **;**	**2**	**A** before exercise heart rate will be lower
2(a)(ii)	**1** fingers on, wrist / neck / artery **;** **2** number beats over a period of time / bpm **;** **3** use a heart rate monitor / AW **;** **4** contact of sensor with skin **;**	**2**	
2(b)	**1** lack of, blood supply / oxygen / glucose to heart, wall / muscle / tissues / cells **;** **2** less / no, (aerobic) respiration / described **;** **3** (heart) tissue / cells, die **;** **4** heart (muscle) cannot contract **;**	**2**	**A** more anaerobic
2(c)	*description* **1** no difference between groups at 0 months **;** **2** HRR in **A** increases and **B** increases and then decreases **;** **3** (at) 3 months**,** little difference between groups / group **B** higher **;** **4** (at) 6 months / at end**,** group **A** higher HRR (than group **B**) **;** **5** comparative data quote with units **;** *explanation* **6** (regular) exercise improves, HRR / fitness **;** **7** exercise, strengthens heart muscle / increases, stroke volume / cardiac output **;** **8** *idea that* anaerobic respiration / oxygen debt reduces HRR **; ora** **9** given plan has better long term effect / without given plan better short term effect **;** **10** patients may stick to given plan better (than their plan) **; ora** **11** without a given plan patients probably started with a higher intensity plan **; ora** **12** given plan may be better designed (to improve HRR long term) **; ora**	**6**	**A** fitness or HR for HRR throughout **A** both groups increase HRR overall

Question	Answer	Marks	Guidance
2(d)	**1** reduced, salt / (saturated) fats / cholesterol **;** **2** stop smoking **;** **3** reduce stress **;** **4** AVP **;** e.g. / medication qualified / control diabetes / reduced alcohol / reduce blood pressure	**1**	

Question	Answer	Marks	Guidance
3(a)(i)	DNA **;**	**1**	**A** correct elements **I** RNA
3(a)(ii)	*parental phenotypes* resistant x not disease-resistant *parental genotypes* Rr **;** x rr **;** *gametes* R r x r (r) **;** *offspring genotype* Rr and rr **;** *offspring phenotype* resistant and not resistant / AW **;**	**5**	**ecf** from previous line above throughout
3(b)(i)	heterozygous, plant / parent, carry the not-resistant / r, allele **;** some offspring would be, not-resistant / rr / homozygous recessive **;** using heterozygotes results in profit loss / AW **;**	**2**	**A** homozygous dominant = no r allele / only R **A** therefore all offspring are disease-resistant
3(b)(ii)	paint pollen onto selected trees / AW **;** isolate plants / cover flowers, of unselected trees **;** identify not disease resistant trees **;** AVP **;** remove not-resistant trees	**1**	**A** artificial pollination
3(b)(iii)	human choice (rather than environmental pressures) / AW **;** less, diversity / variation **;** faster change **;** AVP **;** e.g. mating is not random	**2**	**A** named features for human use **A** reduced fitness (of species)

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Question	Answer	Marks	Guidance
4(a)(i)	(species) **M ;**	**1**	
4(a)(ii)	(species **L**) because most stable **;**	**1**	
4(a)(iii)	300(%) **;;**	**2**	*If no answer or wrong answer award one mark for working:* (2000–500) / 500 × 100
4(b)	increased, predation **;** disease **;** lack of food **;** migration **;** (named) relevant pollution **;;** (named) relevant environmental change **;;** introduction of new species **;**	**2**	**I** competition unqualified **A** new predators **A** competition for food e.g. eutrophication / rubbish / acid rain e.g. habitat loss / el Niño / global warming / climate change / hurricane / tsunami
4(c)(i)	(larger holes) allow, more / small / immature, fish through **; ora** nets more specific to target species / prevents by-catch **;**	**1**	

