| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(i)** | B ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(ii)** | D ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(iii)** | D ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(b)(i)** | 1. idea of carbon fixation produces {GP / eq} ;<br>2. (product) is converted to {starch / sugar / eq} ;<br>3. {faster / eq} C-fixation means faster {sugar / starch / eq} production / eq ;<br>4. reference to rate of {growth / development} depends on rate of carbon fixation ;<br>5. reference to increased GPP (of crop) ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(b)(ii)** | 1. reference to effect of temperature change on {kinetic energy / movement} of {molecules / particles / eq} / eq ;<br><br>2. therefore this effects number of {collisions / enzyme-substrate complex} ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(b)(iii)** | 1. A ;<br>[award if written in text instead]<br><br>Any **four** from:<br><br>2. idea that (in Central Europe) {temperatures never reach 25$^{o}$C / data for 25 $^{o}$C is irrelevant} / 14$^{o}$C is {within the range / close to the average temperature} ;<br><br>3. {mean / eq} temperatures (in Central Europe) {15.25 / 15.3}$^{o}$C ;<br><br>4. A has highest rates of $CO_2$ fixation at 14$^{o}$C / eq ;<br><br>5. (therefore) A {will grow well / eq} in temperature (range) of Central Europe / eq ;<br><br>6. {B / C / D /E / F / others} would have relatively low {growth / yield / eq} at 14$^{o}$C / eq ; | **max (5)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(a)** | <table><tr><th>Feature</th><th>Bacteria only</th><th>Viruses only</th><th>Both bacteria and viruses</th></tr><tr><td>Glycogen granules</td><td>X</td><td></td><td></td></tr><tr><td>Nucleic acids</td><td></td><td></td><td>X</td></tr><tr><td>Protein coat (capsid)</td><td></td><td>X</td><td></td></tr></table> 1 mark per row ;;; | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(b)(i)** | 1. viruses (and bacteria) involved ;<br>2. (usually) antibiotics {are only effective against bacteria / do not affect viruses / eq} ;<br>3. {other medication / eq} needed to deal with viruses / eq ; | **max (2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(b)(ii)** | 1. both enrofloxacin and florfenicol named ;<br>2. idea of {(high) effectiveness / eq} against all three bacteria / eq ;<br>3. above {80% / 83%} / eq / average above 90% / eq ; | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(b)(iii)** | 1. idea that antibiotic used is {most effective / eq} (against the known bacterium) ;<br><br>2. idea that none of the antibiotics is 100% effective / some bacteria {survive / eq} ;<br><br>3. some bacteria {are resistant / eq} ;<br><br>4. idea of resistant strain {develops / prevented} ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3(a)** | 1. polysaccharide ;<br>2. unbranched / straight chain ;<br>3. {beta / β} glucose ;<br>4. (1-4) glycosidic bonds (between glucose molecules) ;<br>5. reference to intermolecular hydrogen bonds / eq ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3(b)** | xylem / sclerenchyma ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3(c)** | 1. reference to {decomposition / decay / putrefaction } (by microorganisms) ;<br>2. reference to respiration ;<br>3. releases carbon dioxide for photosynthesis / eq ;<br>4. methane released in anaerobic (conditions);<br>5. (methane) available as fuel / eq ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3(d)(i)** | Any **one** from:<br><br>1. reference to {<u>increased / eq</u>} income /<br><br>2. in order to export fuel /<br><br>3. reference to more {jobs / eq} /<br><br>4. reduce imports of (fossil / bio) fuels /<br><br>5. reference to biofuels {renewable / sustainable} /<br><br>6. fossil fuels finite / eq /<br><br>7. {reduce use of / as alternative to} {fossil fuels / named e.g.} /reference to meeting carbon targets / eq /<br><br>8. reference to no loss of {farmland / eq} ; | **max (1)** |

| Question Number | Answer | Mark |
|---|---|---|
| ***3(d)(ii) QWC** | (QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)<br><br>1. reference to (combustion of) biofuels releases carbon dioxide {recently / eq} removed from atmosphere / eq ;<br><br>2. (therefore) there is no (net) increase in carbon dioxide (in atmosphere) / eq ;<br><br>3. carbon dioxide is a greenhouse gas / eq ;<br><br>4. that {absorbs / traps / eq} {infra-red / heat / long-wave} (radiation reflected from Earth's surface) ;<br><br>5. reference to prevents {infra-red / heat / long-wave} {escaping / eq} into space ;<br><br>6. reference to (therefore) mean temperature of Earth's surface increases ;<br><br>7. idea that carbon in peat(land) was {trapped / eq} {a long time ago / eq} ;<br><br>8. idea of peatland clearance releases carbon dioxide ;<br><br>9. idea that there is a (net) gain of carbon dioxide (in the atmosphere) ;<br><br>10. idea that removal of plants (during clearance) reduces photosynthesis ;<br><br>11. reference to carbon dioxide released from (clearance) machinery ; | **max (5)** |

