**M1.
**

*One mark for each correct row*

**3**

(b)     16;

**1**

(c)     1.      Higher affinity / loads more oxygen at low / same / high partial pressure / pO2;

2.      (Therefore) oxygen moves from mother / to fetus;

**2**

 **[6]**

**M2.**          (a)     More that one polypeptide / chain;

*Ignore references to haem / other groups*

**1**

 (b)     Different primary structure / amino acids / different number of polypeptide chains;

*Question is about haemoglobin so do not credit differences in DNA*

**1**

(c)     1.      Low partial pressure of oxygen in lungs;

2.      (Llama) haemoglobin able to load more oxygen / (llama)
haemoglobin saturated (at low / particular partial pressure of oxygen);

3.      Higher affinity for oxygen;

*The terms used in the graph (or near approximations) should be used in this answer.*

*Ignore references to unloading*

*The answer must relate to llamas*

**3**

**[5]**

**M3.**(a)     (i)      Left ventricle;

**1**

(ii)     Thick muscle / thick walls;

*Accept more muscle / more muscular.*

*Ignore stronger muscle.*

**1**

 (c)     1.      Closed open;

2.      Open closed;

**2**

**[4]**

**M4.**(a)     1.      Ventricle pressure rises **then** blood starts to flow into aorta because pressure causes (aortic / semilunar) valve to open;

*Accept times, eg ventricle pressure rises at 0.3 (25) seconds,followed by blood flow into aorta at 0.35 / 0.4 seconds*

***Idea of sequence is essential***

*Accept times*

2.      Ventricle pressure starts to fall **so** blood flow falls;

***Idea of sequence is essential***

**2**

(b)     1.      Thickness of wall increases **because** ventricle (wall) contracts;

*Must be idea that increase in thickness is linked to contraction*

*Accept muscle for ventricle and systole for muscle contraction*

2.      Contraction **causes** the increase in pressure;

*Accept thickening of wall*

**2**

(c)                        *2 marks for correct answer*

1.      Between 120 ± 5;;

*Length of cycles varies slightly*

2.      Length of cardiac cycle correct but final answer wrong;

*Length of cardiac cycle = 0.45 - 0.52*

**2**

**[6]**

**M5.**          (a)     (i)      0.4(s);

**1**

(ii)     

**1**

(iii)     0.26 (between 0.4 – 0.14) × 75 (or from (a)(ii)) = 19.5(s)
*OR*0.25 (between 0.4 – 0.15) × 75 (or from (a)(ii)) = 18.75(s)

*(no double penalty)(allow rounding only if working shown)*

**1**

(b)     (ii)     right ventricle;
same pattern / description (as left ventricle) but lower (pressure);

**2**

(c)     increase in volume / size of ventricles (*accept heart) /* hypertrophy of
heart / increased strength of heart muscle / increased strength of
contraction; more blood leaves heart in each contraction / increase
in stroke volume;

**2**

**[7]**

**M6.**          (a)     1.      (Risk) decreases, then increases;

2.      (Risk) increases from 2 (drinks per day);

*Accept increases risk above 3*

**2**

(b)     Age affects heart disease / age affects how alcohol affects the body;

*Accept age affects results*

*Accept ‘removes confounding variable’*

*Accept ’controlling a variable’*

**1**

(c)                        *To gain 3 marks candidates must have mp1 and 2 from mps 2-5*

1.      (True because) studies show decreased risk up to 3 drinks per day;

*Accept any evidence from graph*

**1**

2.      (False because) eg all show an increased risk above 5 drinks / day, eg **A** and **B**, show increased risk (of heart disease) above 4 per day;

*Accept any evidence from graph*

3.      Data only about heart disease / alcohol causes other diseases / social problems;

4.      Amount of alcohol per drink may vary;

5.      May be due to other factor

**2 max**

**[6]**

**M7.**          (a)     lymph;

**1**

(b)     arrow drawn from right to left . no mark *( if wrong direction disqualify )*correct reference to blood entering capillary having higher hydrostatic
pressure;

**1**

(c)     HP forces water out;

idea that HP is “higher” than WP;

proteins remain in blood (increases WP);

idea that WP is now “higher” than HP;

water returns by osmosis / along WP gradient;

water moves out at arteriole end and back in (at venule end);

**4 max**

**[6]**

**M8.**          (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 and 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**

(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]**

**M9.**(a)     (i)      Made of (different) tissues / more than one tissue;

**1**

(b)     (i)      Short diffusion distance / pathway;

*Accept: thin diffusion pathway*

**1**

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

*Accept: example of more time for specific substance to be exchanged*

**1**

(c)     1.      Water potential (in capillary) not as low / is higher / less negative / water potential gradient is reduced;

*Accept: ‘blood or plasma’ instead of ‘capillary’*

2.      Less / no water removed (into capillary);

*Accept converse: water remains in the tissue*

3.      By osmosis (into capillary);

***Q*** *Marking points 2. and 3. must be in the context of movement into the capillary*

*Neutral: reference to more tissue fluid being formed as in the question stem*

*Neutral: reference to lymphatic drainage*

**3**

**[6]**