Mark scheme

Respiration and gas exchange

Biology 0610 · Questions from Paper 3, Paper 4 and Paper 6

Total marks

96

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
4	6	10	10	13	9	10	11	11	12	**96**

Question 1 [4]

1	glucose ; lactic acid ; alcohol ; carbon dioxide ;	4	

Question 2 [6]

2	**(a)**	*carbon dioxide* – 0.04% / lower and 4.0% / higher; *water* – varies due to humidity of surroundings / AW and more / saturated;	[2]	
	(b) (i)	*test* – limewater ; *results* – clear / colourless / transparent to cloudy;	[2]	**A.** hydrogen carbonate solution – red to yellow. initial colour must be given
	(ii)	*test* – (anhydrous) copper sulphate / cobalt chloride; *results* – white to blue for copper sulphate blue to pink for cobalt chloride;	[2]	
			[Total: 6]	

Question 3 [10]

3(a)	*diagram correctly labelled clockwise from top right:* trachea ; alveolus ; diaphragm ; rib ; bronchus ;	5	
3(b)	mouth / nose ;	1	
3(c)	more ; less ; vapour / molecules ;	3	
3(d)	limewater ;	1	

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Question 4 [10]

4(a)(i)	aerobic ;	1	
4(a)(ii)	**A** glucose ; **B** water ;	2	
4(a)(iii)	diffusion ;	1	
4(b)	*any three from:* active transport ; cell division ; growth ; maintain body temperature ; muscle contraction ; passage of nerve impulses ; protein synthesis ; AVP ;;	3	
4(c)	*any three from:* rate of respiration increases then decreases as temperature increases ; peak rate / optimum, at 40°C ; rate / gas production, very low / AW, after 60°C ; rate / gas production, the same / 0.1 at 80°C and 90°C ; data manipulation ;	3	e.g. rate doubles from 10°C to 20°C

Question 5 [13]

5(a)	chemical ; cells ; nutrient ; oxygen ;	4	
5(b)(i)	80 (kJ) ;;	2	1 mark for correct working if answer wrong 1600 x 0.05 or equivalent calculation
5(b)(ii)	carbon dioxide ; water ;	2	either order
5(b)(iii)	muscle contraction / muscle doing work / (muscle) movement ; metabolism / enzyme reactions / chemical reactions / digestion; protein synthesis ; cell division / cell repair; active transport ; growth ; passage of nerve impulses ; maintenance of a constant body temperature ; excretion;	3	**I** exercise **A** reproduction **A** shivering / keep warm / homeostasis
5(c)	(muscle produces) lactic acid ; **ora** **or** (muscle) does not produce carbon dioxide / ethanol / alcohol ; **ora**	1	**A ora** only if yeast stated
5(d)	brewing / making alcoholic drinks / making beer / bread-making / biofuels / making ethanol / making carbon dioxide ;	1	**A** fermentation

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Question 6 [9]

6(a)(i)	**X –** larynx ; **Y –** trachea ; **Z –** bronchus ;	**3**	
6(a)(ii)	cartilage ;	**1**	
6(b)	*any four from:* **1** external intercostal muscles contract (and internal intercostal muscles relax) ; **2** lifts ribs, upwards / outwards; **3** diaphragm, contracts / flattens; **4** volume of, thorax, increases ; **5** pressure in, thorax, decreases ; **6** causing air to flow, down a pressure gradient / into the lungs / lungs inflate ; **7** equalising pressure between atmosphere and lungs ;	**4**	
6(c)	alveoli / alveolus ;	**1**	

Question 7 [10]

7	**(a)**	lowered / flattened / AW ; increases / AW ; decreases / AW ; higher / greater / more ; into / inside; alveoli ;	6	
	(b)	(**A** / goblet cell) secretes / produces, mucus ; sticky ; collects / traps, particles (in the air) ; cilia, move / beat / waft; mucus moves / removes, away from alveoli / out of trachea / towards larynx / towards mouth / AW ;	max 4	***ignore*** hairs direction needed
			[Total: 10]	

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Question 8 [11]

8 (a)

structure	letter from Fig. 1.1
left lung	**D**
bronchus	**J**
diaphragm	**E**
intercostal muscle	**H**
rib	**C**
trachea	**B**

[5]

Only one letter per box; if more than one letter no mark

If letter crossed out but not rewritten mark it

JEHCB

(b) (i) 3750 ; *no mark for working alone* — [1] — *if the answer is not in the table look for it in the space for working*

(ii) number of breaths (per minute) / different rate of breathing ;
exhaled breath has a higher temperature ; — [max 1]

A faster, slower, change in frequency
ignore depth (as in the table) / heavier

(iii) water vapour / H_2O / any **named** rare *or* inert gas *or* pollutant ; — [1]

names, correct symbols or formulae for any of the following: H_2, Ar, He, Xe, Ne, Rn, Kr, SO_2, O_3, CO, NO_2, N_2O, CH_4, NH_3, I_2

(iv)

in breathed out air
1 after exercise less oxygen and more carbon dioxide / ora ;
2 use of data with % to quantify (for either oxygen or carbon dioxide) ;
explanation in terms of the following increasing
3 more oxygen, absorbed / is needed / used up ;
4 more carbon dioxide, produced ;
5 more gas exchange ;
6 more respiration ; **R** more anaerobic respiration
7 more energy required ;
8 repaying / AW, oxygen debt ; — [max 3]

MP2
oxygen – 17.2 to 15.3% / 1.9%
carbon dioxide – 3.6 to 5.5% / 1.9%

R inhaled
R exhaled
R produce energy

Question 9 [11]

9(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) ;;	**2**	one mark for correct symbols one mark for correct balancing
9(b)	150(%) ;;	**2**	one mark for correct working if answer wrong
9(c)	demand for, energy / oxygen, increases ; (rate of) respiration increases ; limited supply of oxygen to muscle (tissue) ; *idea that* heart / pulse / breathing, rate not increased enough ; muscles respire anaerobically ; lactic acid is produced ;	**3**	
9(d)	horses continue to breathe, at high rate / deeper ; continue with a high, heart / pulse, rate ; to provide, enough / AW, oxygen (to 'pay-off' the debt) ; lactic acid, moves / diffuses / AW, (from muscle) into blood ; lactic acid transported to the liver ; (in the liver) lactic acid is, broken down / oxidised / respired (aerobically) ;	**4**	

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Question 10 [12]

10(a)	20 ; 90 ; muscles / blood ; debt ; liver ; oxygen ; aerobic ;	**7**	
10(b)(i)	liver ;	**1**	
10(b)(ii)	kidney ;	**1**	
10(c)	$C_6H_{12}O_6 \rightarrow$; $2C_2H_5OH + 2CO_2$;	**2**	products in either order
10(d)	bread / **AVP** ;	**1**	

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