Question Number	Answer	Mark
1(a)	cross next to degree of muscle concentration ; cross next to signs of decomposition ;	**(2)**

Question Number	Answer	Mark
1(b)	1. idea of SD {measures / shows} {spread / range / eq} of data ; 2. Idea of most readings are within {± 1 x SD / ± 2 x SD} e.g. approx 60% readings within (±)1 x SD / approx 90% readings within (±) 2 x SD ; 3. idea that as length of time increases, SD increase / eq ; 4. idea of more variability (in temperature) as time increases / eq ; 5. comment on change in reliability of time of death with time / eq ; 6. estimate (of time of death) can only be within a {4 / 5 / 6 / 7} hour period ; 7. use of manipulated data ;	**max (4)**

Question Number	Answer	Mark
1(c)	**three from the following:** {(body) mass/ BMI / weight / eq} {(subcutaneous) fat /eq} surface area, {ambient / eq } temperature immersion in water age (of person at death) skin colour thickness of hair gender clothing blood loss humidity air movement {core / body} temperature at time of death ;;;	**(3)**

Question Number	Answer	Mark
2(a)	1. idea of reflection ; 2. reference. to {incorrect / eq } {wavelength / colour / frequency} ; 3. idea of {not hitting the {chloroplast / chlorophyll}} / it is transmitted ; 4. idea of light being in excess e.g. at max. photosynthesis so more light can be used ;	**max (2)**

Question Number	Answer	Mark
2(b)(i)	{joules / energy} per {square metre / metre squared /(unit) area} per {year / unit time} ;	**(1)**

Question Number	Answer	Mark
2(b)(ii)	Award 2 marks for correct answer (84.8 / 84.84) 1. correct subtraction (24.4 – 3.7 / 20.7) ; 2. correct multiplication by 100 ÷ 24.4 ; [consequential errors apply]	**(2)**

Question Number	Answer	Mark
2(b)(iii)	B ;	**(1)**

Question Number	Answer	Mark
2(c) [QWC]	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. reference to {*thylakoids* / *thylakoid* (membranes)} ; 2. in {*granum* / *grana*} ; 3. (light energy) raises energy level of *electrons* / {*chlorophyll* / *electrons*}excited / eq ; 4. *electrons* released from {*chlorophyll* /photosystem / eq} / eq ; 5. reference to *electron* {carrier / eq} ; 6. reference to series of {redox / oxidation & reduction / eq} reactions ; 7. reference to energy level of *electrons* {falls / eq} ; 8. reference to {synthesise ATP from ADP +P / phosphorylate ADP} ; 9. reference to *photophosphorylation* ; 10. reference to ATP {*synthetase / synthase / ase*} ; 11. reference to {*chemiosmosis* / eq} ; 12. idea of *electrons* from {*photolysis* / eq} used to replace those lost ; 13. reference to involvement of {accessory pigments / named example} ;	**max (6)**

Question Number	Answer	Mark
3(a)(i)	C ;	**(1)**

Question Number	Answer	Mark
3(a)(ii)	C ;	**(1)**

Question Number	Answer	Mark
3(b)(i)	temperature ;	**(1)**

Question Number	Answer	Mark
3(b)(ii)	1. rate of growth increases as temperature increases {between 13°C and 22°C / up to 22°C} ; 2. rate of growth decreases {between 22°C and 25°C / above 22°C} ; 3. use of manipulated data to support above e.g. increases by {0.7 (a.u.) / 4.5 times}, decreases by 0.1 (a.u.) ; 4. reference to enzymes involved (in growth) ; 5. molecules {move about more / have more kinetic energy}, as temperature increases ; 6. (therefore) {enzyme and substrate (molecules) collide more / rate of enzyme-substrate complexes formation increases} as temperature increases ; 7. correct reference to denaturation of some {enzyme / protein / eq} (molecules) ; 8. (therefore) rate of {growth / reactions} decreases as fewer enzyme molecules available ;	**max (4)**

Question Number	Answer	Mark
3(b)(iii)	1. idea that (each temperature) has same light intensity ; 2. correct reference to must be above {threshold / compensation point} ; 3. (below which) no net photosynthesis takes place / eq ; 4. reference to {so light is not limiting factor / so temperature is the limiting factor}; 5. photosynthesis produces {material / eq} needed for growth / eq ;	**max (3)**

Question Number	Answer	Mark
3(b)(iv)	1. {wavelength / colour / frequency} of light ; 2. CO_2 concentration / eq ; 3. pH / eq (of solution) ; 4. reference to {mineral / eq} ;	**max (2)**

Question Number	Answer	Mark
4(a)(i)	C ;	**(1)**

Question Number	Answer	Mark
4(a)(ii)	A ;	**(1)**

Question Number	Answer	Mark
4(b)(i)	**D** = antigens / (glyco)proteins ; **E** = B {lymphocytes / cells} / plasma cells ; **F** = antibodies / immunoglobulins ; **G** = macrophage / phagocyte / eq ; **H** = enzymes / lysozyme ;	**(5)**

Question Number	Answer	Mark
4(b)(ii)	1. reference to protein nature of {antigens / antibodies} ; 2. antigens are specific (to each bacteria) / eq ; 3. antibodies need to be {complementary / specific} (to the antigen) ; 4. idea that {binding / eq} can take place ; 5. (some bacteria) have {different / changed} antigens / eq ; 6. idea that this is a primary infection ; 7. reference to {mucus / slime} {coat /capsule} (of bacterial cells) ; 8. idea that some bacteria are inside body cells ; 9. idea of antibodies already present e.g. from passive immunity or breast feeding ;	**max (3)**

