

Respiration

Mark Scheme 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Respiration
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

CHEMISTRY ONLINE
— TUITION —

Time Allowed: 65 minutes

Score: /54

Percentage: /100

Question	E	Answers	Marks	Additional Guidance
1 (a)	1	muscular contraction / movement / pump blood ;	[max 3]	MP1 A maintain posture R 'sitting' unqualified R breathing unqualified MP2 R heat unqualified MP4 R respiration
	2	maintenance of body temperature ;		
	3	active transport / described / (passage of) nerve <u>impulses</u> ;		
	4	metabolic reactions / named example (e.g. excretion / biosynthesis /		
	5	digestion)		
	6	growth / replacement / repair ;		
	7	mitosis / nuclear division / cell division ; making, gametes / sperm ;		
(b)		aerobic ; respiration ;	[2]	
(c)	1	<u>oxygen debt</u> ;	[max 4]	A lactic acid, converted to CO ₂ and water / lactic acid oxidised
	2	oxygen not supplied fast enough (from lung / heart) / ORA more O ₂ supplied;		
	3	to muscles ;		
	4	removal of excess carbon dioxide ;		
	5	<u>anaerobic</u> respiration (in muscles) ;		
	6	lactic acid / lactate ;		
	7	builds up in muscle / not carried away fast enough in blood ;		
	8	lowers blood pH ;		
	9	makes person feel tired / muscle stiffness / fatigue / AW ;		
	10	muscle cannot contract any more ;		
	11	lactic acid is, broken down / respired / converted to glucose ;		

Question	Expected Answers	Marks	Additional Guidance
1 (d)	<p><i>at start of run</i></p> <p>1 <u>vasoconstriction</u>; 2 (constriction / AW) of arterioles ; A arteries 3 decrease in supply of blood to skin capillaries ; 4 ref. to shunt vessels ; 5 to increase supply of blood to <u>muscles</u> ;</p> <p>6 no / little sweat ;</p> <p><i>later as body temperature increases</i></p> <p>7 <u>vasodilation</u> ; 8 (relaxation / AW) of arterioles ; A arteries 9 increase in supply of blood to skin capillaries ; 10 (causes) loss of heat ; 11 by, conduction / convection / radiation ;</p> <p>12 increase in blood flow to sweat glands ; 13 increase production of sweat ; 14 loss of heat by evaporation ;</p>	[max 5]	<p>NB: All marks should be qualified by reference to stage of the run</p> <p>R constriction of capillaries / blood vessels / veins</p> <p>R constriction of capillaries / blood vessels / veins</p>
[Total:14]			

CHEMISTRY ONLINE
— TUITION —

Question		Answers			Marks	Additional Guidance
2	(a)	$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$; $\rightarrow \text{CO}_2 + \text{H}_2\text{O}$; $6\text{O}_2, 6\text{CO}_2, 6\text{H}_2\text{O}$;			3	<i>marks for:</i> correct formulae for glucose and oxygen correct formulae for carbon dioxide and water balancing the equation ignore word equation
	(b)	1	temperature ;		max 3	A amount A 'number / size'
		2	mass of soda lime ;			
		3	volume of air in the syringe ;			
		4	volume / size, of syringe ;			
		5	mass of seeds ;			
		6	idea of reading from same edge of droplet (each time) ;			
	(c)	(i)	1	moves to the right / towards seeds / syringe ;	max 3	
			2	seeds absorb oxygen ;		
			3	give out carbon dioxide, absorbed by soda lime ;		
			4	volume of, air / gas, decreases ;		
			5	pressure of, air / gas, decreases ;		
	(c)	(ii)	1	slows down / stops ;	max 2	A aerobic respiration stops R respiration (unqualified) stops
			2	rate of respiration decreased ;		
			3	oxygen being used up / AW ;		
			4	aerobic respiration slows / ref. to anaerobic respiration ;		
					[Total: 11]	

