

1.	(a)	Concept of mixture with dead space air / eq; (e.g. air in trachea / air just breathed in)	1	
	(b)	Due to water vapour; alters relative % of N <sub>2</sub> ;	2	[3]
2.	(a)	(i) Oxygen / glucose / amino acids / named ions / water / lipid; ( <i>A monosaccharides R sugars</i> ) ( <i>One mark awarded only if both substances correct.</i> )	1	
		(ii) More blood will mean <u>more</u> effective supply of oxygen / nutrients / removal of waste products / heat; Needed to meet increased respiration / metabolism / greater energy demand (of muscle);	2	
	(b)	(i) (Molecules) too large to pass through wall / out of capillary;	1	
		(ii) Lowers water potential / makes water potential more negative; Causing water to move into capillary by osmosis / diffusion; ( <i>A Lowers solute potential / increases osmotic pressure</i> )	2	[6]
3.	(a)	Made of tissues;	1	
	(b)	(i) Increase in pressure causes valve <b>A</b> to shut; And valve <b>B</b> to open; Blood will therefore be squeezed in one direction / valves prevent backflow;	3	
		(ii) “Residual” pressure / “Suction” due to action of heart / “Respiratory pump”;	1	
	(c)	(i) Causes an increase up to 4 kPa / stroke volume reaches 100 cm <sup>3</sup> then no further effect / stroke volume remains constant; <i>Mark for rise then constant with reference to point at which gradient changes.</i>	1	
		(ii) Heart rate / pulse rate / description;	1	[7]

4. Quality of written communication should be considered in crediting points in the marking scheme. In order to gain credit, answers must be expressed logically in clear, scientific terms.

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|-----|------|--|-------|
| (a) | (i)  | Correct answer of 17-20 = 1 mark<br>Supported by correct working = 1 mark                                  | 2     |
|     | (ii) | 2880 cm <sup>3</sup> ;   | 1     |
| (b) |      | Intercostal muscle / diaphragm contracts; Increasing volume of lungs / thorax / chest cavity;              | 2     |
| (c) |      | Rounding reduces it to zero / only to one decimal place;   | 1     |
| (d) | (i)  | Some air has been in trachea / bronchi / other parts of gas exchange system / dead space;                  | 1     |
|     | (ii) | Gas exchange / diffusion only takes place in alveoli;<br>Sample includes air from alveoli and other parts; | 2     |
| (e) | 1    | Large surface area produced by many alveoli;   |       |
|     | 2    | Single layer of epithelial cells / very thin epithelium / squamous / pavement;                             |       |
|     | 3    | Capillary walls one cell thick;  |       |
|     | 4    | Giving short diffusion pathway;  |       |
|     | 5    | RBC thin / flattened / disc-shaped so large surface area;  |       |
|     | 6    | No nucleus / mitochondria;   |       |
|     | 7    | Haemoglobin for transport of oxygen;   |       |
|     | 8    | Red cell close to capillary wall;  | max 6 |

[15]

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|----|-----|------|--|-------|
| 5. | (a) | (i)  | Units include both volume and time;  | 1     |
|    |     | (ii) | Heart beats faster so more blood leaves heart in given time / increased cardiac output;<br><i>Needs reference to given time in order to explain rate.</i>        | 1     |
|    | (b) |      | Amount of oxygen (falls) in veins from muscles;  | 1     |
|    | (c) |      | More blood is flowing to lungs;<br>More oxygen can diffuse / pass into blood from alveoli / lungs;<br>More oxygen in blood in pulmonary vein / arteries to body; | 2 max |

[5]

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|----|-----|------|--|---|
| 6. | (a) | (i)  | Arteries divide to form arterioles;                            | 1 |
|    |     | (ii) | Blood goes to (an organ) along an artery and leaves by a vein; | 1 |

