

# Markscheme

May 2019

Biology

Standard level

Paper 2

No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without written permission from the IB.

Additionally, the license tied with this product prohibits commercial use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, is not permitted and is subject to the IB's prior written consent via a license. More information on how to request a license can be obtained from <http://www.ibo.org/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite de l'IB.

De plus, la licence associée à ce produit interdit toute utilisation commerciale de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, n'est pas autorisée et est soumise au consentement écrit préalable de l'IB par l'intermédiaire d'une licence. Pour plus d'informations sur la procédure à suivre pour demander une licence, rendez-vous à l'adresse <http://www.ibo.org/fr/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin que medie la autorización escrita del IB.

Además, la licencia vinculada a este producto prohíbe el uso con fines comerciales de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales— no está permitido y estará sujeto al otorgamiento previo de una licencia escrita por parte del IB. En este enlace encontrará más información sobre cómo solicitar una licencia: <http://www.ibo.org/es/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

## Section B

### Extended response questions - quality of construction

- ♦ Extended response questions for SLP2 carry a mark total of **[16]**. Of these marks, **[15]** are awarded for content and **[1]** for the quality of the answer.
- ♦ **[1]** for quality is awarded when:
  - ♦ the candidate's answers are clear enough to be understood without re-reading.
  - ♦ the candidate has answered the question succinctly with little or no repetition or irrelevant material.

**Section A**

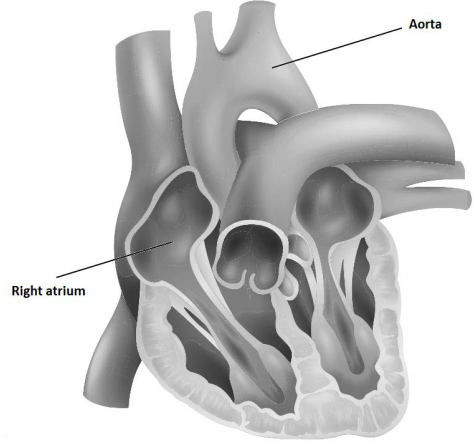
Question			Answers	Notes	Total
1.	a	i	Sierra Leone ✓		1
1.	a	ii	Liberia ✓		1
1.	b		country with biggest population/Mali has lowest number of deaths <b>OR</b> country with smallest population/Liberia has biggest number of deaths ✓	<i>OWTTE</i>	1
1.	c		greater density means more frequent contact with infected people/animals ✓	<i>Need both greater density and frequency of contact</i>	1
1.	d		a. overall pattern similar in both/both show a rise and a fall in the infections ✓  b. both countries show an increase during 2014 <b>OR</b> neither country shows an increase in 2015 ✓  c. both show a sudden drop at one point <b>OR</b> sudden drop earlier «Oct–Nov 14» in Liberia than in Guinea «Dec 14, Jan 15» ✓  d. Guinea fluctuates whereas Liberia rises to a peak and then decreases/no fluctuations ✓  e. epidemic starts earlier «in April 14» in Guinea than in Liberia «in June 14» ✓  f. epidemic peaks earlier «Sept 14» in Liberia than in Guinea «Dec 14» ✓  g. epidemic lasts longer in Guinea than it does in Liberia <b>OR</b> last case recorded in Liberia Feb 15 while cases continue «at least» until May 15 in Guinea ✓  h. numbers of cases in Guinea generally lower than in Liberia <b>OR</b> number of cases higher in Liberia than in Guinea ✓		<b>3 max</b>

*(continued...)*

(Question 1 continued)

Question		Answers	Notes	Total
1.	e	a. improved medical care/support/supplies/equipment/training of staff/hygiene/distribution of vaccine ✓ b. improved understanding of how to avoid infection «amongst public»/greater awareness in society/better education ✓ c. rise in number of deaths means fewer infectious individuals ✓ d. impact of disease control measures/control policies/quarantine/isolation ✓ e. drop in the number of fruit bats ✓ f. maybe seasonal changes/weather changes ✓ g. people may have left the area ✓ h. international aid arrives ✓	OWTTE	2 max
1.	f	a. cells not killed/few cells killed «even at high concentrations» ✓ b. «T-705» effective/viruses reduced/viruses killed at 100 µM <b>OR</b> «T-705» very effective/viruses much reduced/nearly all viruses killed at 1000 µM ✓ c. virus concentration decreases as T-705 concentration increases ✓ d. drug has «high» potential for treatment «at high enough concentration» ✓		2 max
1.	g	raise awareness/provide information for local population/supply health workers/equipment/train local staff/share expertise/provide financial support/provide vaccine/travel ban alert to affected country ✓		1

