Question	Answer	Marks	Guidance
1 a i	any **one** from: shot requires a high strength performance / ORA (1) marathon requires high cardiovascular efficiency/ ORA (1)	1	
a ii	B (1) high cardiovascular **and** medium speed (1)	2	**allow** answer ringed on table **ignore** medium flexibility/agility and low strength
b	because Paula might have inherited desired **genes** from her mother / idea of random shuffling of chromosomes in meiosis (1) Paula would need to have suitable environment / training / correct diet / motivation (1)	2	**allow** desired genes from Paula's mum may be/not be expressed
	Total	5	

Question	Answer	Marks	Guidance
2 a	**[Level 3]** Quantitative explanation (to include at least one calculation of change) of how blood flow changes **and** include idea that some named organs receive more blood **and** other named organs get less. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Statement of change using data from the table **and** a qualitative explanation of how blood flow changes. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Qualitative explanation of how blood flow changes. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** • blood flow to skin increases by 1600 / x 6.3 • blood flow to muscles increases by 11 500 / x 12.5 • blood flow to heart muscles increases by 550 / x 3.75 • blood flow to digestive system decreases by 750 / x 0.44 • blood flow to kidneys decreases by 500 / x 0.55 • blood flow to brain increases by 50 / x 1.1 / stays (almost constant) • blood diverted to skin / muscles / heart muscles • blood diverted from digestive system / kidneys • (total) blood flow is faster/increases • (total) blood flow increases by 12 500 / x 3.5 If answer is qualitative only with no use of data, then max L1 **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
b	idea that **all** the blood goes through the lungs (1)	1	**allow** all the blood needs oxygenating
	Total	**7**	

Question	Answer	Marks	Guidance
3 a	adrenaline (1)	1	
b i	0.08 (1)	1	
ii	contraction of ventricles is longer / 0.24 v 0.08 (1) need to pump blood further / to the body (1)	2	**allow** atria only need to pump the blood into the ventricles / do not need to pump as far (1) **ignore** to generate a higher pressure
	Total	**4**	

Question			Answer	Marks	Guidance
4	(a)		she used anaerobic respiration / she could not get enough oxygen / (1) production of lactic acid (1) **but** need (extra) oxygen to break down / remove lactic acid (2)	3	**ignore** just 'needs oxygen' **ignore** she needs more oxygen **ignore** oxygen debt has built up **allow** need (extra) oxygen to remove / pay back oxygen debt = (1)
	(b)		some blood bypasses lungs / oxygenated and deoxygenated blood mix (1) not enough/less oxygen in blood / not enough/less oxygen supplied to muscles (1) less (aerobic) respiration / less energy (for muscles) (1)	3	**allow** lack of blood to lungs / less blood to lungs **ignore** no blood to lungs **allow** lack of oxygen in blood **ignore** no oxygen in blood **ignore** less oxygen to body **ignore** no energy / no respiration **allow additional marking points:** anaerobic respiration / oxygen debt / lactic acid (1) carbon dioxide builds up in blood / AW (1) **ignore** references to backflow / valves
			Total	**6**	

Question			Answer	Marks	Guidance
5	(a)		**any two from:** could cause hypothermia / exposure / (1) could lead to frostbite / unconsciousness / death (1) could slow / stop enzymes working / chemical reactions (in body) (1)	2	**allow** reverse arguments e.g. must stay warm so do not get hypothermia **not** hyperthermia **allow** (could cause) poor circulation **ignore** stop body / organs working **ignore** feel weak / shivering / pneumonia **ignore** enzymes denaturing when cold
	(b)		idea that there is **less blood** near **skin** surface (so less heat loss) (1)	1	**allow** less heat loss by radiation (1) **ignore** blood flows away from skin **ignore** blood vessels constrict / narrow **ignore** no blood near skin surface **ignore** blood not flowing as close to the skin surface **not** blood vessels move (further) away from skin / surface
	(c)		lowers (blood) glucose / sugar levels OR removes **excess** glucose / sugar (from blood) (1) by converting glucose / sugar into **glycogen** OR by storing (glucose / sugar) in the liver / muscles OR by increasing uptake by cells (1)	2	**allow** keeps glucose / sugar levels low **allow** stops glucose / sugar levels getting too high **ignore** just 'removes sugar from blood' **but** converts **excess** glucose / sugar to glycogen = (2) **ignore** (glucose / sugar level falls) because glucose / sugar is broken down **ignore** sends glucose / sugar to liver / muscles
			Total	**5**	

