| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 1 | (a) | (i) | 90 (%) (1) | 1 | **allow** 90.32258 or correct rounding |
| | | (ii) | vessel at A = capillary (1)<br><br>vessel at B = vein (1) | 2 | **allow** capillary bed / arteriole **ignore** small artery<br><br>**allow** venule / named vein e.g. vena cava |
| | (b) | | reduces effective blood circulation /<br>blood could fall back into heart /<br>backflow would happen<br>(1)<br><br>pressure is not maintained / reduces pressure (1) | 2 | **ignore** references to oxygenated/deoxygenated<br>**ignore** less blood but **allow** less blood pumped around body<br>**ignore** job of valves e.g. valves stop backflow<br><br>**allow** not enough pressure to push blood around<br>**allow** oedema / idea of fluid building up in tissues / lungs<br>**ignore** references to higher pressure e.g. inside heart |
| | | | **Total** | **5** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 2 | (a | | cholesterol: males have a higher value in most countries / 4 countries / all except India / ORA (1)<br><br>BMI: males have a higher value in most countries / 4 countries / all except Cyprus / ORA (1) | 2 | **allow** males have a higher cholesterol / ORA<br><br>**allow** males have a higher BMI value / ORA<br><br>**allow** 'males have higher values / ORA' for 1 mark if no other mark awarded |
| | **(b)** | | idea that children are still growing (1)<br><br>idea that results are (too) variable (1) | 2 | <br><br>**allow** e.g. sudden growth spurts / different rates of growth<br>note just 'growth spurts ' gets 1 |
| | **(c)** | **(i)** | all points correctly plotted to within 0.5 square (2)<br>**but**<br>three / four points correctly plotted to within 0.5 square (1) | 2 | points are:<br>(3.2, 24.5)<br>(3.6, 22.6)<br>(4.7, 28.0)<br>(4.7, 25.2)<br>(5.0, 27.0)<br><br>**ignore** labels |
| | | **(ii)** | there is (now) **no** link / pattern / correlation (1)<br><br>(because) points are scattered / random / AW (1) | 2 | <br><br>**allow** examples e.g. Greece and Netherlands have same cholesterol but different BMI |
| | **(d)** | | there is a different number of people in each country (1)<br><br>taking an **average/mean** gives the two countries equal weighting<br>**or**<br>taking an **average/mean** of the two values does not give a true mean of all the people (1) | 2 | |
| | | | **Total** | **10** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 3 | (a) | | <table><tr><th>name</th><th></th><th>part</th></tr><tr><td>aorta</td><td></td><td>D</td></tr><tr><td></td><td></td><td></td></tr><tr><td>left atrium</td><td></td><td>E</td></tr><tr><td></td><td></td><td></td></tr><tr><td>right ventricle</td><td></td><td>C</td></tr><tr><td></td><td></td><td></td></tr><tr><td>tricuspid valve</td><td></td><td>B</td></tr><tr><td></td><td></td><td></td></tr><tr><td>vena cava</td><td></td><td>A</td></tr></table> | 2 | 3 or 4 correct (1)<br>less than 3 correct (0) |
| | (b) | (i) | provides a large surface area to volume ratio (1) | 1 | **allow** large SA / V<br>**allow** squeeze through capillaries<br>**ignore** arteries/veins/vessels |
| | | (ii) | **any two from:**<br>DNA codes for mRNA (1)<br>mRNA moves (from nucleus) to cytoplasm (1)<br>(mRNA passed to) ribosomes in cytoplasm (to make haemoglobin / protein) (1) | 2 | |
| | | (iii) | (haemoglobin combines with oxygen to form) oxyhaemoglobin (in lungs) (1)<br>reverse reaction / breakdown of oxyhaemoglobin happens in tissues/cells to release oxygen (1) | 2 | **allow** oxyhaemoglobin dissociates releasing oxygen |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| | **(c)** | | (bone marrow) contains stem cells / undifferentiated cells (1)<br><br>(stem cells ) have genes / have information to develop into different (red or white) cells (1) | 2 | <br><br><br>**allow** have genes for either type of cell<br>**allow** can turn genes on and off as required |
| | | | **Total** | **9** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4 a i | **any two from:**<br>as mass increases, heart rate decreases / AW / ORA (1)<br><br>as mass increases, life span increases / AW / ORA (1)<br><br>as heart rate decreases, life span increases / AW / ORA (1) | 2 | if get 2 correct and 1 wrong then award 2 marks<br><br>'as mass increases, heart rate decreases and life span increases' = (2) |
| ii | (yes) – idea that the life time heart beats are all around 1 or 2 billion (1)<br><br>(no) – idea that some life time heart beats are more than twice / three times the value of others / AW OR chicken does not fit pattern (1) | 2 | **ignore** most are about the same (simply repeating question)<br>**allow** all between 0.7-2.2 billion / within 1.5 billion<br><br>(yes) – idea that most are about the 1 billion / within 0.5 billion, but chicken is the odd one out as it's about 2 billion / a lot more = (2)<br><br>**allow additional marking points:**<br>sample is not large enough to reach a valid conclusion (1)<br>idea that there is still a large difference between eg 0.7 and 0.8 billion (1) |
