**Additional Circulation Answers**

**M1.**          (a)     Endothelium/epithelium;

*Allow endothelial/epithelial*

*Reject: epidermis/endodermis*

**1**

(b)     Measurement divided by 8;

**1**

Allow answer in range of 3-3.3 for two marks;

*Correct answer gains 2 marks.*

**1**

(c)     (i)      Stretches/’expands’ under high pressure/when ventricle  
contracts/systole;

Recoils/’springs back’ under low pressure/when ventricle  
relaxes/diastole;

***Q*** *References to aorta contracting or relaxing negates marks for stretch and recoil.*

Smooths blood flow/maintains blood pressure/reduces  
pressure surges;

*Stretch and recoil without reference to blood pressure etc. = one mark.*

*Stretch and recoil to smooth blood flow etc. = two marks*

*Ignore references to aorta withstanding blood pressure or not being damaged.*

**2 max**

(ii)     (Muscle) contracts;

*‘It’ in answer = muscle*

**1**

(Arteriole) constricts/narrows/alters size  
of lumen/reduces/regulates blood flow (to capillaries);

*Allow converse (muscle) relaxes and (arteriole) dilates etc/increase blood flow etc.*

*Ignore references to pressure*

**1**

(d)     (i)      Large/increase in (total) cross sectional area/friction/resistance;

**1**

(ii)     (More) time for exchange of substances;

**1**

**[9]**

**M2.**          (a)     Made up of different tissues/more than one tissue;

***Q*** *Made up of tissues implies more than one so allow. Ignore references to function*

**1**

(b)     Deoxygenated/less pressure;

**1**

***Q*** *Unqualified pronouns in the context of this question refer to pulmonary artery*

(c)     Thick muscular walls;  
Greater elastic content;  
Do not have valves;  
Small/narrow lumen;

*QWC Unqualified pronouns in the context of this question refer to artery*

**2 max**

(d)     (i)      Decreases with increased distance from the heart;

**1**

(ii)     Friction /resistance to flow;

**1**

**[6]**

**M3.**          (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 |

*Two marks for two correct rows*

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

**2 max**

(d)     Contracts;

(Causing) vasoconstriction/narrows lumen;

**2**

(e)     (Elastic tissue) stretches when pressure is high;

Springs back/recoils/returns to normal;

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

**2 max**

**[9]**

**M4.**          (a)     (Blood) plasma;

**1**

(b)     More/larger proteins/less urea/carbon dioxide/more glucose/amino  
acids/fatty acids/oxygen/high(hydrostatic) pressure;

***Q*** *Reference to blood cells/water potential = neutral****Q*** *No Protein should not be credited*

**1**

(c)     (i)      Contracts;

***Q*** *Do not accept pumping of heart/heart beating*

**1**

(ii)     Loss of fluid/volume;

         Friction/resistance (of capillary wall);

***Q*** *Reference to a narrow lumen is not sufficient to gain a mark unless friction or resistance is mentioned.*

**1 max**

(d)     Water potential (in capillary) not as low/is higher/less negative/water  
potential gradient is reduced;

More tissue fluid formed (at arteriole end);

Less/no water absorbed (into blood capillary);

by osmosis; (into blood capillary);

***Q*** *The last two marking points must be in context of movement into the blood capillary*

**3 max**

**[7]**

**M5.**          (a)     More than one polypeptide chain;

**1**

(b)     In lungs, there is a high partial pressure of oxygen;  
And low carbon dioxide concentration;

***Q*** *Candidates should refer to partial pressure of oxygen since this is the terms in the graph. Do not credit references to “more oxygen” in the context of this part of the question*

**2**

(c)     (i)      Carbon dioxide is a product of respiration;

**1**

(ii)     Displaces dissociation curve to the right/Bohr shift;  
Lower affinity for oxygen/less saturated with oxygen;

**2**

(d)     In ground squirrel lower partial pressure of oxygen in lungs;  
Haemoglobin can be saturated/load more oxygen;  
at lower partial pressure of oxygen;

**2 max**

**[8]**

**M6.**          (a)     High(er) affinity for oxygen / absorbs/loads more oxygen;

At lower partial pressure (of oxygen) / lower pO2;

*Accept: Loads oxygen ‘quicker’, ‘more readily’, ‘higher saturation’, use of figures from graph for first point.*

