Mark Scheme

Q1.

Question number	Answer	Notes	Marks
(a)	• oxygen; • glucose;	in any order	2
	• water; • carbon dioxide;	in any order	2
(b) (i)	• A to B = 60 seconds; • 10 breaths during that period = 10 per minute;		2
(ii)	• 19.5 - 13.5 squares of movement = 6 squares; • $1dm^3$ = 4 squares; • $6/4 = 1.5dm^3$;		3
(c)	• peaks/troughs higher/lower; • closer together;		2
			Total 11 marks

Q2.

Question number	Answer	Notes	Marks
(a) (i)	C; (red blood cells)		1
(ii)	any three from • more carbon dioxide (1) • less oxygen (1) • moister (1) • warmer (1)		3
(iii)	• large surface area (1) • thin (walled)/wall one cell thick (1) • good blood supply (1) • moist lining (1)		3
(b)	• thin wall (1) • narrow lumen (1)	Allow references to only one blood cell passing through	2
(c)	• breathing (out)/exhalation more difficult/not smooth/shortness of breath/faster breathing rate (1) • as lungs would not squeeze out air/forced exhalation(1)		2

Q3.

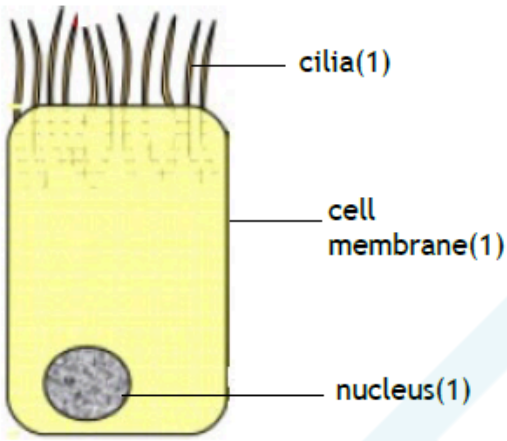
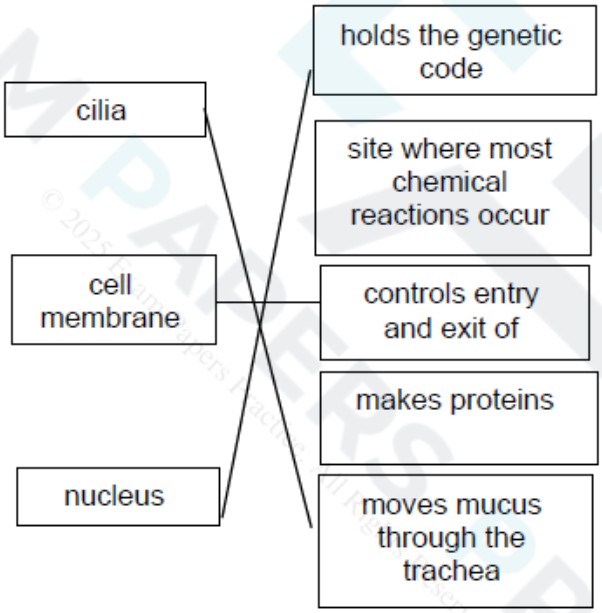
<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>(a) (i)</td><td>Increase/goes up;</td><td>allow equivalent</td><td>1</td></tr>
<tr><td>(ii)</td><td>Information required about other factors, such as diet/exercise/alcohol consumption/age/gender/exposure to pollution/(genetic) history/smokers or non smokers;;</td><td>Allow one mark for reference to lifestyles only</td><td>2</td></tr>
<tr><td>(b)</td><td>Less mucus removed by cilia/more mucus/build up of mucus in lungs/blocks airways/bacteria not removed;
Increased risk of (lung/respiratory) infection/coughing;</td><td></td><td>1
1</td></tr>
<tr><td>(c) (i)</td><td><table><tr><td></td><td>Surface area</td><td>Volume</td><td>SA:V ratio</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td>54;</td><td>27;</td><td>2:1;</td></tr></table></td><td>Allow for SA:V ratio 6:3 ECF</td><td>3</td></tr>
<tr><td>(ii)</td><td>Smaller surface area to volume ratio (in lungs with emphysema);
Reduced/less efficient gas exchange/diffusion of oxygen/carbon dioxide;
Less oxygenated blood/less oxygen transferred (to cells);
Less (aerobic) respiration;</td><td></td><td>Max 3</td></tr>
</table>

Q4.

