

# Markscheme

**May 2025**

**Biology**

**Higher level**

**Paper 1B**

© International Baccalaureate Organization 2025

All rights reserved. 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 the prior written permission from the IB. Additionally, the license tied with this product prohibits 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, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organisation du Baccalauréat International 2025

Tous droits réservés. 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 préalable de l'IB. De plus, la licence associée à ce produit interdit toute utilisation 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, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d'informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d'une licence, rendez-vous à l'adresse <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organización del Bachillerato Internacional, 2025

Todos los derechos reservados. 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 la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso 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—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

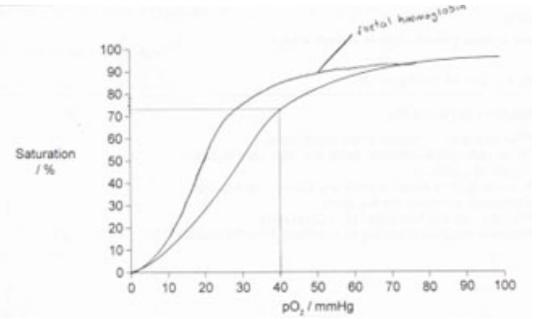
En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

### Subject Details: Biology HL Paper 1b Markscheme

Candidates are required to answer **all** questions. Maximum total = **35 marks**.

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. An alternative answer is indicated by “**OR**”. Either answer can be accepted.
5. An alternative markscheme is indicated under heading **ALTERNATIVE 1** etc. Either alternative can be accepted.
6. Words in brackets ( ) in the markscheme are not necessary to gain the mark.
7. Words that are underlined are essential for the mark.
8. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
9. If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect).
10. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
11. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking indicate this by adding **ECF** (error carried forward) on the script.
12. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

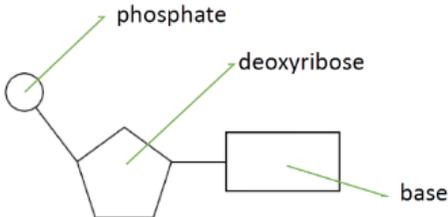
Question		Answers	Notes	Total
1.	a	73%;	<p><i>Accept answers between 71 and 74 %.</i></p> <p><i>Units required.</i></p>	1
1.	b	<p>a. as pO<sub>2</sub> increases, % saturation increases <b>OR</b> positive correlation/relationship;</p> <p>b. % saturation levels off/plateaus/<i>OWTTE</i> (at higher partial pressure);</p> <p>c. sigmoidal relationship/S curve;</p>	<p><i>a., b. Accept quoting values for increase and levelling off.</i></p> <p><i>c. Do not accept other terms than sigmoid or S shaped curve.</i></p> <p><i>Do not accept 100% saturation.</i></p>	2 max

Question	Answers	Notes	Total
1. c	<p>curve should be the sigmoidal and drawn to the left of the oxygen dissociation curve;</p> 	<p><i>Labels not necessary.</i></p> <p><i>Not necessary that curves meet at high pO<sub>2</sub>.</i></p>	1
1. d	<p>a. oxygen binds to the haem group/iron;                      b. haemoglobin structure / 4 haem groups allow for <u>cooperative binding</u> of oxygen;                      c. when one oxygen binds to haemoglobin oxygen affinity increases due to change in conformation (of haemoglobin);</p>		1 max
1. e	<p>a. tidal volume is the volume of <u>air</u> moved into and/or out of the lungs in one normal/regular/unforced breath;                      b. use a spirometer/named appropriate apparatus;                      c. breathe/expire (normally) into the mouthpiece/tube (of the spirometer);                      d. measure the volume of air breathed out;</p>	<p><i>Accept annotated diagrams of how the equipment is used.</i></p> <p><i>a. Do not accept forced/deep/maximum breath, etc.</i>  <i>b. Do not accept respirometer or respiration belt.</i></p> <p><i>Accept other apparatus enabling to measure air volume, e.g., balloon, bell jar, etc.</i></p>	3 max

Question		Answers	Notes	Total
2.	a	<p>a. the crocodile feeds on three different species of animals / <i>OWTTE</i>;</p> <p>b. the crocodile can be a tertiary consumer while cormorant/tigerfish is a secondary consumer <b>OR</b> the crocodile has a <u>higher trophic level</u> than both the cormorant and tigerfish / <i>vice versa</i>;</p> <p>c. DDT doesn't break down/biodegrade/metabolize <b>OR</b> (bio)accumulates/builds up (in the fat/adipose tissues/crocodile);</p> <p>d. accumulation/biomagnification of DDT in the higher/across trophic levels;</p>	<p><i>c. Do not award this marking point for "accumulates in the food chain".</i></p> <p><i>d. Trophic levels required.</i></p>	<b>2 max</b>
2.	b	<p>a. kapenta;</p> <p>b. has the lowest levels of DDT;</p>		<b>2</b>