Question Number	Answer	Mark
5(a)	<table><tr><th>Description</th><th>DNA only</th><th>RNA only</th><th>Both DNA and RNA</th></tr><tr><td>Polymer formed from a single strand of nucleotides</td><td></td><td>✓</td><td></td></tr><tr><td>Pentose present in the nucleotides</td><td></td><td></td><td>✓</td></tr><tr><td>Adenine, cytosine, guanine and thymine present</td><td>✓</td><td></td><td></td></tr><tr><td>Nucleotides linked by phosphodiester bonds</td><td></td><td></td><td>✓</td></tr></table> **all rows correct 2 marks** **two or three rows correct 1 mark**	**(2)**

Question Number	Answer	Mark
5(b)(i)	1. DNA strands {separate / unzip / eq} ; 2. idea that one DNA {strand / eq} used as template (to form mRNA) / eq ; 3. from free nucleotides / eq ; 4. reference to complementary base pairing ; 5. reference to hydrogen bonding ; 6. correct reference to {RNA-polymerase / DNA helicase} ; 7. credit correct sequence of bases on {mRNA / DNA} ;	**max (3)**

Question Number	Answer	Mark
5(b)(ii)	1. reference to specific amino acid attachment to tRNA ; 2. idea that anticodon (on tRNA) {attaches / binds / lines up / eq} to the {codon / triplet} on mRNA ; 3. example quoted using the information in the diagram e.g. tRNA with alanine has CGA anticodon which binds to GCU on mRNA ; 4. idea that two tRNA held in ribosome (at any one time) ; 5. reference to formation of peptide {bonds / links} (between adjacent amino acids) ; 6. reference to peptidyl transferase ;	**max (3)**

Question Number	Answer	Mark
5(c)	1. <u>stop codon</u> ; 2. used to end the {sequencing / further attachment of tRNA / eq} ; 3. release of the {polypeptide / ribosome} /eq ;	**max (2)**

Question 6) N/A

Question Number	Answer	Mark
7(a)	1. reference to {carbon / organic / eq} compounds in plant material ; 2. idea that digestion provides respiratory substrates ; 3. carbon dioxide released (from respiration) ; 4. (this carbon dioxide is) available for photosynthesis ; 5. reference to woodlice {eaten / decompose} ;	**max (3)**

Question Number	Answer	Mark
7(b)(i)	A ;	**(1)**

Question Number	Answer	Mark
7(b)(ii)	1. {wavelength / colour / frequency} of light ; 2. light intensity / shading ; 3. temperature ; 4. moisture content of {air / substratum / eq} / humidity ; 5. {pH / chemical composition / eq} of {substratum / eq} ; 6. air currents / wind / eq ; 7. texture of substratum / eq ; 8. reference to {oxygen / carbon / methane} ;	**max (2)**

Question Number	Answer	Mark
7(c)(i)	<table><tr><td>8</td><td>3</td></tr><tr><td>9</td><td>1</td></tr><tr><td>10</td><td>1</td></tr></table> All three answers correct to 1 significant figure ;	**(1)**

Question Number	Answer	Mark
7(c)(ii)	1. woodlice move about / eq ; 2. (therefore) difficult to count / eq ; 3. some might be {counted more than once / missed out} / eq ;	**max (2)**

Question Number	Answer	Mark
7(c)(iii)	1. for results to be (scientifically) valid ; 2. only one factor needs to be varied / eq ; 3. other factors need to be kept constant / eq ; 4. reference to {many / biotic / eq} factors (in a garden) ; 5. (these factors are) {difficult to control / eq} ; 6. reference to difficult to set test factor values ;	**max (3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>8(a)</td><td>
<table>
<tr><th>Description</th><th>Name of structure</th><th>P, E or B</th></tr>
<tr><td>Enclosed by outer smooth membrane inner membrane folded forming cristae</td><td>Mitochondrion / mitochondria</td><td>E / eukaryotic</td></tr>
<tr><td>Long strand-like structure extending out from the cell Used for locomotion</td><td>Flagellum / flagella</td><td>B / both</td></tr>
<tr><td>Small, circular loop of double-stranded DNA</td><td>plasmid</td><td>P / prokaryotic</td></tr>
</table>
1 mark for any two correct cells ;;;
</td><td>(3)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>8(b)(i)</td><td>bactericidal ;</td><td>(1)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>8(b)(ii)</td><td>1. cell wall {weaker /cannot form properly / eq} ;
2. {cell / cell wall} bursts (easily) / eq ;
3. during division /eq ;</td><td>max (2)</td></tr>
</table>

Question Number	Answer	Mark
8(b)(iii)	1. reference to antibiotic acting as selective pressure ; 2. reference to some bacteria resistant (to antibiotic) ; 3. idea that resistant bacteria survive and {reproduce / pass on resistance / pass on gene / eq}; 4. idea that antibiotic no longer effective ; 5. reference to some infections cannot be treated with antibiotics ;	**max (2)**

Question Number	Answer	Mark
8(c)	1. idea of bacteria distributed evenly / description of technique e.g. lawn spreading ; 2. description of method used to apply different antibiotics at known positions e.g. multidisks, wells in agar ; 3. reference to control of antibiotic concentration ; 4. reference to {sterile / aseptic} technique ; 5. reference to incubation at a suitable temperature ; 6. description of how effect is assessed e.g. measure {clear area / inhibition zone / eq} ; 7. reference to replication (with same bacterium) ; 8. reference to repetition with different bacteria ;	**max (4)**