Question	E	Answers	Marks	Additional Guidance
3 (a)		release of energy, from, food / named food ; with oxygen ;	[2]	A word / chemical, equation (even if not balanced) for 1 mark R produce / create
(b)	1 2 3 4 5	external intercostal muscles contract ; ribcage raised ; A 'expands' volume of, thorax / chest / lungs, increases ; pressure of air decreases ; pressure of atmospheric air is greater than air in lungs ;	[max 4]	MPs 1 and 2 ignore diaphragm A space / size allow MPs 3–5 if in context of diaphragm
(c)	1 2 3 4	(external) intercostal muscles relax ; ribs, fall / move in and down ; <u>internal</u> intercostal muscles contract ; ref. to elasticity of lungs ;	[max 2]	R refs. to diaphragm
(d) (i)	70 ;		[1]	if answer not in Table 3.1 A elsewhere
(ii)	1 2 3 4 5 6 7 8 9 10 11 12 13	requires <u>more</u> oxygen ; oxygen debt ; lactic acid produced during exercise ; (as a result of) anaerobic respiration ; not enough oxygen supplied, to muscles (during running) ; lactic acid lowers pH of blood ; high concentration of carbon dioxide in blood ; from aerobic respiration ; (carbon dioxide) detected by, brain / receptors ; (carbon dioxide) stimulates high ventilation rate ; (carbon dioxide) increases depth of breathing ; lactic acid is, broken down / respired / converted to glucose ; ref. to homeostasis ;	[max 5]	A lactate for lactic acid throughout the answer A 'need to remove carbon dioxide'
[Total: 14]				

Question	E	Answers	Marks	Additional Guidance
4 (a)		$C_6H_{12}O_6$; $2C_3H_6O_3$;	[2]	I word equation I energy / ATP R if 2 is not included for $C_3H_6O_3$ R glucose if oxygen included on left of arrow R if water given on either side
(b)		2.0 / 2 ; 18 ; 36 ;	[3]	A <i>ecf</i> for volume of air per minute = multiple of first two figures in answer
(c)	1 2 3 4 5 6 7 8 9 10 11 12 13 14	descriptive comment on difference between Fig. 3.1 and 3.2 ; A data quote for any one of the results shown in Table 3.1 <u>muscle</u> ; respires faster ; R breathes faster (as this is for MP1) <i>idea that</i> more, energy / ATP, released / needed ; <u>aerobic</u> respiration ; <i>idea that</i> requires more oxygen ; A ref to more <u>oxygenated</u> blood <i>idea that</i> remove more carbon dioxide ; <i>change to breathing maintains</i> pH of blood ; oxygen concentration ; carbon dioxide concentration ; prevents (much) <u>anaerobic</u> respiration occurring ; prevents build up of, lactic acid / lactate ; R removes prevents oxygen debt ; R repays AVP ; e.g. ref. to homeostasis, contraction of muscle	[max 5]	breathing rate, volume of air, ventilation rate e.g. breathe, fast / faster, deeper R heavier A more respiration NOT more glucose R 'energy produced' MP8 – MP10 must have idea of maintaining near constant MP11–13 R refs. to there being an oxygen debt and paying off oxygen debt as question is about <i>during exercise</i> not afterwards, other points especially MP1 to 7 can still be awarded if answer contains refs to oxygen debt unless answer says 'after exercise'

Question	E	Answers	Marks	Additional Guidance
4 (d)		<p><i>mark both parts together to max 5 – some points may be awarded in either section</i></p> <p>1 <u>more</u> / <u>faster</u> , respiration in muscles ;</p> <p><i>pulse rate</i></p> <p>2 pulse rate increases ;</p> <p>3 <i>idea that</i> more / faster, blood transport to, muscles / lungs ;</p> <p>4 <i>idea that</i> muscle requires more oxygen ;</p> <p>5 remove, carbon dioxide from muscles ;</p> <p>6 remove, lactic acid / lactate, from muscles ;</p> <p>7 remove heat from muscles ;</p> <p><i>concentration of glucose</i></p> <p>8 concentration of blood glucose, increases / stays the same ;</p> <p>9 glucose required for, energy / respiration ;</p> <p>10 for muscle, activity / contraction / to work ;</p>	[max 5]	<p>A heart pumps faster R 'to body'</p> <p>I – (strenuous) exercise</p>
			[Total: 15]	

CHEMISTRY ONLINE
— TUITION —