Question		Answers	Notes	Total
2.	a	«micrograph» <u>C</u> cristae/double membrane is visible/«folds of» membranes inside ✓	<i>Must state observation</i>	1
2.	b	a. «double» membrane may have formed when engulfed ✓ b. replicate by binary fission like free-living prokaryotes <b>OR</b> reproduce separate from «host» cell replication ✓ c. they have their own «circular» DNA <b>AND</b> reproduce on their own ✓ d. they have «70s» ribosomes <b>AND</b> can manufacture «their own» proteins ✓ e. have organelle«s» similar to free-living prokaryotes ✓ f. similar in size to free-living prokaryotes ✓ g. mitochondrial inner membranes manufacture ATP like bacterial membranes ✓ h. currently there is no free-living prokaryote like a mitochondrion ✓		3 max

Question			Answers	Notes	Total
3.	a	i & ii	<p>both labelled clearly as in diagram ✓</p> 		2
3.	b		<p>a. valves open and close in response to changes in blood pressure/heart contraction/pumping ✓</p> <p>b. valve prevents backflow/maintains direction of blood flow ✓</p> <p>c. valves allow heart chambers to fill/to empty ✓</p>		2 max
3.	c		<p>a. coronary heart disease/CHD/coronary artery disease/CAD occurs when there is reduction of oxygen to the heart muscle ✓</p> <p>b. high ratio of LDL to HDL/fatty diet leads to plaque formation in arteries ✓</p> <p>c. plaque breaks off causing damage that activates blood clot formation ✓</p> <p>d. clots «in the bloodstream» may block a coronary artery/coronary thrombosis reducing blood flow/oxygen <b>OR</b> clots can cause heart attack/muscle death ✓</p> <p>e. sickle cell anemia «crisis» produces blood clots «that can cause coronary/arterial blockage» ✓</p>		2 max

(continued...)

(Question 3 continued)

Question		Answers	Notes	Total
3.	d	a. produce antibodies ✓ b. memory cells confer immunity ✓ c. specific immunity results from production of antibodies specific to a particular antigen ✓ d. recognize pathogens ✓ e. destroy foreign cells/cancer cells ✓		2 max
4.	a	type I: a. carry out gas exchange <b>OR</b> diffusion of gases/CO <sub>2</sub> /O <sub>2</sub> ✓  type II: b. secrete fluid/surfactant ✓		2 max
4.	b	a. O <sub>2</sub> concentration in alveolar air greater than in capillary/blood «prior to gas exchange» <b>OR</b> hemoglobin in blood binds oxygen maintaining the concentration gradient ✓  b. O <sub>2</sub> gas dissolves in water lining the alveolus ✓ c. O <sub>2</sub> <u>diffuses</u> through wall of alveolus and capillary into blood ✓ d. CO <sub>2</sub> concentration in blood greater than in alveolar air «prior to gas exchange» ✓ e. CO <sub>2</sub> <u>diffuses</u> through wall of capillary and alveolus into alveolar airspace ✓		3 max



Question		Answers	Notes	Total
5.	a	fur/hair/mammary glands/feed young with milk/three inner-ear bones/lungs ventilated by diaphragm/lungs contain alveoli ✓		1
5.	b	<i>Canis aureus</i> /golden jackal <b>AND</b> <i>Canis lupus</i> /grey wolf ✓	<i>Both needed</i>	1
5.	c	<i>Hapalemur aureus</i> /Golden bamboo lemur <b>AND</b> <i>Canis aureus</i> /golden jackel/ <i>Canis lupus</i> /grey wolf/ <i>Vulpes vulpes</i> /red fox <b>OR</b> <i>Vulpes vulpes</i> /red fox <b>AND</b> <i>Canis aureus</i> /golden jackal/ <i>Canis lupus</i> /grey wolf/ <i>Hapalemur aureus</i> /golden bamboo lemur ✓		1
6.	a	male because Y chromosome present <b>OR</b> male because sex chromosomes/last two chromosomes/pair 23 are unpaired/different «from each other»/not homologous ✓		1 max
6.	b	21 <b>AND</b> Down syndrome/trisomy 21 ✓	<i>Both needed</i>	1