*Neutral: References to unloading.*

**2**

(b)     1. (Hydrostatic) pressure lower in capillary/blood / higher in tissues/tissue fluid;

2. Water (returns);

3. By osmosis;

4. Water potential lower/more negative in blood/capillary / higher/less negative  
    water potential in tissues / via water potential gradient;

5. Due to protein (in blood);

6. (Returns) via lymph (system/vessels);

*First marking point must be in context of between blood and tissue fluid.*

*Neutral: References to hydrostatic pressure and water potential at arteriole end of capillary.*

**3 max**

**[5]**

**M7.**          (a)     Loading/uptake/association of oxygen at high p.O2;

In lungs (haemoglobin) is (almost) fully saturated/in lungs  
haemoglobin has a high affinity for oxygen;

Unloads/releases/dissociates oxygen at low p.O2;

Unloading linked to higher carbon dioxide concentration;

*Allow converse for second marking point in tissues i.e. haemoglobin has low affinity/releases most of its oxygen.*

*Mark for haemoglobin having high affinity for oxygen must be ‘in lungs’.*

**3 max**

(b)     (i)      Larger the mammal the more to the left/steeper/‘higher’ is the  
curve/the higher the affinity for oxygen;

*Allow converse.*

*Ignore references to Bohr shift*

**1**

(ii)     Smaller mammal has greater surface area to volume ratio;

Smaller mammal/larger SA:Vol ratio more heat lost  
(per unit body mass);

*Allow converse explanation for larger mammals or lower surface area to volume ratio.*

Smaller mammal/larger SA:Vol ratio has greater rate of  
respiration/metabolism;

*Allow suitable named mammal as alternative to smaller or larger mammal.*

Oxygen required for respiration;

(Haemoglobin) releases more oxygen/oxygen released more  
readily/haemoglobin has lower affinity;

**4 max**

**[8]**

**M8.**          (a)     (i)      Faster/greater/more effective response in children;

*Do not accept children have more haemoglobin*

**1**

(ii)     Use line of best fit;

**1**

Extrapolate/extend line (and read from graph);

*Allow calculation using rate of increase per day = one mark.  
However for both marks this must be linked to line of best fit.*

**1**

(iii)     More than one polypeptide chain;

*Allow many polypeptide chains.*

*‘Haemoglobin has four polypeptide chains’ must be in correct context to gain mark.*

**1**

(b)     (i)      Has same water potential;

*Allow converse for effect of using distilled water or a concentrated solution.*

**1**

No (net) water movement/osmosis;

**1**

Cells will not swell/burst/change size;

*No osmotic lysis = two marks*

**1**

(ii)     Pernicious anaemia (cells) greater range/spread/variation of  
diameters/width\_s;

Some pernicious anaemia (cells) wider than 9 (µm)/some  
less than 5.5 (µm)/without pernicious anaemia none more than  
9 (µm)/none less than 5.5 (µm);

Pernicious anaemia (cells) peak/most frequent at 8.5 (µm)/peak/most  
frequent at higher diameter//without pernicious anaemia peak/most  
frequent at 7 (µm)/peaks at lower diameter;

*There are several alternatives for marking points 2 and 3*

**2 max**

**[9]**

**M9.**          (a)     Increase in/more carbon dioxide;

          Curve moves to the right/depressed;

***Q*** *Any reference to haemoglobin increasing affinity for oxygen disqualifies second mark point.*

**2**

(b)     (i)      More haemoglobin;

         So can load/pick up more oxygen (in the lungs);

***Q*** *Second mark point must relate to idea of loading oxygen. Answers referring only to transport of oxygen should not be credited this mark.*

**2**

(ii)     (Haemoglobin) has lower affinity for oxygen/more oxygen  
released;

         In/to the cells/tissues;

**2**

**[6]**

**M10.**          (a)     correct answer: 77 - 78 ;;   *allow 75 - 80* = 2 marks  
OR  Use of 55 AND 17 saturation / fall = 38;     = 1 mark  
OR  (Fall = y % +) use of ;                       = 1 mark

**2**

(b)     (in exercise) - faster respiration rate;  
more CO2 production;  
CO2 is acidic / forms carbonic acid;  
lactic acid production;  
release of H+ ions;

**3 max**

**[5]**