

APOLLO

Gas exchange

HL

Biology

First assessment 2025

9 questions | mark schemes

Mark-scheme answers

Biology HL | Paper 1A | May 2025 TZ1 | Q15 | 1 marks

15. D

Biology HL | Paper 1A | May 2025 TZ1 | Q23 | 1 marks

23. C

Biology HL | Paper 1A | May 2025 TZ2 | Q23 | 1 marks

23. A

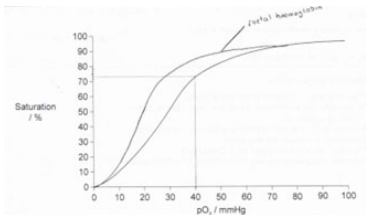
Biology HL | Paper 1A | May 2025 TZ3 | Q25 | 1 marks

25. D

1.	a	73%;	Accept answers between 71 and 74 %. Units required.	1
1.	b	a. as pO_2 increases, % saturation increases OR positive correlation/relationship; b. % saturation levels off/plateaus/OWTTE (at higher partial pressure); c. sigmoidal relationship/S curve;	a., b. Accept quoting values for increase and levelling off. c. Do not accept other terms than sigmoid or S shaped curve. Do not accept 100% saturation.	2 max

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2225 – 6014

Question	Answers	Notes	Total
1. c	curve should be the sigmoidal and drawn to the left of the oxygen dissociation curve; 	Labels not necessary. Not necessary that curves meet at high pO_2 .	1
1. d	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);		1 max
1. e	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;	Accept annotated diagrams of how the equipment is used. a. Do not accept forced/deep/maximum breath, etc. b. Do not accept respirometer or respiration belt. Accept other apparatus enabling to measure air volume, e.g., balloon, bell jar, etc.	3 max

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2225 – 6014

Question	Answers	Notes	Total
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10.	a	a. a codon is a triplet of bases of <u>mRNA</u>; b. (a codon) codes for/ is translated into one amino acid; c. one codon (AUG) initiates the translation OR AUG codes for Methionine/Met; d. 3 codons (UAA, UAG and UGA) are stop codons; e. one codon in <u>mRNA</u> matches/pairs with anticodon in <u>tRNA</u> OR complementary base pairing between <u>tRNA</u> and <u>mRNA</u> (in translation); f. genetic code is degenerate OR more than one codon/multiple codons can code for one amino acid; g. order of codons determines order of amino acids/primary structure of polypeptide/protein;	<i>b. Allow codons code for/are translated into amino acids.</i>	4 max
10.	b	a. photosystems embedded/located in chloroplast/thylakoid membranes; b. two types of photosystems, (Photosystem I and Photosystem II/PSI and PSII); c. structure allows light energy to be captured; d. (energy used) to emit excited electron; e. molecular <u>arrays</u> of chlorophyll (and accessory pigments) OR photosystem combines different types of pigments in one <u>array</u>; f. a greater proportion of wavelengths can be absorbed / greater proportion of sunlight can be used OR a single molecule of chlorophyll would not be able to perform photosynthesis;		3 max

Question	Answers	Notes	Total
10. c	a. increased (cellular) respiration can increase CO₂ levels in blood OR anaerobic (cellular) respiration produces lactic acid; b. due to exercise/lack of oxygen; c. (aqueous) carbon dioxide reacts to form carbonic acid/H⁺ ions (and HCO₃⁻ ions) OR increased CO₂ levels in blood cause a decrease in pH/acidosis OR lactic acid in blood can release H⁺ ions / can cause a decrease in pH/acidosis; d. in the presence of carbonic anhydrase (enzyme); e. <u>chemoreceptors</u> detect levels of carbon dioxide (in the blood) OR <u>chemoreceptors</u> monitor (blood) pH / H⁺ (in blood); f. (chemoreceptors) found in aorta/carotid arteries; g. (chemosensors/chemoreceptors) send information to respiratory centre in brain OR to the medulla/brainstem; h. (medulla) sends nervous impulses to the <u>external</u> intercostal muscles; i. (medulla) sends nervous impulses to the diaphragm; j. through intercostal/phrenic nerve; k. increasing breathing/ventilation rate; l. increasing volume of the lungs (during inhalation)/ increasing depth of breathing;		8 max

4.	a	increases/higher (volume of air inhaled/exhaled per minute);		1
4.	b	by chemoreceptors OR in the brainstem / medulla (oblongata) / carotid artery / aorta;		1
4.	c	a. changes/increases/decreases in carbon dioxide concentration/level; b. (increases in) carbon dioxide reduce pH/converse; c. carbon dioxide produced by (aerobic cell) respiration; d. removal of carbon dioxide from the blood in the lungs / by ventilation / by exhalation/expiration; e. dissociation of carbonic acid / hydrogen ions from carbonic acid / H_2CO_3 to $\text{HCO}_3^- + \text{H}^+$; f. lactic acid produced by anaerobic respiration / lactic acid reduces blood pH;		2 max
4.	d	diaphragm; <u>external</u> intercostal muscles;		2

Question	Answers	Notes	Total
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5.	a	a. diaphragm flattens OR volume inside the thorax/chest increases; b. pressure inside the thorax/chest/lungs decreases (below atmospheric pressure); c. air enters lungs to equalise the pressure OR air enters lungs moving from high to low pressure;	<i>For c. do not accept just "air enters the lungs" without an explanation.</i>	2 max
5.	b	(external) intercostal (muscles);	<i>Do not accept "internal" intercostal muscles. If the answer refers to both "internal and external" intercostal muscles (without any clarification on the role of each), then it is considered a contradiction, award no marking point.</i>	1

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8825 – 6021M

Question			Answers	Notes	Total
5.	c		a. moistens the inside wall/surface of the <u>alveoli</u> (for gas exchange); b. reduces surface tension (inside alveoli); c. prevents (alveoli) walls/surfaces sticking together OR helps to prevent collapse of the lungs; d. enhances (alveolar) expansion of lungs OR allows the inflation of lungs after birth;	<i>For c. (second strand) accept alveoli.</i>	2 max

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8825 – 6021M

Question	Answers	Notes	Total
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4.	a	a. concentration in blood is lower than air / blood arriving at alveoli is oxygen poor/deoxygenated; b. oxygen moves into blood by diffusion; c. oxygen concentration in alveolar air lower than in atmospheric air; d. ventilation occurs OR alveolar air replaced by (oxygen rich) atmospheric air; e. flow of blood in capillaries maintains concentration gradient;	Allow converse for CO ₂ for MP a, b and c	3
4.	b	a. rich capillary supply; b. epithelium is one cell thick; c. moist surface; d. large surface area / high surface area to volume ratio;		2
4.	c	a. plasma membrane has microvilli / is highly folded; b. large numbers of mitochondria (to supply energy for active transport); c. many vesicles formed by endocytosis;		2

Question	Answers	Notes	Total
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