**Section B**

**Clarity of communication: [1]**

*The candidate's answers are clear enough to be understood without re-reading. The candidate has answered the question succinctly with little or no repetition or irrelevant material.*

Question		Answers	Notes	Total
7.	a	a. DNA is unwound/strands are separated «by RNA polymerase» ✓ b. new nucleotides attached to template strand «by RNA polymerase» ✓ c. <u>complementary</u> base pairing/base pairing with an example <b>OR</b> adenine with thymine/uracil with adenine/cytosine with guanine/guanine with cytosine ✓ d. mRNA detaches from template ✓ e. DNA rewinds ✓		4 max
7.	b	a. facilitated diffusion by channel proteins ✓ b. active transport by protein pumps <b>OR</b> protein pumps eg sodium-potassium ✓ c. cell recognition by glycoproteins/protein receptors ✓ d. communication/receptors for hormones/signal molecules ✓ e. cell adhesion ✓ f. allow up to one additional mark for AHL material ✓		4 max

(continued...)

(Question 7 continued)

Question		Answers	Notes	Total
7.	c	<p>a. natural selection is caused by selection pressures in the environment <b>OR</b> example of a selection pressure ✓</p> <p>b. natural selection requires that variation exists within a species ✓</p> <p>c. variation arises randomly due to mutation <b>OR</b> variation is enhanced by meiosis/sexual reproduction ✓</p> <p>d. over-production of offspring promotes selection <b>OR</b> natural selection occurs when there is competition/overpopulation/predators/environmental changes/changes in selection pressures ✓</p> <p>e. well adapted individuals/individuals with best variations survive to reproduce/survival of fittest ✓</p> <p>f. «frequency of» genes/alleles conferring an advantage are selected for <b>OR</b> genes/alleles conferring a disadvantage are selected against ✓</p> <p>g. genetic divergence/difference increases <b>OR</b> natural selection «genetically» isolates members of a species so eventually they can no longer produce fertile offspring ✓</p> <p>h. genetic divergence» leads to reproductive isolation ✓</p> <p>i. geographical/behavioural/ecological factors may lead to «reproductive» isolation ✓</p> <p>j. prolonged «reproductive» isolation leads to speciation ✓</p> <p>k. up to one additional mark for AHL information ✓</p>		7 max

(Plus up to [1] for quality)

Question		Answers	Notes	Total
8.	a	a. «detritivores» obtain nutrition from detritus/waste/dead bodies ✓ b. are heterotrophic ✓ c. removes large waste/cleans up the ecosystem <b>OR</b> helps control spread of disease ✓ d. facilitates further decomposition ✓ e. contribute to the supply of «inorganic» nutrients for autotrophs/nutrient cycling <b>OR</b> improve soil conditions/aeration ✓		4 max
8.	b	a. amylase is an enzyme ✓ b. secreted by salivary glands/pancreas ✓ c. active/released into the mouth/small intestine ✓ d. acts on starch/polysaccharides ✓ e. breaks «glycosidic» bond by hydrolysis/adding water ✓ f. converts insoluble/large molecule to soluble/small molecules ✓ g. product is maltose/disaccharide/sugar molecule ✓		4 max

(continued...)

(Question 8 continued)

Question		Answers	Notes	Total
8.	c	a. plants convert light energy into chemical energy by photosynthesis ✓ b. photosynthesis takes place in chloroplasts ✓ c. chloroplasts «are organelles that» contain the pigment chlorophyll ✓ d. chloroplasts/chlorophyll «in plants» absorb sunlight ✓ e. «chlorophyll» absorbs red <b>AND</b> blue light most effectively ✓ f. light causes photolysis/splits water molecule ✓ g. carbon dioxide <b>AND</b> water are reactants «in photosynthesis» ✓ h. glucose <b>AND</b> oxygen are products «of photosynthesis» ✓ i. light <u>intensity</u> is a limiting factor for the <u>rate</u> of photosynthesis ✓ j. organic/carbon compounds/glucose provide food/stored energy «for plant itself, animals, food chains» ✓ k. up to one additional mark for an accurate detail from AHL ✓		7 max

(Plus up to [1] for quality)