Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/31**

Paper 3 Theory (core) **May/June 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 (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	Expected Answers	Marks	Additional Guidance
1 (a) (i)	A – membrane / cell membrane / plasma membrane ; B – cytoplasm ;	[2]	
(ii)	DNA;	[1]	
(b)	*diffuses in:* oxygen / glucose ; *diffuses out:* carbon dioxide / water ;	[2]	
(c)	(diffusion) does not need oxygen / respiration / energy (but active transport does); (diffusion) involves movement (of particles) from high to low concentration / down a concentration gradient (but opposite for active transport);	[max 1]	**A** diffusion is passive
	C – <u>cell wall</u>; D – vacuole;	[2]	**R** cell membrane

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Question	Expected Answers	Marks	Additional Guidance
(d) (ii)	p*rocess:* photosynthesis ; *animal dependence:* 1 (chloroplasts contain chlorophyll) absorb / use / trap, light / energy ; 2 (to) produce glucose / carbohydrate / food, or plants are producers ; 3 (photosynthesis) removes carbon dioxide (from atmosphere) or adds oxygen (to the atmosphere) ; 4 primary consumers / herbivores / animals, gain energy or food / as they eat plants / producers ; 5 secondary consumers / carnivores eat herbivores / primary consumers / other animals ; 6 (animals) need / use oxygen for respiration ;	[1] [max 4] [1 + 4]	AW throughout. Mark independently. **I** other named process If respiration / another process is named, mark the explanation and award points relating to photosynthesis **I** sun (alone) **I** reference to food chain / web unqualified mp **2** and **3** (only) can be obtained from an equation. chemical equation must be correct and balanced
		[Total: 13]	
2 (a) (i)	fur / hair; (external) ears; mammary glands;	[max 1]	

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Question	Expected Answers	Marks	Additional Guidance
(ii)	give birth (to live young) ; suckle young / feed young on milk ; 3 inner ear ossicles ; differentiated teeth ; 2 sets of teeth (deciduous and permanent) / AW ; diaphragm ; sweat glands ; sebaceous glands ;	[max 2]	
(b) (i)	bison ;	[1]	
(ii)	3600 (kg) ;	[1]	
(iii)	number between 1300–1400 (kg) ;	[1]	
(iv)	the larg(er) the body mass, the long(er) the life span / AW **ora** ;	[1]	**A** positive correlation **I** proportional unqualified **R** directly proportional

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Question	Expected Answers	Marks	Additional Guidance
(c)	1 water / potable / clean / drinkable ; 2 adequate food supply / balanced diet / eating healthily / access to food / no famine ; 3 medical facilities / doctors / hospitals / treatments ; 4 personal hygiene ; 5 sanitation / sewage treatment / removal of rubbish ; 6 exercise facilities / taking regular exercise ; 7 shelter from elements / housing ; 8 absence of pollution / safe or clean environment ; 9 use of modern technology ; 10 improved education / schools ; 11 avoidance of smoking / alcohol / drugs ; 12 avoidance of hazardous behaviour / promiscuity / risky activities / crime / no war ; 13 reduction in poverty ;	[max 3]	**A** AW throughout **A** examples of the categories **I** healthy life-style **I** good / stressful / hostile environment unqualified **I** avoid natural disasters / diseases
		[Total: 10]	

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<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3 (a)</td><td>
<table>
<tr><th>label</th><th>name</th><th>function</th></tr>
<tr><td>F</td><td>capillary ;</td><td>transports blood / heat / supplies oxygen glucose to cells / removes carbon dioxide;</td></tr>
<tr><td>G</td><td>receptors / <u>sensory</u> neurone ;</td><td>detect changes in external environment / stimulus / touch / pressure / temperature;</td></tr>
<tr><td>H</td><td></td><td></td></tr>
<tr><td>J</td><td>adipose tissue / fat / fatty tissue ;</td><td>insulation / prevention of heat loss / keeps body warm / shock absorber / energy store;</td></tr>
</table>
</td><td>[6]</td><td>I vein / artery

R detects temperature of the blood
I responds to

I fatty acids
I dermis</td></tr>
<tr><td>(b) (i)</td><td>with no back-pack 6 (arbitrary units);

with 9kg back-pack 13 (arbitrary units);

117(%);</td><td>[3]</td><td>I 116.6%</td></tr>
<tr><td>(ii)</td><td>more / increased volume of, sweat produced;</td><td>[1]</td><td></td></tr>
</table>

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Question	Expected Answers	Marks	Additional Guidance
(c)	1 ref. to <u>evaporation</u> ; 2 (of) water / sweat ; 3 (idea of) need for heat / latent heat / energy ; 4 (heat / latent heat / energy for evaporation) taken from / body/skin / blood ; 5 blood carries heat ;	[max 3]	**I** ref. to heat loss by conduction / convection / radiation **I** sweat absorbs heat unqualified
		[Total: 13]	
4	<u>glands</u> ; <u>blood</u> ; <u>target</u> ; <u>insulin</u> ; <u>blood</u> ;	[5]	
		[Total: 5]	
5 (a)	xylem ;	[1]	
(b) (i)	rate of transpiration increases as temperature rises / **ora** ; rate of increase becomes faster as temperature rises / **ora** ; the higher the temperature the greater the distance moved by the meniscus **ora** ;	[max 1]	**A** positive correlation **I** efficiency **R** incorrect causal relationship in an **ora**

