| Question number | Answer | Mark |
|---|---|---|
| 1(a) (i) | Any **one** from:<br>1. reduces {volume / pressure of gas} / eq ;<br>2. allows {measurement of oxygen used / movement of liquid / eq} ; | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 1(a) (ii) | 1. returning the coloured liquid back to zero / eq ;<br>2. idea of calibration ;<br>3. repetition / eq ; | (2) |

| Question number | Answer | Mark |
|---|---|---|
| 1(b)* QWC | **(QWC – Spelling of technical terms** *(shown in italics)* **must be correct and the answer must be organised in a logical sequence)**<br>1. reference to constant temperature ;<br>2. use of water bath / eq ;<br>3. reference to {suitable / stated / fixed time / eq} ;<br>4. Reference to measuring {volume / distance} ;<br>5. description of how to obtain volume ;<br>6. calculation of rate described / eq ;<br>7. reference to replicates ;<br>8. description of control e.g. no woodlice ;<br>9. idea of welfare of animals important ;<br>10. reference to {mass / eq} of woodlice ; | (6) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(a) | 1. idea that carbon dioxide dissolves (in the water / in the oceans) ;<br><br>2. for {carbon fixation / light-independent reaction / eq} ;<br><br>3. by {photosynthesis / eq} of {seaweed / algae / (phyto) plankton / autotrophs / eq} ; | **1 ACCEPT** absorbed / reacts with /diffuses into / becomes carbonic acid<br><br>**3 ACCEPT** plants (that live in the sea)<br>**IGNORE** organisms | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(b) | respiration / decomposition / eq ; | **ACCEPT** description<br>**NOT** photosynthesis | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(c) | **B** carbon dioxide and water | | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(d) | 1. decomposition / idea of breakdown of {organic matter / plant material / biomass / eq} ;<br><br>2. idea of (bacteria) producing {enzymes (for digestion) / correctly named hydrolytic enzyme} ;<br><br>3. respiration {produces / eq} {carbon dioxide / eq} ; | **1 ACCEPT** animal material decay / rot | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| 2(e) | **B** light-independent reaction | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(f)(i) | Correct answer gains both marks<br><br>{332 + 23 + 444 / 799 } and {338 + 450 / 788 } ;<br><br>(799 – 788) = 11 (au) ; | <br><br><br><br>**CE** applies | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(f)(ii) | 1. idea that rate of production of carbon dioxide is greater than rate of removal of carbon dioxide ;<br><br>2. idea of using of {fossil fuels / named fossil fuel / forests / eq} {releasing / producing} carbon dioxide ;<br><br>3. idea that this carbon (in fossil fuels / forests) was {locked up / removed from the air } years ago ;<br><br>4. idea of deforestation resulting in less {photosynthesis / carbon fixation / light independent reaction / eq} ; | **1 ACCEPT** carbon dioxide **{**production / release} is greater than used in photosynthesis<br><br><br><br>**3 ACCEPT** ref to carbon sink<br><br><br>**4 ACCEPT** less carbon dioxide used for photosynthesis | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (a)** | 1. high numbers of obese people / eq ;<br><br>2. this is linked to increased risk of diseases such as {diabetes / CVD / eq} ;<br><br>3. idea that this puts an economic burden on society ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (b)** | 1. three fatty acids ;<br><br>2. contains a glycerol (molecule) / ref. to ester bonds ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (c)** | 1. 80% × {10 / 15 / 20} % OR 0.8 × 0.1 OR 0.8 x 0.15 OR 0.8 x 0.2 OR idea that percentage mortality has not changed ;<br><br>2. 0% / 8% / 12% / 16% / (range) 8 to 16% ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (d)** | 1. (serious) self reflection is associated with increased activity in the mPFC (in both) / eq ;<br><br>Body image:<br><br>2. there is a link between overweight body image in females and activation of mPFC / eq ;<br><br>3. there is no (significant) mPFC activation in men when presented with equivalent male images /eq ;<br><br>Words:<br><br>4. {words / eq} associated with increased activation in the amygdala in females / eq ;<br><br>5. (and) deactivation of the left mPFC in females / eq ;<br><br>6. in men this response was reversed / eq ; | **(4)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (e)** | 1. idea that cortisol levels need to be high for a long time ;<br><br>2. this leads to {high blood pressure / suppressed thyroid function / impaired immunity / increased intra-abdominal fat / CVD / diabetes / cancer} ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (f)** | 1. greater surface area / eq ;<br><br>2. idea of more quickly hydrolysed (by enzymes) / eq ;<br><br>3. to release energy / for use in respiration / eq ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (g)** | 1. UCP-1 is in the mitochondria / eq ;<br><br>2. idea that electron transport chain is disrupted ;<br><br>3. (therefore) less ATP is produced by the electron transport chain / eq ;<br><br>4. UCP-1 might inhibit {ATP synthase / ATPase / eq } OR alter the proton gradient / eq ;<br><br>5. more energy as heat / eq ; | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (h)** | 1. it only undergoes the first stage of metabolism / eq ;<br><br>2. glucose is completely metabolised / eq ;<br><br>3. idea that products of 18F-FDG breakdown cannot be metabolised ;<br><br>4. idea that this is due to wrong shape for next enzyme ;<br><br>5. (so) cannot bind to active site / binds permanently / eq ;<br><br>6. idea that (altered shape means) cannot exit through the same glucose / eq channels they entered by ; | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (i)** | 1. fucoxanthin increases the production of UCP-1 / eq ;<br><br>2. UCP-1 {uncouples / disrupts / eq} the electron transport chain / oxidative phosphorylation / eq ;<br><br>3. less ATP available for use / eq ;<br><br>4. more energy lost as heat / eq ;<br><br>5. extra fat is used in {respiration / eq} ; | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| ***3 (j** | **Take into account quality of written communication when awarding the following points.**<br><br>1. PRDM16 levels higher in BAT than WAT / eq ;<br><br>2. loss of PRDM16 causes a loss in heat production / eq ;<br><br>3. more energy stored as fat in WAT / eq ;<br><br>4. (artificial) excess of PRDM16 causes white fat cells to become brown fat cells / eq ;<br><br>5. this influences UCP-1 levels / eq ;<br><br>6. genetically engineered mice had high levels of UCP-1 during BAT formation / eq ;<br><br>7. increasing PRDM16 in muscle cells causes them to differentiate into brown fat cells / eq ;<br><br>8. increased BAT as a result associated with increased {heat production / weight loss / fat loss / eq} / eq ; | **(5)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3 (k)** | 1. anorexia associated with a reduction in {CD68 expression / mRNA coding for fat synthesis / certain proteins / eq} / eq ;<br><br>2. anorexia associated with an increase in resistin mRNA expression / eq ;<br><br>3. {psychological distress / eq} leads to changes in DNA structure / methylation of DNA / eq ; | **(2)** |