Question	Answer	Marks	Guidance
6 a	**[Level 3]** Calculation of BAC **and** quantitative discussion of short-term risks which refers to graph BAC levels in graph. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Calculation of BAC **and** qualitative discussion of short-term risks. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Incomplete calculation of BAC **or** qualitative discussion of short-term risks. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points at level 3 may include:** • BAC = 0.2 (g in 100ml of blood) • gives **25x** relative risk of accidents that a BAC of 0.2 would cause as shown on the graph **Indicative scientific points at level 2 may include:** • BAC = 0.2 (g in 100ml of blood) • gives increased risk of accidents **Indicative scientific points at level 1 may include:** • 28-20= 8g of alcohol after 2 hours • BAC = $\frac{8}{4000}$ x 100 • increased risk of accidents **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
b	**any two from:** alcohol breakdown produces toxins/poisons (1) cause cirrhosis (1)	2	**allow** forms hardening / scarring of liver tissue **ignore** rots your liver **ignore** fatty liver
	Total	8	

Question	Answer	Marks	Guidance
7 a	contains antifreeze protein / chemical (1)	1	**ignore** all behavioural responses **ignore** thick shell
b	Leg B (1) **and any two from** blood vessels close together (1) (more) heat transfer between vessels / heat transfer from blood flow into foot to blood flow out of foot (1) blood vessels further/away from leg surface/less blood near surface (1) counter current (1)	3	**ignore** arteries/veins if used singularly **allow** blood entering the foot flows close to the blood leaving the foot / AW **allow** blood returning to the body gets warmed up **if Leg A or C given** **allow** counter current (1) **ignore** blood transfer between blood vessels
	Total	**4**	

Question	Answer	Marks	Guidance
8 a	increase / maintain rate of flow of **blood** (1) increase / maintain transport of materials around body (1)	2	**allow** increase speed of blood / make blood flow faster **allow** "it" for blood **ignore** so the heart still pumps **allow** named examples e.g. oxygen / food **allow** prevent renal failure **ignore** organ failure/ lack of blood to organs **ignore** just 'increases blood volume' **allow** other examples of the consequences of low blood pressure e.g. unconsciousness / fainting (1) **allow** transport of more oxygenated blood faster (2) **ora** for all responses
b	lack of/ less red blood cells / haemoglobin (1) lack of / less oxygen causes anaerobic respiration (1)	2	**ora**
	Total	**4**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9</td><td>(a)</td><td></td><td><table><tr><th></th><th>Haploid</th><th>Diploid</th></tr><tr><td>egg cell</td><td>✓</td><td></td></tr><tr><td>sperm cell</td><td>✓</td><td></td></tr><tr><td>zygote</td><td></td><td>✓</td></tr><tr><td>cells in embryo</td><td></td><td>✓</td></tr><tr><td>cells in twin embryos</td><td></td><td>✓</td></tr></table>
all correct (2)
at least three correct (1)</td><td>2</td><td>more than one tick per line negates a correct tick</td></tr>
<tr><td></td><td>(b)</td><td></td><td>mitosis (1)</td><td>1</td><td>mark phonetically (look for a ‘t’)</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>higher pressure / greater rate of flow (1)</td><td>1</td><td>must be comparative
allow can have different pressures in lungs and body (1)
allow more efficient / more rapid transport of oxygen (1)
allow blood is pumped around faster
ignore blood is pumped fast</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>idea that oxygen travels from (blood of) mother / to (blood of) foetus (1)

but

idea that oxygen moved from mother’s haemoglobin to foetus’ haemoglobin (2)</td><td>2</td><td>

allow maintains a concentration gradient across placenta (1)</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>energy (source) (1)</td><td>1</td><td>allow valid named process eg active transport / movement / protein synthesis / DNA synthesis (1)
ignore simply ‘for growth’ / ‘for development’
ignore store</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
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