

Gas Exchange in Humans

Mark Scheme 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Gas Exchange in Humans
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: 59 minutes

Score: /49

Percentage: /100

Question		Mark	Guidance
1 (a)	function	letter	name
	structure that makes sounds	A	larynx
	bone that provides protection for the lungs	E	rib ;
	airway that allows passage of air only into the right lung	J	bronchus ;
	airway that allows passage of air into both lungs	B	trachea ;
	contracts to increase the volume of the thorax	F/G	(F) diaphr / (G) exter intercostal muscle ;
	muscle that contracts to lower the ribcage	K	internal intercostal muscles ;
	site of gas exchange	M	alveoli ;
		[6]	
(b)	keeps, airways / trachea / bronchi, open ; allows (free flow of) air into (the lungs) ; allows flexibility / can breathe even when, bent / swallowing / AW ; AVP ;	[max 2]	I protection
(c) (i)	(aerobic) respiration ;	[1]	R anaerobic respiration
(ii)	rate (of breathing) increases ;	[1]	R it increase A it's faster / deeper

Question		Mark	Guidance
1 (iii)	stimulus (is CO ₂); A acidic/pH, of blood decreases ; (CO ₂ / pH) detected by the brain ; by a receptor ; ref to (named) neurone in context ; brain sends impulses to, (intercostal) muscles / diaphragm / effectors ; (intercostal) muscles / diaphragm / effectors, contract more (frequently) ; negative feedback / homeostasis ; reflex / automatic / involuntary ;	[max 3]	
		[Total: 13]	

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Question	Expected Answers		Marks	Additional Guidance
2 (a) (i)	bronchus/bronchiole(s) ;		[1]	
(ii)	1 2 3 4	goblet cells, release/produce, mucus ; mucus traps, dirt/particles/pathogens ; cilia, beat /AW ; to move, fluid /AW, up/out (of airway) ;	max [3]	R 'cilia trap dirt'
(b) (i)	1 2 3 4	diffusion ; across (cell/permeable) membranes ; high concentration to low concentration (of O ₂) / down concentration gradient ; moist lining /AW/O ₂ is dissolved ;	max [3]	
(b) (ii)	1 2 3 4 5 6 7 8	<u>external</u> intercostal muscles contract ; <u>internal</u> intercostal muscles relax ; lifts ribs, upwards/outwards ; diaphragm contracts ; diaphragm, flattens/drops ; volume of, thorax/lungs/chest, increases ; pressure in, thorax/lungs/chest, decreases ; air flows in down a pressure gradient ;	max [4]	A ribcage expands
(iii)	carbon dioxide ; water <u>vapour</u> ;		max [1]	

Question	Expected Answers		Marks	Additional Guidance
2 (c)	1	tar/carcinogens ;	max [4]	<i>component must be linked to correct effect</i>
	2	carcinogenic/ can cause, lung cancer ;		
	3	sticks to/ blocks / damages, (named) air passages/ alveoli/ cilia ;		
	4	(trigger) production of, more/ excess, mucus ;		
	5	(smoke) particles ;		
	6	trigger white blood cells ;		
	7	irritant/ causes asthma/ prone to infection ;		
	8	phagocytosis described ;		
	9	carbon monoxide ;		
	10	combines with haemoglobin (permanently) ;		
	11	reduced oxygen transport (of blood) ;		
			[Total: 16]	

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3 (a) (i)	award two marks if the answer is correct – 12 if there is no answer or it is incorrect, award one mark for correct working 6 s – 1 s = 5 seconds for 1 breath ; 60/5 = 12 (breaths per minute) ;	max [2]	Alternative: 4 s – 9 s = 5 s for 1 breath Allow 10 s for 2 breaths for working mark.
(ii)	slower breathing rate before match ; ora deeper breathing during match ; ora during the match breaths are different from each other ; ora pressure (in lungs) increases during the match ;	max [3]	
(b)	<u>external</u> intercostal muscles contract ; <u>internal</u> intercostal muscles relax ; lifts ribs, upwards/outwards ; diaphragm contracts ; diaphragm, flattens/drops ; volume of, thorax/lungs/chest, increases ; pressure in, thorax/lungs/chest, decreases ; air flows in down a pressure gradient/description ;	max [4]	Note: internal and external must be stated
(c) (i)	(CO ₂) is metabolic/AW, waste ; (CO ₂) is toxic ;	max [1]	ignore – from body (in question stem)
(ii)	(blood) plasma ;	[1]	
(iii)	pH decreases/becomes acidic ;	[1]	
(d)	more, (aerobic) respiration ; steeper concentration gradient ;	[2]	A description of gradient.
		[Total: 14]	

4 (a)	diaphragm <u>contracts</u> and, lowers / flattens / AW; rib cage rises / moves, upwards / outwards; external intercostal muscles <u>contract</u> ;	max 3	A increases in volume / expands
(b)	pH decreases; increased rate of aerobic respiration; more carbon dioxide (into blood plasma); forms (carbonic) acid; anaerobic respiration occurs (during strenuous exercise); lactic acid produced;	max 3	idea of <u>more</u> needs to be apparent at least once for MP2 and MP3 A carbon dioxide is acidic
		[Total: 6]	

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