



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0438/31

Paper 3 Theory (Core)

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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

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This document consists of **12** printed pages.

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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
- 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 words given must be used by the candidate (or grammatical variants of them)

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
1(a)	arthropods; five; exoskeleton; population; carnivore / consumer; producer;	6	
1(b)	actual size = $\frac{\text{observed size}}{\text{magnification}}$; <i>If no correct formula</i> ref. to, observed / diagram / image, size; ref. to magnification ;	3	magnification = $\frac{\text{observed size}}{\text{actual size}}$ = 2 marks
1(c)	to avoid predators / AW; to find their food / AW; ref. to cool temperature / to avoid sun / AW; keep moist / AW; camouflage; AVP;	2	A humid place
1(d)(i)	both have same genus / both <i>Porcellana</i> ;	1	

Question	Answer	Mark	Guidance
1(d)(ii)	they are different species; offspring would be infertile;	1	
		Total: 13	

Question	Answer	Mark	Guidance										
2(a)(i)	a group of receptor cells; which respond to, (specific) stimuli / light / sound / touch / temperature / chemicals;	2	A receptor A detects / reacts to / receives, for responds I ref to environment										
2(a)(ii)	an, organ / eye, is made of, more than one / many, tissues; working together to perform a function;	2											
2(b)(i)	<table border="1"> <thead> <tr> <th>function</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>carries impulses to the brain</td> <td>C ;</td> </tr> <tr> <td>contains light receptors to detect light</td> <td>A ;</td> </tr> <tr> <td>controls how much light enters the eye</td> <td>G ;</td> </tr> <tr> <td>refracts light</td> <td>F ;</td> </tr> </tbody> </table>	function	letter	carries impulses to the brain	C ;	contains light receptors to detect light	A ;	controls how much light enters the eye	G ;	refracts light	F ;	4	A D
function	letter												
carries impulses to the brain	C ;												
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controls how much light enters the eye	G ;												
refracts light	F ;												
2(b)(ii)	B ;	1											
		Total: 9											

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
3(a)(i)	2.5 g;	1	
3(a)(ii)	28.1%;;	2	$\frac{1.8 \times 100}{6.4}$ or 0.281×100
3(b)	hot and dry;	1	
3(c)(i)	large surface area / elongated cells;	1	
3(c)(ii)	O at start; P before N ; M at the end;	3	
3(d)(i)	<u>xylem</u> ;	1	
3(d)(ii)	mineral ions;	1	
		Total: 10	

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
4(a)(i)	disease-causing organism;	1	
4(a)(ii)	(direct) contact / through blood / through (named) body fluids; (contaminated) surfaces / AW; (contaminated) food / water / AW; from, animals / (named) vector; through the air / AW;	2	
4(a)(iii)	<i>mechanical</i> skin / hairs in nose; <i>chemical</i> mucus / stomach or hydrochloric acid / gastric juices;	2	
4(b)(i)	ref. to white blood cells; phagocytosis / engulfing / description of engulfing; ref. to production of antibodies / causing cells to clump / stick to cell surface AW;	3	
4(b)(ii)	vaccination / antibiotics / antifungals / antivirals / antitoxin / antiseptics / AVP;	1	
		Total: 9	

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
5(a)(i)	(most fish) 1905– 1909;	1	
5(a)(ii)	(least fish) 1960– 1964;	1	
5(a)(iii)	14.0 × 106 <u>kg</u> ;;	2	37.4 – 23.4 = 14.0
5(b)	(no) fish catches still dropped / little change in catches / AW;	1	I ref. to lampreys already there and reproducing
5(c)	<p>pollution / contamination, of lakes / water / sea / rivers;</p> <p>specific example e.g. fertilisers / pesticides / oil / petrol / chemicals / sewage;</p> <p>fishing;</p> <p>lack of food;</p> <p>habitat, destruction / interference;</p> <p>other fish species / predator (birds or animals);</p> <p>disease / parasites;</p> <p>A.V.P.; e.g. global warming / acid rain / eutrophication</p>	3	

Question	Answer	Mark	Guidance
5(d)	captive breeding program; zoos / reserves / national parks; ban hunting / laws to protect; conserve / protect, habitat AW; remove predators / competitors; educate / awareness / research; idea of ecotourism;	2	
		Total: 10	

Question	Answer	Mark	Guidance												
6(a)	<table border="1"> <tr> <td>process</td> <td>involves the movement of particles down a gradient</td> <td>involves the movement of particles up a gradient</td> <td>energy is required to move the particles</td> </tr> <tr> <td>diffusion</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>active transport</td> <td></td> <td>✓</td> <td>✓</td> </tr> </table>	process	involves the movement of particles down a gradient	involves the movement of particles up a gradient	energy is required to move the particles	diffusion	✓			active transport		✓	✓	2	3 correct ticks = 2 marks 1 or 2 correct ticks = 1 mark
process	involves the movement of particles down a gradient	involves the movement of particles up a gradient	energy is required to move the particles												
diffusion	✓														
active transport		✓	✓												

Page 9	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
6(b)	lungs / alveoli; leaf / stoma(ta); small intestine / ileum / duodenum;	3	A stomach / liver / kidney / muscle / AVP
6(c)	provides support / turgid / AW;	1	
		Total: 6	

Question	Answer	Mark	Guidance
7(a)	breakdown of food, into smaller pieces / to increase SA; ref. to chewing / tearing / using teeth / masticating grinding; without chemical change to the food molecules;	2	R ref. molecules I ref. to enzymes
7(b)(i)	(Q) dentine; (R) pulp (cavity);	2	A capillary / nerve
7(b)(ii)	has two cusps AW / has larger SA / is not pointed / canine only has one cusp / canine is pointed ; has two roots / canine only has one root ;	2	I sharp(er)

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Question	Answer	Mark	Guidance
7(b)(iii)	cement is exposed / AW; cement is softer than enamel; cement decays, easily / quickly AW;	2	
7(b)(iv)	avoid eating sugary foods / eat less sugar; do not eat between meals / AW; brush / clean / wash, teeth regularly; use of, dental floss / interdental brushes; use fluoride, toothpaste / water; calcium rich diet; visit dentist;	2	A avoid, acidic / fizzy, drinks
		Total: 10	

Page 11	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Guidance
8(a)(i)	causes (lung) cancer / AW; causes bronchitis; increased mucus production / more goblet cells / cough; reduces gaseous exchange / coats the alveoli / narrows the lumen of the airways; stops cilia working / AW; stains teeth and fingers;	2	
8(a)(ii)	(cigarette smoke) contains carbon dioxide;	1	
8(a)(iii)	(cigarette smoke) is acidic / has a low pH;	1	
8(a)(iv)	nicotine;	1	A particulates
8(b)	yellow / brown / sticky / stained, cotton wool or milky limewater or red Universal Indicator;	1	A many substances pass through the filter

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Question	Answer	Mark	Guidance
8(c)	haemoglobin/ red blood cells/ erythrocytes, carry/ transport, oxygen; carbon monoxide combines with haemoglobin; ref. to permanent bond; (carbon monoxide binding to haemoglobin) prevents O ₂ from binding to haemoglobin/ AW;	2	
		Total: 8	

Question	Answer	Mark	Guidance
9(a)(i)	V ;	1	
9(a)(ii)	W ;	1	
9(a)(iii)	U ;	1	
9(a)(iv)	X ;	1	
9(b)	1:1;	1	A 50% / 0.5
		Total: 5	