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Question	Expected Answers	Marks	Additional Guidance
(ii)	1 enzymes will be destroyed / cease to function ; 2 shoot / plant / leaf / cells die / no transpiration ; 3 water loss greater than water intake ; 4 difficulty in achieving temperature (in lab) ;	[max 2]	**A** enzymes denatured **A** wilting
(c) (i)	less transpiration / (meniscus) will not move as fast or as far / slower rate of movement / less water loss / less water uptake ;	[1]	**I** smaller / lower results
(ii)	1 smaller leaves ; 2 fewer leaves ; 3 less surface area (for transpiration) ; 4 fewer stomata (through which transpiration can occur) ;	[max 2]	
(d)	humidity ;	[max 1]	**A** air movement / light (intensity) / carbon dioxide concentration
		[Total: 8]	

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<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>6 (a)</td><td>change the genetic material (of an organism);

by removing / changing / inserting (individual) genes;

from one organism / species to another;</td><td>[max 2]</td><td></td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>example</th><th>benefit</th></tr>
<tr><td>to make (bacteria) produce insulin ;</td><td>treat diabetes / cheaper method of production ;</td></tr>
<tr><td>crop plants resistant to herbicides / pesticides ;</td><td>kill weeds / other pests without killing plant so more food produced ;</td></tr>
<tr><td>crop plants resistant to insects ;</td><td>less of plant eaten by insect – more food produced ;</td></tr>
<tr><td>crop plants produce more vitamins ;</td><td>fewer cases of vitamin deficiency ;</td></tr>
<tr><td>any valid example ;</td><td>any valid benefit ;</td></tr>
</table>
</td><td>[max 4]</td><td>I references to artificial selection

mark as a pair, but benefit must match example</td></tr>
<tr><td></td><td></td><td>[Total: 6]</td><td></td></tr>
</table>

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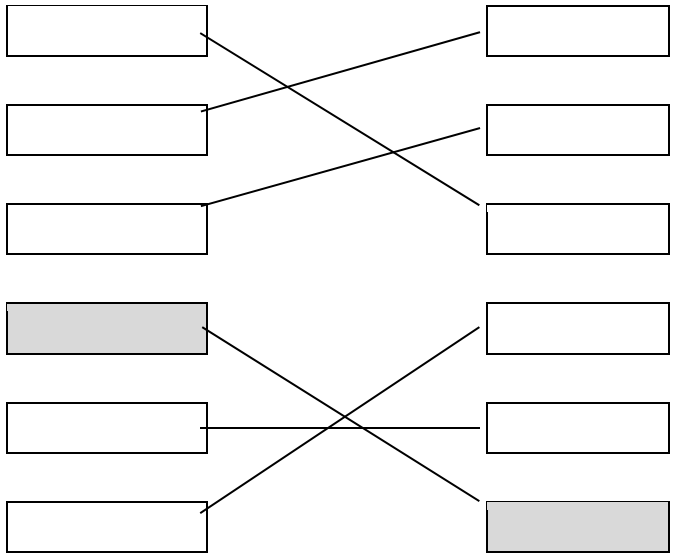
Question	Expected Answers	Marks	Additional Guidance
7	 ;;;;	[4]	5 or 4 correct = 4 3 correct = 3 2 correct = 2 1 correct = 1
		[Total: 4]	
8 (a) (i)	***L*** – renal artery ; ***M*** – ureter ;	[2]	
(ii)	*produced by*: liver ; *transferred in:* blood / plasma / blood vessels / circulation ;	[2]	

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Question	Expected Answers	Marks	Additional Guidance
(b)	1 student drank less water / ate fewer foods, containing water ; 2 student sweated more / AW ; 3 (as) it was a hotter day ; 4 (as) student exercised / student had a fever ; 5 student ate a lot of salty food ; 6 lower humidity so water (vapour) lost in exhalation ;	[max 3]	ignore numbered lines **A** student had diarrhoea; student vomited; student lost a lot of blood; **I** renal failure on that day / student cried
(c)	1 screening / removal of large solids / twigs / plastic / etc. ; 2 settling out / grit settles to bottom of tank ; 3 microbes / bacteria decompose (digest) organic material ; 4 digestion of materials in liquid by (aerobic) microorganisms ; 5 aeration ; 6 materials in sludge digested by (anaerobic) bacteria ; 7 filtration ; 8 chlorination or sterilisation / use of disinfectants / bactericides / bacteria killed ;	[max 3]	**A** filtration once only unless qualified
		[Total: 10]	

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<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>9 (a) (i)</td><td>
<table>
<tr><td>component</td><td>food</td></tr>
<tr><td></td><td></td></tr>
<tr><td>protein ;</td><td></td></tr>
<tr><td>carbohydrate ;</td><td></td></tr>
<tr><td></td><td>any example of plant cell wall material / any fruit or vegetable ;</td></tr>
</table>
</td><td>[3]</td><td></td></tr>
<tr><td>(ii)</td><td>minerals / ions / named mineral ;

vitamins / named vitamin ;

water ;</td><td>[max 2]</td><td>A ecf from table if group not given there</td></tr>
</table>

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Question	Expected Answers	Marks	Additional Guidance
(b)	1 use of agricultural machinery / tractors / trucks ; improved efficiency / greater land area cultivated / plant more seeds / harvest more of the crop / harvest faster / spray pesticides / irrigate the crop ; 2 use of (artificial) fertilisers ; improved yields / grow faster ; 3 use of herbicides / pesticides / insecticides; no competition from weeds / pests or increases yields ; 4 selective breeding; improve quality / quantity of produce ; 5 use of glass houses / poly-tunnels ; protect crops from adverse environment / provide optimum growing environment / grow out of season / increased yields ; 6 any valid example ; with improvement ;	[max 4]	example and improvement must match **A** increased yields for any of the explanations **A** explanations in terms of increased speed or efficiency and **I** references to an example being easier
(c)	1 death of organisms ; 2 disrupts food chains / webs / eutrophication ; 3 habitat destruction / soil erosion ; 4 changes in precipitation ;	[max 2]	**A** deforestation **A** reduced biodiversity
		[Total: 11]	

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