BIOLOGY MIND

Edexcel

A-Level

BIOLOGY

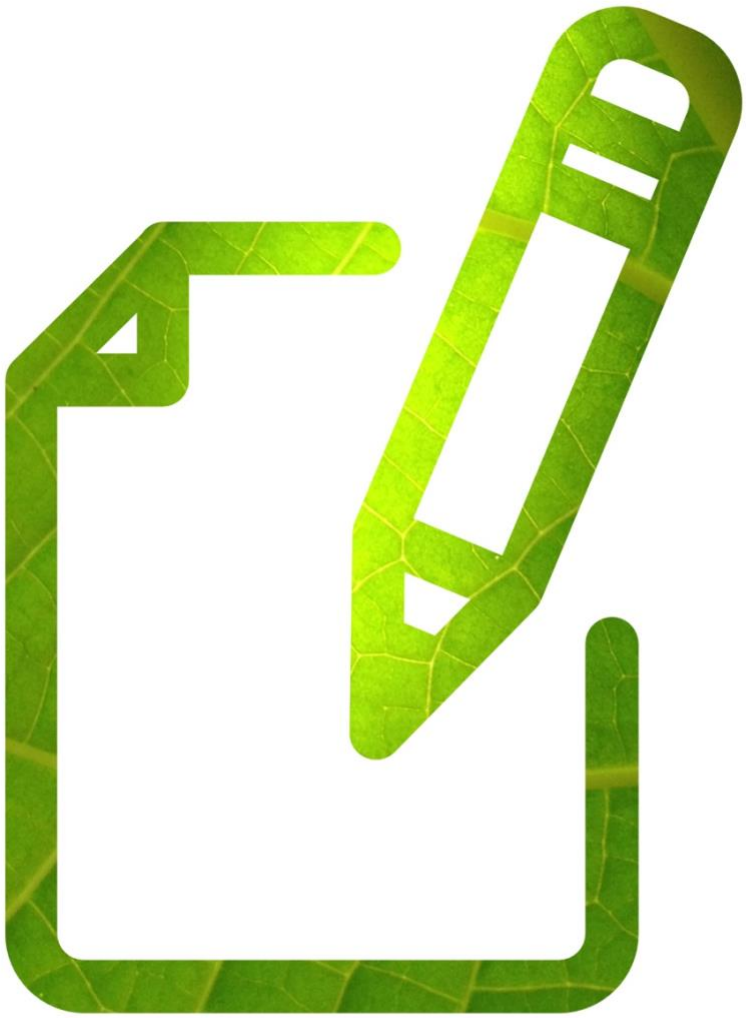
Biological Molecules

DNA & Protein Synthesis 1

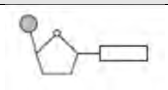
Time allowed

56 minutes

MARK SCHEME



Score	Percentage
/47	%

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	C 		(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	B G-A-U-U-C-A-C-G-U		(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	C 3 1 4 2		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	8		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	6		(1)

Question Number	Answer	Additional Guidance	Mark
1(c)	1. DNA is {double stranded/ has a double helix} and RNA is {single stranded / does not have a double helix} ; 2. DNA has {thymine / T } while RNA has { uracil / U } ; 3. DNA has deoxyribose while RNA has ribose ; 4. DNA is { larger / longer } than RNA / eq ;	**1. ACC T** mixtures e.g. DNA double helix mRNA is single strand **IGNORE** hydrogen bonds **2.NOT** thiamine, thyamine	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	1. as it is a greenhouse gas / eq ; 2. idea of CO_2 leading to global warming ;	**2 ACCEPT** description of effect of global warming	**(2)**

Question Number	Answer	Additional Guidance	Mark
*2(a)(ii)	***QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence**	**QWC Emphasis is on logical sequence**	
	1. idea of using gene involved / eq ;	**1 ACCEPT** allele	
	2. reference to {restriction enzyme / endonuclease} / eq ;		
	3. idea of same (restriction) enzyme used to cut open plasmid / eq ;		
	4. reference to sticky ends ;		
	5. detail of sticky ends e.g. complementary bases exposed ;		
	6. (DNA) ligase used to bind useful gene to plasmid / eq ;	**6 ACCEPT** join for bind	
	7. by forming phosphodiester bonds / eq ;	**7 ACCEPT** description of a phosphodiester bond	
	8. idea of uptake of plasmid by bacterium ;		**(6)**