Question	Answer	Marks	Guidance
4(c)(ii)	**1** education / awareness **;** **Accept** commercials / advertising / tax consumer **2** reduced demand (to eat from unsustainable fish stocks) / public pressure / campaigning **;** **3** steps taken by fisherman voluntarily / AW **;** **4** (legal) quotas / treaties / licenses / laws / restricted catch weight **;** **5** ensuring sustainable population size / recovery of, endangered / specific, species **;** **6** no-catch zones / nursery zones / protected areas / MPAs **; ora** **7** overflow of target species / increase in population outside zone / breeding recovery **;** **8** limited fishing season **;** **9** stock recovery / optimises breeding seasons **;** **10** fines**;** **11** discourage / punish, poor practice **;** **12** restocking / captive breeding and release **;** **13** increases gene pool / number of young / reproductively-viable, fish **;** **14** fish farming **;** **15** alternative source of fish **;**	**4**	*max 3 for methods only* *explanations must be linked to correct method* e.g. use of better fishing methods MPA = marine protected areas **A** patrols / policing

Question	Answer	Marks	Guidance
4(d)	**1** guillemots / gulls / squid / seals, reduce in numbers **;** **2** guillemots / gulls, become extinct **; Accept** ref to alternative food sources for any other named species **3** because their food / energy, source has reduced / (intraspecific) competition for their food increases **;** **4** zooplankton, might increase / stay same / decrease and valid explanation **;** **5** phytoplankton decrease because zooplankton increase **; 6**	**4**	mp4 *examples of valid explanations:* increase leads to less cod predation decrease leads to more squid predation stay same leads to balance squid and cod predation
4(e)	development providing the needs of increasing human population **;** without harming the, environment **;**	**2**	

Question	Answer	Marks	Guidance
5(a)(i)	respiration **;** aerobic (respiration) **;** release energy / make ATP **;**	**2**	**A** respiration using oxygen **A** provide energy **R** produce / generate, energy
5(a)(ii)	different composition of cell wall **;** no, chlorophyll / chloroplasts / heterotrophic **;** extracellular digestion / saprophytic / decomposer / AW **;** hyphae / mycelium **;** no (central) vacuole **;** AVP **;**	**2**	**A** not, autotrophic / photosynthetic / AW **A** enzymes secreted from cells to digest food **I** spores e.g. multinucleate / reproduction by budding

Question	Answer	Marks	Guidance
5(b)	respiration / fermentation **;** carbon dioxide released **;** (bubbles / carbon dioxide) causes, dough / bread, to rise **;** (yeast produces) enzymes **;** enzymes / amylase, digest starch **;** AVP **;**	**3**	e.g. yeast, are not toxic / does not produce toxins / reproduce rapidly / can be stored dry / are single celled / cheap
5(c)(i)	(fungus) grown / put, in fermenters **;** aerobic conditions / AW **;** (provide) sugars / nitrogen source / nutrients **;** purification / filtration, of product / penicillin **;** batch culture / AW **;** sterile conditions **;** AVP **;**	**3**	**A** bioreactors **A** bubble air through e.g. ammonia / amino acids / protein e.g. described maintenance of culture / penicillin produced, when sugar source decreases / in stationary phase **A** fermentation conditions such as stirring / use of water jacket / controlling temp / pH etc.
5(c)(ii)	bacteria are made of cells **; ora**	**1**	**A** viruses are not alive / do not have a cell wall
5(d)	mechanical barriers **;** example of mechanical barriers **;;** chemical barriers **;** example of chemical barriers **;;** blood clotting **;**	**max 3**	**A** physical barriers / dead layer of cells for skin e.g. skin / hairs in nose / ear wax **A** mucus as mechanical or chemical e.g. mucus / stomach acid / vaginal acid / tears / lysozymes **A** scab

Question	Answer	Marks	Guidance
6(a)(i)	**X** – sensory**;** **Y** – motor / effector **;**	**2**	

Question	Answer	Marks	Guidance
6(a)(ii)	sweat glands **;** blood vessels **;** hair erector muscles **;**	**1**	
6(a)(iii)	negative feedback **;**	**1**	
6(b)(i)	shunt vessels, constrict / close / AW **;** more / redirect, blood flow to skin (capillaries) **;** heat from blood, lost / radiates **;** vasodilation (of arterioles) **;**	**3**	**A** vasoconstriction **A** heat loss from blood vessels
6(b)(ii)	sweat, secreted / made (by sweat glands) **;** evaporative (cooling) **;** hair erector muscles relax **;** (hairs lie flat) so that less (air) insulation / allows more air movement (across skin) **;**	**3**	 **A** less air trapped
6(c)(i)	quick(er) (response) **;** long-term response is not required **;**	**1**	
6(c)(ii)	insulin **;** glucagon **;** ADH **;** AVP **;**	**2**	

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