

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

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

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|-----------------|------|---|-------|---|-------|---|-------------|---|-----------------|---|-----------------|---|-----------|---|---|---|
| 3               | (a)  | <table border="1"> <thead> <tr> <th>name</th> <th>part</th> </tr> </thead> <tbody> <tr> <td>aorta</td> <td>D</td> </tr> <tr> <td>left atrium</td> <td>E</td> </tr> <tr> <td>right ventricle</td> <td>C</td> </tr> <tr> <td>tricuspid valve</td> <td>B</td> </tr> <tr> <td>vena cava</td> <td>A</td> </tr> </tbody> </table> | name  | part  | aorta | D | left atrium | E | right ventricle | C | tricuspid valve | B | vena cava | A | 2 | 3 or 4 correct (1)<br>less than 3 correct (0) |
| name            | part |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
| aorta           | D    |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
| left atrium     | E    |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
| right ventricle | C    |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
| tricuspid valve | B    |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
| vena cava       | A    |   |       |   |       |   |             |   |                 |   |                 |   |           |   |   |   |
|                 | (b)  | (i) provides a large surface area to volume ratio (1)   | 1     | <b>allow</b> large SA / V<br><b>allow</b> squeeze through capillaries<br><b>ignore</b> arteries/veins/vessels |       |   |             |   |                 |   |                 |   |           |   |   |   |
|                 |      | (ii) <b>any two from:</b><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     | <b>allow</b> oxyhaemoglobin dissociates releasing oxygen  |       |   |             |   |                 |   |                 |   |           |   |   |   |

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|----------|-----|--|----------|---|
|          | (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        | <b>allow</b> have genes for either type of cell<br><b>allow</b> can turn genes on and off as required |
|          |     | <b>Total</b>   | <b>9</b> |   |

| Question | Answer   | Marks | Guidance   |
|----------|--|-------|--|
| 4 a i    | <p><b>any two from:</b><br/> as mass increases, heart rate decreases / AW / ORA (1)</p> <p>as mass increases, life span increases / AW / ORA (1)</p> <p>as heart rate decreases, life span increases / AW / ORA (1)</p>                | 2     | <p>if get 2 correct and 1 wrong then award 2 marks</p> <p>'as mass increases, heart rate decreases and life span increases' = (2)</p>  |
| ii       | <p>(yes) – idea that the life time heart beats are all around 1 or 2 billion (1)</p> <p>(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)</p> | 2     | <p><b>ignore</b> most are about the same (simply repeating question)</p> <p><b>allow</b> all between 0.7-2.2 billion / within 1.5 billion</p> <p>(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)</p> <p><b>allow additional marking points:</b><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)</p> |
| iii      | <p>no (no mark)</p> <p><b>any two from:</b><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)</p>                              | 2     | <p><b>if yes, no marks</b></p> <p><b>if trend not clear, check table in 13ai to see if/where human placed</b></p> <p><b>allow</b> any two other correct comparisons</p>  |

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|--------------|---|-----------|--|
| b i          | <p>idea that can use these findings to target treatment / preventative care (1)</p> <p>idea that results are reliable because they involved many people / involved people from around the world (1)</p>                       | 2         | <p><b>allow</b> can inform / identify patients (with potential risks)</p> <p><b>allow</b> 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</p> <p><b>ignore</b> idea that it's not worth treating heart disease patients</p> |
| ii           | <p>idea that the study only included heart disease patients / AW (1)</p> <p>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)</p> | 2         | <p><b>ignore</b> not enough data</p> <p><b>allow additional marking points:</b><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)</p>  |
| <b>Total</b> |   | <b>10</b> |  |

| Question     |         | Answer   | Marks     | Guidance  |
|--------------|---------|--|-----------|---|
| 5            | (a)     | (mosquito) bites (infected) person (1)<br><br>via the (plasmodium in) blood (1)  | 2         | <b>ignore</b> feeding / drinking / inserting / depositing unqualified<br><b>allow</b> piercing/ injecting<br><br><b>ignore</b> plasmodium is in the saliva<br><b>allow</b> sucking blood (to get plasmodium out or into a person/host)<br><b>allow</b> correct reference to plasmodium if not stated e.g. it/parasite/protozoan<br><b>ignore</b> 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         | <b>ignore</b> it kills mosquitoes unless qualified<br><b>ignore</b> 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         | <b>allow</b> 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         | <b>allow</b> scent<br><b>ignore</b> muscles unless correctly qualified  |
|              | (e) (i) | brain / hypothalamus (1)<br>(monitors) temperature of <b>blood</b> (1)   | 2         | <b>ignore</b> body temperature (in question)  |
|              | (ii)    | <b>any two from:</b><br>(more) blood flows close to surface (1)<br>(increased) heat loss (1)<br>by radiation / conduction / convection (1)   | 2         | <b>not</b> blood vessels move closer to surface<br><br><b>allow</b> any heat transfer but needs to be a loss from the body  |
| <b>Total</b> |         |  | <b>11</b> |   |

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| 6            | (a)  | $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (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 reactants and products must be on correct side of equation but can be in either order |
|              | (b)  | <p>arteries carry blood at low pressure away from the heart <input type="checkbox"/></p> <p>arteries carry blood at high pressure away from the heart <input checked="" type="checkbox"/></p> <p>arteries carry blood at low pressure and have valves to prevent backflow <input type="checkbox"/></p> <p>arteries carry blood at high pressure back to the heart <input type="checkbox"/></p> <p>arteries join veins to capillaries <input type="checkbox"/></p> | 1        | any additional incorrect tick loses mark   |
|              | (c)  | ( 93.6% (1)   | 1        | <b>allow</b> 94 or 93.62 or 93.617<br><b>not</b> 94.0 (incorrect rounding)   |
|              | (ii) | <p>(no) (no mark)</p> <p>1. his heart rate 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)</p> <p>2. builds up lactic acid / builds up oxygen debt (1)</p> <p>3. so causes fatigue / cramp / pain (1)</p>  | 3        | if have not put 'no' can still award marking point 1 only<br><br><b>allow</b> builds up lactate<br>lactic acid is toxic = 1  |
| <b>Total</b> |      |   | <b>7</b> |  |