BIOLOGY MIND

Edexcel

A-Level

BIOLOGY

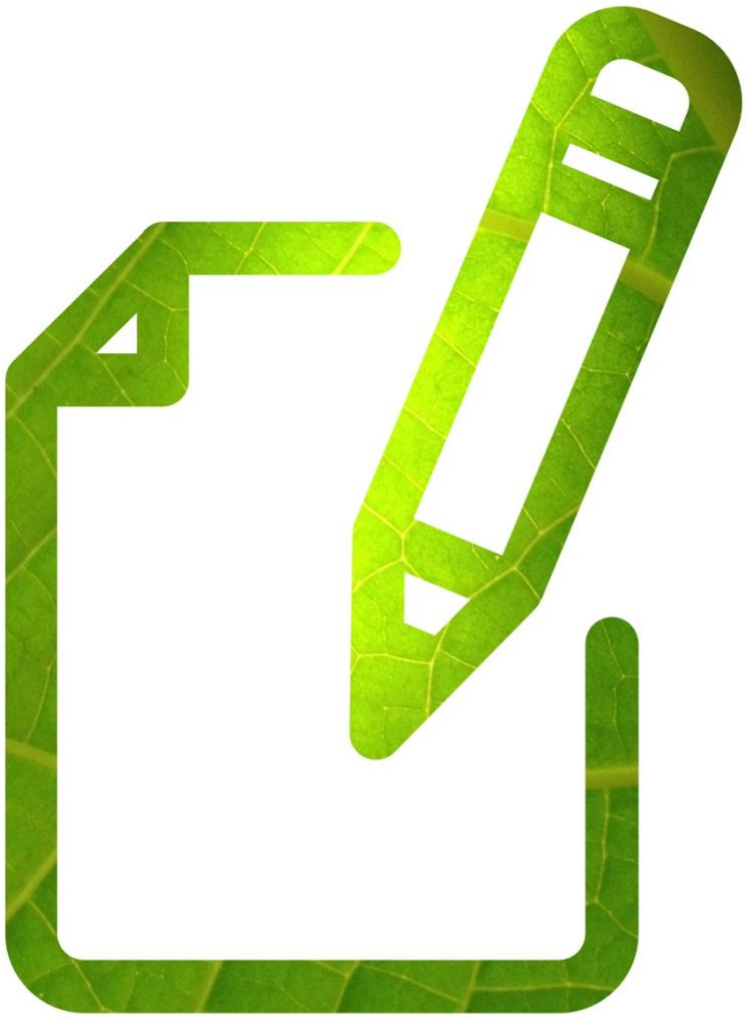
Biological Molecules

DNA & Protein Synthesis 6

Time allowed

54 minutes

MARK SCHEME



Score	Percentage
/45	%

Question Number	Answer	Mark
***1(a) QW**	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. reference to CFTR {protein / channel} eq ; 2. reference to a different {amino acid / sequence of amino acids / eq} (on defective CFTR protein) ; 3. reference to change in protein ; 4. reference to role of protein in transporting chloride ions ; 5. reference to (chloride) ions not {moving out of cells / going into mucus} ; 6. reference to sodium ions moving in ; 7. water does not move out (of cells) / water moves in (to cells) /eq ; 8. by osmosis / eq ; 9. mucus (on cell surface) {is not diluted / becomes thicker / becomes stickier} / eq ; 10. (thickened mucus) cannot be moved by {cilia / coughing} ;	**max (5)**

Question Number	Answer	Mark
1(b)(i)	1. idea that mucus {traps / eq} {bacteria / pathogens} ; 2. idea that {bacteria / mucus containing the bacteria} cannot be removed (by cilia); 3. idea that mucus provides conditions for bacteria to {live / grow / develop / eq} ; 4. reference to antibodies not being effective ; 5. reference to trauma caused by coughing ; 6. idea that resident {phagocytes / macrophages} cannot destroy bacteria ;	**max (2)**

Question Number	Answer	Mark
1(b)(ii)	1. {increase / eq} with age ; 2. (increases) {from 0 to 25 / up to 25} ; 3. {constant /eq} 25 to 35 ; 4. {decreases / eq} 35 to 45 ; 5. credit correct manipulation of figures ;	**max (3)**

Question Number	Answer	Mark
1(b)(iii)	1. Overall increase in P and decrease in S ; 2. At 0 more S than P / between 0 and 7 years S is greater than P ; 3. After 7 years P is greater than S ; 4. S starts to decrease at year 15 but P {decreases at 35 years / continues to increase} ; 5. Maximum P is greater than maximum S ; 6. S {stays constant / is at its highest} between 10 and 15 years but P {stays constant / is at its highest} between 25 and 35 years ;	**max (2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>2(a)</td><td>
<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
</td><td>(2)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>2(b)(i)</td><td>
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} ;
</td><td>max (3)</td></tr>
</table>

Question Number	Answer	Mark
2(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
2(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 Number	Answer	Mark
3(a)	D ;	**(1)**

Question Number	Answer	Mark
3(b)	A ;	**(1)**

Question Number	Answer	Mark
3(c)	B ;	**(1)**

Question Number	Answer	Mark
3 (d)	B ;	**(1)**

Question Number	Answer	Mark
3(e)	C ;	**(1)**

Question Number	Answer	Mark
3 (f)	C ;	**(1)**

Question Number	Answer	Mark
4	1. transcription ; 2. mRNA / eq ; 3. translation ; 4. ribosomes / rough endoplasmic reticulum / RER ; 5. tRNA / eq ; 6. peptide / covalent ;	**(6)**

Question Number	Answer	Mark
5(a)(i)	<table><tr><th>Statement</th><th></th><th>FALSE</th></tr><tr><td>This sequence of bases could be used as a template during translation</td><td></td><td>☒</td></tr><tr><td>A strand of mRNA could be synthesised using this sequence</td><td>☒</td><td></td></tr><tr><td>This sequence codes for 7 amino acids during protein synthesis</td><td>☒</td><td></td></tr></table> 1 mark each correct box ;;; [crosses in both boxes for a statement = 0]	**(3)**

Question Number	Answer	Mark
5(a)(ii)	1. ribosomes / RER / rough endoplasmic reticulum / poly(ribo)some ; 2. descriptive feature e.g. (for ribosome or polysome) {ribosomal RNA / rRNA} / protein component / {two sub-units / large and small sub-unit} (for RER) ribosome attached to membrane ;	**(2)**

Question Number	Answer	Mark
5(b)(i)	1. {change / eq} in DNA ; 2. ref to {change / deletion / addition / duplication / substitution / eq} of {bases / nucleotides} ;	**(2)**

Question Number	Answer	Mark
5(b)(ii)	1. correct reference to change in frequency of either allele e.g. mutant increases / normal decreases ; 2. idea of reproductive success of the {mutant / non-photosynthetic} individuals ; 3. (as trees develop) pond will be (more) shaded / eq ; 4. (less light means) less photosynthesis possible / eq ; 5. ref to photosynthetic individuals die / {non-photosynthetic / mutant} individuals survive ; 6. ref to pass on the {mutation / allele} (for using organic compounds) / eq ; 7. ref to more organic nutrients in pond ;	**maximum (4)**