Question		Answers	Notes	Total
2.	c	<p>a. use the <u>capture-mark-release-recapture</u> method  <b>OR</b>                      use the Lincoln index method;</p> <p>b. (random) sample is captured and marked/tagged (in a manner that will not harm the fish/tilapia);</p> <p>c. captured sample is released (and allowed to mix with general population);</p> <p>d. (after a period of time) second sample is captured and both the total number and the number of marked fish/tilapia counted/<i>OWTTE</i>;</p> <p>e. correct formula / description of formula;</p>		3 max
2.	d	<p><i>Impact: [2 max]</i></p> <p>a. overfishing can disrupt food chains/webs/ecosystems;</p> <p>b. named example from the diagram;</p> <p>c. decrease biodiversity / <i>OWTTE</i>;</p> <p><i>Assessing: [2 max]</i></p> <p>d. monitoring/measuring that the rate of harvesting of species is lower than the rate of replacement of species/<i>OWTTE</i>;</p> <p>e. monitoring/enforcing application of regulations;</p> <p>f. monitoring population size (over time)</p> <p><b>OR</b></p> <p>monitoring biodiversity (over time);</p>	<p><i>e. Accept monitoring of regulations, e.g., size/age of fish, number in a catch, mesh size of nets, quotas, etc., but not setting of regulations.</i></p>	4 max

Question		Answers	Notes	Total
3.	a	48 % ;	<p><i>Accept answers between 46 and 50 %.</i></p> <p><i>Units required.</i></p>	1
3.	b	<p>a. phosphorous/P is present in DNA <b>AND</b> sulphur/S in proteins/amino acids;</p> <p>b. lower percentage of <sup>32</sup>P remaining outside the cells show that <sup>32</sup>P was (injected) in the bacteria / <i>vice versa</i>;</p> <p>c. since phosphorus/P is a component of DNA therefore DNA is the genetic material / <i>OWTTE</i>;</p> <p>d. high percentage of <sup>35</sup>S remaining outside the cells shows that <sup>35</sup>S was not (injected) in the bacteria / <i>vice versa</i>;</p> <p>e. (since sulphur/S is component of protein), therefore protein is not genetic material;</p>	<p><i>b. and d. must indicate radioactive /isotopic P or S</i></p>	3 max

Question			Answers	Notes	Total
3.	c	i	 <p>a. deoxyribose drawn as a pentagon and labelled;</p> <p>b. (nitrogenous/nucleic) base linked correctly (to C1) of deoxyribose and labelled;</p> <p>c. phosphate linked correctly (to C5) of deoxyribose and labelled;</p>	<p><i>Allow a named/abbreviation base other than uracil/U.</i></p> <p><i>Do not accept ribose nor pentose sugar.</i></p>	3
3.	c	ii	<p><i>Purines: adenine/A and guanine/G</i></p> <p><i>Pyrimidines: thymine/T and cytosine/C;</i></p>	<p><i>All four bases need to be correctly listed to gain the 1 mark.</i></p>	1 max

Question			Answers	Notes	Total
4.	a		94 (%);	<i>Allow answers between 90 and 98.</i>	1
4.	b		(suggests that) there is no significant difference in percent decolorization;		1

Question		Answers	Notes	Total
4.	c	<p>a. pH, as each enzyme has (optimum) pH at which it functions best <b>OR</b> pH out of optimum/OWTTE pH results in denaturation / change in enzyme shape/conformation/ active site;</p> <p>b. temperature, as increased temperature results in enzyme denaturation / change in enzyme shape/conformation/ active site <b>OR</b> low (too low) temperatures cause enzyme inactivity / less enzyme activity/molecule collisions <b>OR</b> higher temperatures cause more enzyme activity/molecule collisions;</p> <p>c. size/shape/surface area/volume/number of the alginate beads as this affects the ratio of exposure of enzyme to the substrate;</p> <p>d. volume/concentration of the (crystal violet) dye as concentration of substrate affects rate of reaction <b>OR</b> volume of the enzyme as the final concentration of substrate/enzyme depends on the volume of the two solutions;</p> <p>e. type of enzyme/dye as enzymes are substrate specific;</p> <p>f. time allowed for enzyme reaction as longer or shorter time will impact on the amount/percentage of substrate that will be catalysed / OWTTE;</p>	<p><i>Naming a variable only is not sufficient for "discuss".</i></p> <p><i>a: Accept too acidic or basic.</i></p> <p><i>d: Do not accept enzyme/laccase concentration as this is the independent variable.</i></p>	<p><b>2 max</b></p>

Question		Answers	Notes	Total
4.	d	a. suggested method that could be used to measure colour change; b. measure absorbance/transmittance/ <i>OWTTE</i> of light before the experiment/adding laccase/control group <b>OR</b> compare colour with colour chart before the experiment/adding laccase; c. measure absorbance/transmittance/ <i>OWTTE</i> of light after the experiment/adding laccase <b>OR</b> compare colour with colour chart after the experiment/adding laccase; d. calculate the (percentage) difference;	a. <i>Colorimeter/spectrophotometer/serial dilutions/colour chart / standard curve.</i>  b and c: <i>A quantifiable reference must be used.</i>	<b>3 max</b>
4.	e	in linear products are not recycled but in cyclical they are recycled/become substrates/reactants / <i>OWTTE</i> ;	The format <i>“they are recycled in cyclical, but they are not in linear”</i> is acceptable.  Do not accept enzymes instead of products/substrates/reactants.	<b>1</b>