| Question Number | Answer | Mark |
|---|---|---|
| **4(a)(i)** | Any characteristic symptom of TB e.g. tubercules, bloody sputum, (general)body tissue wastage ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **4(a)(ii)** | D ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **4(a)(iii)** | 1. idea of {bacterium / eq} recognised as {non-self / eq} ;<br>2. reference to labelling of bacteria by B {lymphocytes / cells} ;<br>3. phagocytosis / phagocytic / phagocyte ;<br>4. descriptive detail of phagocytosis (involving {bacterium / eq}) ;<br>5. reference to formation of vacuole ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **4(a)(iv)** | 1. {kills / eq} {bacteria / eq} in {stomach / mouth / saliva / gastric juice} ;<br>2. (by) {(hydrochloric) acid / lysozyme} ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| ***4(b)QWC** | (QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)<br><br>**Supporting the hypothesis:**<br><br>1. both HIV and TB infection rates rise and then fall / eq ;<br><br>2. both HIV infection and TB infection increase {from 1990 to 2000 / for the first 10 years} / eq ;<br><br>**Not supporting the hypothesis:**<br><br>3. TB infection falls from 2000 onwards but HIV continues to rise (until 2004) / eq ;<br><br>4. different {parameters /measures / variables / eq} for the two infections / eq ;<br><br>**General points:**<br><br>5. idea of {more {data / information / eq} is needed / other factors (may be) involved} ;<br><br>6. reference to need for statistical {analysis / test} ;<br><br>7. such as correlation {data / test / named example} ;<br><br>8. there is no data that {links HIV infection with TB infection / shows that people with HIV also have TB / shows causal relationship / eq} ; | **max (4)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(i)** | (abiotic factors) are non-living / eq ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(ii)** | C ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(b)(i)** | C ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(b)(ii)** | 1. make it {easier / easy} to {estimate / measure / calculate / count} / eq ;<br>2. reference to more precise ;<br>3. idea of each section would be 4% ; | **max (2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(b)(iii)** | (water) mint<br>(common) duckweed<br>(soft) rush<br><br>one correct 1 mark ;<br>three correct 2 marks ;; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(b)(iv)** | 1. {saturation / eq} not measured / depth of water does not give saturation data / eq ;<br><br>2. no data on other {factors / variables / conditions} ;<br><br>3. other {factors / variables / conditions} may be {affecting distribution / not controlled / confounding} ;<br><br>4. named example / eq ;<br><br>5. idea of only one set of data taken ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(a)(i)** | C ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(a)(ii)** | B ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(a) (iii)** | A ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(b)** | 1. idea of sequence of {bases / nucleotides} on DNA determines sequence on (pre-) mRNA ;<br>2. reference to complementary base pairing / stated example e.g. AU / CG / GC / TA (DNA: mRNA) ;<br>3. reference to formation of bonds by condensation reaction ;<br>4. phosphodiester {bonds / links} ;<br>5. reference to RNA-polymerase ; | **max (3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(c)(i)** | 1. reference to {start / stop / nonsense} (codon) ;<br>2. start (codon) needed to begin {polypeptide synthesis / eq} / {stop / nonsense} (codon) needed to end {polypeptide synthesis /eq } / eq ; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(c)(ii)** | 1. reference to {difference / variations / eq } of {exons / mRNA} ;<br><br>2. reference to different {primary structure / sequence of amino acids} ;<br><br>3. reference to {secondary / tertiary } structure of proteins depends on primary {structure / sequence} / eq ;<br><br>4. due to {change in / different} bonds ;<br><br>5. {hydrogen / ionic / disulphide} bonds ;<br><br>6. reference to different 3D shape / eq ; | **max (3)** |

Question 7) N/A

| Question Number | Answer | Mark |
|---|---|---|
| **8(a)** | <table><tr><th>Source of antibodies</th><th>Form of immunity</th></tr><tr><td></td><td>D</td></tr><tr><td></td><td>B</td></tr><tr><td></td><td>C</td></tr><tr><td></td><td>A</td></tr></table><br>Note:<br>[accept descriptions instead of letters]<br><br>4 correct = 2 marks<br>2 or 3 correct = 1 mark<br>0 or 1 correct = 0 marks ;; | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8(b)** | 1. (bacterium) is made of many different {polymers / chemicals / eq} / eq ;<br><br>2. which can act as antigens / eq ;<br><br>3. reference to B {lymphocytes / cells} ;<br><br>4. reference to (individual B-lymphocytes) recognise specific antigens / antibodies are specific / eq ;<br><br>5. reference to {activation/ eq} of B-lymphocytes by T {lymphocytes / cells} ;<br><br>6. reference to mitosis (in B-lymphocytes or cells) ;<br><br>7. to {form / eq} genetically identical plasma cells ; | **max (4)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8(c)** | 1. specific {antigen / virus / pathogen / bacterium / eq} can be {identified / eq} ;<br><br>2. idea of {specific / monoclonal} antibody binds to {specific / only one} antigen ;<br><br>3. specific treatment can be given / eq ;<br><br>4. avoids unnecessary use of {drugs / treatment} / eq ;<br><br>5. more likely to be effective / eq ; | **max (3)** |