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>(a) (i)</td><td>any four of

• exhale through tube A;
• time how long for limewater to go cloudy;
• replace limewater;
• inhale through tube B;
• compare time to go cloudy;</td><td></td><td>4 marks</td></tr>
<tr><td>(ii)</td><td>• more carbon dioxide in exhaled air;
• quicker/less time to go cloudy with exhaled air;
• produced by respiration;</td><td></td><td>3 marks</td></tr>
<tr><td>(b) (i)</td><td><table><tr><th>Lung volume</th><th>Letter</th><th>Volume in dm^3</th></tr><tr><td>tidal volume</td><td>W;</td><td>0.4;</td></tr><tr><td>vital capacity</td><td>Z;</td><td>2.25;</td></tr></table></td><td></td><td>4 marks</td></tr>
<tr><td>(ii)</td><td>• deep/maximum inhale;
• followed by maximum/forcefully exhale;</td><td>must be in correct order</td><td>2 marks</td></tr>
<tr><td colspan="4">Total 13 marks</td></tr>
</table>

Q5.

Question number	Answer	Notes	Marks
(a) (i)			3
(ii)		Reject more than one line from each structure	3

(b) (i)	Tar (1)		1
(ii)	• (cilia)burned/destroyed/reduced in number(1) • paralysed/cannot beat to and fro/move mucus(1)		2
	Total for Question = 9 Marks		

Q6.

Question number	Answer	Additional guidance	Mark
(a)	Reponses in the following order: pressure (1) volume (1) diaphragm (1) down (1) inflating (1)	 reject along	 5

Question number	Answer	Mark
(b)(i)	Arrow shows blood is flowing away from lung/alveolus	1

Question number	Answer	Mark
(b)(ii)	Process: • width of wall (measured with ruler) is 1 mm (1) • scale 18 mm = 0.1 mm (1) • actual width = 0.1 ÷ 18 (1) • 0.0055/0.006 mm (1)	4

Question number	Answer	Mark
(b)(iii)	An explanation that makes reference to the following points: • thin wall (1) • therefore short diffusion pathway (1) • oxygen/carbon dioxide will pass across in shorter time (1)	3

Q7.

Question number	Answer	Mark
(a)	A bar chart showing: • two bars for each student plotted correctly (1) • a key to clearly indicate resting pulse and pulse after two minutes of exercise (1) • horizontal and vertical axes with labels and units (1) • an appropriate scale (1)	4

Question number	Answer	Additional guidance	Mark
(b)	Process: (64 + 82 + 76 + 90) ÷ 4 (1) = 78 (1)	allow 2 marks for correct final answer	2

Question number	Answer	Mark
(c)	A suggestion that makes reference to pulse rate at rest/pulse rate after exercise not repeated or incorrect reading of pulse at rest/following exercise	1

Question number	Answer	Mark
(d)	Any three of the following possible reasons: • gender differences (1) • differences in body mass (1) • reference to health of lungs/heart/fitness of students (1) • different exercises carried out (1)	3

Question number	Answer	Additional guidance	Mark
(e)	A description that makes reference to any two of the following points: • place two fingers gently, not thumb (1) • on wrist/neck (1) • count for 15 seconds (1)	do not award radial pulse if linked to neck do not award carotid pulse if linked to wrist allow reference to digital pulse meter for first bullet point allow number of pulses within a set timeframe to work out pulse rate per minute	2

Q8.

Question number	Answer	Mark
(a)(i)	(red blood cells) are a similar size/diameter as the lumen of the capillary	1

Question number	Answer	Mark
(a)(ii)	An explanation that makes reference to any three of the following points: • more diffusion of oxygen (into cells) (1) • slower flow (of red blood cells) (1) • because more time for diffusion to take place (1) • greater surface area in contact with capillary walls/shorter diffusion distance (1)	3

Question number	Answer	Mark
(b)	An explanation that makes reference to any three of the following points: • less oxygen transported (to baby) (1) • (due to) presence of carbon monoxide(1) • has a higher affinity for red blood cells than oxygen or binds more strongly to red blood cells or binds irreversibly to red blood cells (1) • forms carboxyhaemoglobin (1) • less aerobic respiration/less energy released (in baby) (1) • less growth (1)	3