| iii | no (no mark)<br><br>**any two from:**<br>for their mass, heart rate is too low (1)<br>for their mass, life span is too high (1)<br>for their mass, life time heart beats are too high (1) | 2 | **if yes, no marks**<br><br>**if trend not clear, check table in 13ai to see if/where human placed**<br><br>**allow** any two other correct comparisons |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| b i | idea that can use these findings to target treatment / preventative care (1)<br><br>idea that results are reliable because they involved many people / involved people from around the world (1) | 2 | **allow** can inform / identify patients (with potential risks)<br><br>**allow** idea that results are reliable because 4 years is a long time OR idea that results are not reliable because 4 years is not a long time<br>**ignore** idea that it's not worth treating heart disease patients |
| ii | idea that the study only included heart disease patients / AW (1)<br><br>idea that results only show patients with heart beats below 58 and above 78 (beat per min) / do not show results for all heart beats / AW (1) | 2 | **ignore** not enough data<br><br>**allow additional marking points:**<br>4 years is not a long time (1)<br>idea that data only shows a correlation and does not prove causation (1)<br>there are (many) other factors affecting heart disease (1) |
| | **Total** | **10** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 5 | (a) | | (mosquito) bites (infected) person (1)<br><br>via the (plasmodium in) blood (1) | 2 | **ignore** feeding / drinking / inserting / depositing unqualified<br>**allow** piercing/ injecting<br><br>**ignore** plasmodium is in the saliva<br>**allow** sucking blood (to get plasmodium out or into a person/host)<br>**allow** correct reference to plasmodium if not stated e.g. it/parasite/protozoan<br>**ignore** bacteria/viruses/disease |
| | (b) | | (idea that removal will prevent ability to breed) so identifies that (swamps/water) is where mosquitoes breed / eggs or larvae found (1) | 1 | **ignore** it kills mosquitoes unless qualified<br>**ignore** mosquitoes live in swamps |
| | (c) | | idea that they thought nets were successful in stopping gas / gas can get through the nets / did not know mosquitoes caused malaria (1)<br><br>idea that nets stopped mosquitoes (1) | 2 | <br><br><br>**allow** reduction of malaria put down to stopping gas transmission but in fact it was stopping the mosquito (2) |
| | (d) | | smell (of person) (1)<br>wings / wing muscles (1) | 2 | **allow** scent<br>**ignore** muscles unless correctly qualified |
| | (e) | (i) | brain / hypothalamus (1)<br>(monitors) temperature of **blood** (1) | 2 | **ignore** body temperature (in question) |
| | | (ii) | **any two from:**<br>(more) blood flows close to surface (1)<br>(increased) heat loss (1)<br>by radiation / conduction / convection (1) | 2 | **not** blood vessels move closer to surface<br><br>**allow** any heat transfer but needs to be a loss from the body |
| | | | **Total** | **11** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| **6** | (a) | | $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$ (2) | 2 | all correct (2)<br><br>one mark formulae (1) case and subscripts must be correct<br><br>one mark balancing (1) this mark is dependent on the first<br><br>reactants and products must be on correct side of equation but can be in either order |
| | (b) | | arteries carry blood at low pressure away from the heart ☐<br><br>arteries carry blood at high pressure away from the heart ✓<br><br>arteries carry blood at low pressure and have valves to prevent backflow ☐<br><br>arteries carry blood at high pressure back to the heart ☐<br><br>arteries join veins to capillaries ☐ | 1 | any additional incorrect tick loses mark |
| | (c) | ( | 93.6% (1) | 1 | **allow** 94 or 93.62 or 93.617<br>**not** 94.0 (incorrect rounding) |
| | | (ii) | (no) (no mark)<br><br>1. his heart ate puts him in the anaerobic threshold zone / he is not within the target heart rate zone / respiring anaerobically / he's in 85-100% max heart rate zone (1)<br><br>2. builds u lactic acid / builds up oxygen debt (1)<br><br>3. so cau s fatigue / cramp / pain (1) | 3 | if have not put 'no' can still award marking point 1 only<br><br>**allow** builds up lactate<br>lactic acid is toxic = 1 |
| | | | **Total** | **7** | |