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

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.

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

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

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

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]	

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

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]	

<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>

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**

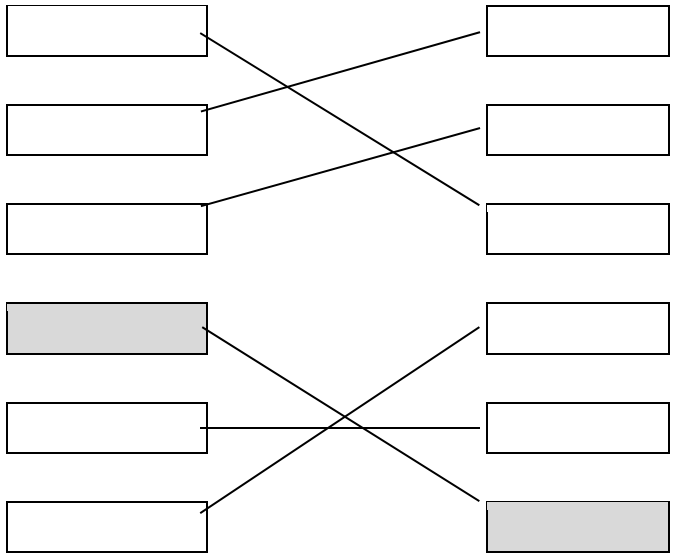
Question	Expected Answers	Marks	Additional Guidance
(ii)	1 enzymes will be destroyed / cease to function ; 2 shoot / plant / leaf / cells die / no transpiration ; 3 water loss greater than water intake ; 4 difficulty in achieving temperature (in lab) ;	[max 2]	**A** enzymes denatured **A** wilting
(c) (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]	

<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>

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]	

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]	

Question	Expected Answers	Marks	Additional Guidance
9 (a) (i)	component ; food [blank] ; [blank] protein ; [blank] carbohydrate ; [blank] [blank] ; any example of plant cell wall material / any fruit or vegetable ;	[3]	
(ii)	minerals / ions / named mineral ; vitamins / named vitamin ; water ;	[max 2]	**A** ecf from table if group not given there

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]	