	(b)	(i)	Multiply (mean) length by total cross-sectional area;	1	
		(ii)	2 marks - Correct answer of 6.45/6.5%; <i>[Accept: 6.4% / 6%]</i> 1 mark - Incorrect answer but clearly derived from volume of blood in capillaries divided by total volume of blood in all vessels;	2	
	(c)	(i)	Muscle/ skin/ lungs/ heart;	1	
		(ii)	Muscle; Contracts; Vasoconstriction/ reduces diameter (of arteriole supplying capillaries);	3	<b>[9]</b>
<b>7.</b>	(a)	(i)	Less/no protein at Y; (Molecule) too large;	2	
		(ii)	More concentrated; Water removed;	2	
	(b)		Produces lower water potential; Water moves into capillary; By osmosis/diffusion;	3	
	(c)		Starvation linked to low protein content of diet/Low protein concentration in plasma/blood; Water potential of blood higher/smaller water potential gradient; Tissue fluid formed faster than returned/less tissue fluid returned to blood;	max 2	<b>[9]</b>
<b>8.</b>	(a)		Made up of tissues;	1	
	(b)		Diffusion; From (blood in) vessels in wall;	2	
	(c)	(i)	Recoil; Of elastic tissue; <i>[Note: Do not allow second point where included with other tissues]</i>	2	
		(ii)	Each surge in pressure caused by one contraction/heart beat;	1	<b>[6]</b>

9. (a) Caused by blood leaving the heart/entering artery;  
As a result of ventricles contracting/systole; 2
- (b) Stretch as pressure increases;  
Recoil/spring back as pressure drops; 2  
*Do not accept contract and relax in this context.*  
*Allow 1 mark for 'stretch and recoil' without reference to pressure.*
- (c) Both have an endothelium/epithelium/squamous cells; 1 [5]
10. (a) Contain different/more than one tissue/type of cell; 1
- (b) 0.8 (s) 1
- (c) 0.4 (s) as events in right ventricle same as in left; 1
- (d) (i) 0 - 0.1/0.4 - 0.9 because the volume increasing/ventricle  
filling/blood entering; 1
- (ii) from 0.9/0.1 – 0.4 because volume decreasing/ventricle  
emptying/blood leaving; 1  
*In part (d) Accept any two figures from within the range.*
- (e) Correct answer of 15.75/15.8/16 = 2 marks  
Incorrect answer but clear understanding that  $45\text{cm}^3$  is 100% = 1 mark 2 [7]
11. (a) (i) Pattern described as constant / decrease to 04.00 / 06.00 then rising; 1
- (ii) Corresponds to ventricles contracting / systole; 1
- (iii) Less / little difference between maximum and minimum / less variation /  
constant / not pulsed / smoother; 2  
pressure in vein lower
- (b) (i) The larger the molecule, the less permeable;  
Over 68 000 walls not permeable; 2
- (ii) Plasma proteins / albumin and globulin too large to leave capillary;  
Water lost / Increase in concentration of proteins in blood / plasma; 2
- (iii) Haemoglobin in red blood cells/  
Haemoglobin too large to pass through membrane of RBC/  
Red blood cells (containing haemoglobin) too large to pass through wall; 1 [9]
12. (a) made of (different) tissues/specified tissues; 1
- (b) (i) 20  $\mu\text{m}$  as it consists of endothelium only/does not contain muscle,

connective tissues and elastic tissue; 1

*(consider other answers and credit understanding.)*

(ii) 1 mark calculation derived from diameter -  $(2 \times \text{wall thickness})$ /  
answer of 3mm; 2  
2 marks 2mm/2000 $\mu\text{m}$ ; 2

(c) stretches as a result of high pressure/surge of blood;  
then recoils; 2

[6]

13. (a) allows comparison  
due to different sizes of organisms; 2

(b) increase in rate of blood flow, Hb concentration increases; 1

(c)  $1.38 \times 0.132 = 0.182$  and  $1.38 \times 0.038 = 0.052$  / equivalent method;  
 $0.182 - 0.052 = 0.13$  / 0.129;  
*(correct answer of 0.13 / 0.129 gains two marks)* 2

[5]

14. (a) Arrows on all five vessels in correct direction; 1

(b) (i) D; 1

(ii) E; 1

(c)

Feature	Vessel C	Vessel E
Valves	Absent	Present
(Relative) thickness of walls	Thicker	Thinner
Elastin/elastic tissue/fibres	More	Less
Muscle	More	Less
Lumen	Narrow	Wide

2 max

*Two marks for two correct rows*

*Accept any pair of contrasting terms with same meaning as those used.*

(d) Contracts;  
(Causing) vasoconstriction/narrows lumen; 2

(e) (Elastic tissue) stretches when pressure is high;  
Springs back/recoils/returns to normal; 2 max

***Q** Do not credit references to contracting, relaxing or expanding*

**[9]**