Question Number	Answer	Additional Guidance	Mark
2(b)	Correct answer gains both marks 1. (one gene contains) 580 000÷525 / 1104.76 base pairs ; 2. this is { 2210 / 2209.5 } bases ; **OR** 3. (genome is 580 000 x 2) = 1160 000 bases ; 4. (one gene is 1160 000 ÷ 525) = { 2210 / 2209.5} bases ;	**Allow 1 mark:** 1105 bases	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	1. deoxyribose in DNA AND ribose in RNA ; 2. thymine in DNA AND uracil in RNA ; 3. idea of enzymes being used are different e.g. DNA polymerase v. RNA polymerase ; 4. 2 strands in DNA and 1 strand for RNA ;	**2 ACCEPT** T and U **3 ACCEPT** DNA formed by DNA replication and RNA by transcription **4 ACCEPT** double helix for 2 strands in DNA	**(3)**
Question Number	**Answer**	**Additional Guidance**	**Mark**
2(c)(ii)	so it can be inserted into a bacterium / idea of less likely to degrade ;	**ACCEPT:** less likely to {mutate / break down }	**(1)**
		IGNORE: for storage unqualified	

Question Number	Answer	Additional Guidance	Mark
2(d)	1. idea that product of a gene acts as an inhibitor ; 2. idea of inhibits next gene ; 3. (if) 1st gene active, it inhibits 2nd gene so 3rd gene is active ; 4. Idea of gene is transcribed for a limited time ;	**1 ACCEPT** protein/polypeptide for product, and repressor for inhibitor **3 ACCEPT** other logical sequence e.g. 2, 3 and then 1	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(e)	1. each step requires its own enzyme / eq ;		
	2. to catalyse / control the step ; 3. idea of the product of one step being the {substrate / eq} for the next step ; 4. all steps must function for nitrogen to be converted to ammonia / eq ; 5. idea of involvement of { cofactors / coenzymes / eq } ;	**1 ACCEPT** appropriate ref to specificity e.g. enzyme 1 only acts on substrate 1 **3 ACCEPT** intermediates involved / reactant for substrate **4 ACCEPT** nitrogen gas {reduced to /H^+ added to form} ammonia **5 ACCEPT** ATP / FAD / NAD	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(f)	1. idea of being non-pathogenic ; 2. virus will {identify / bind to / eq} cancer cells / eq ; 3. virus destroys cancer cells / eq ;	**1 ACCEPT** attenuated, harmless **3 ACCEPT** replicates in cancer cells	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(g)	1. (small number of) healthy people / eq ;		
	2. in case the treatment is dangerous / eq ; 3. idea of establishing dosage ;	**2 ACCEPT** ref to side effects, to make sure it is safe	**(3)**

Question Number	Answer			Additional Guidance	Mark
2(h)		**Stem**	**Ins**	**1 ACCEPT** switched off **2 ACCEPT** specialised for differentiated	**(3)**
	1.	{ any / eq } genes can be activated	most genes deactivated / eq	;	
	2.	{ un / less } differentiated	Differentiated	;	
	3.	cell can continue to divide / no Hayflick limit	{ limited / no } cell division / Hayflick limited	;	
	4.	can give rise to various different cell types	cannot give rise to other types of cell	;	
	5.	No insulin made / insulin gene not active	Insulin made / insulin gene active	;	
	6.	Found in various locations / named location (other than pancreas)	Found in pancreas	;	

Question Number	Answer	Additional Guidance	Mark
2(i)	radiation could lead to { cancer / mutation / eq } ;	**ACCEPT:** named example e.g. deletion	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)	idea that the (RNA) nucleotides attach to this strand OR idea of {nucleotide / base } sequence that directs the synthesis of {complementary sequence / mRNA / eq} ;	ACCEPT complementary to RNA nucelotides, codes for mRNA, {part of the DNA / antisense } strand that the mRNA is built along, NOT DNA nucleotides, plural strands	(1)

Question Number	Answer	Mark
3(b)(i)	**D** have a sugar-phosphate chain ;	(1)

Question Number	Answer	Mark
3(b)(ii)	**C** semi-conservative replication is possible ;	(1)

Question Number	Answer	Mark
3(b) (iii)	**A** 10% ;	(1)

Question Number	Answer	Additional Guidance	Mark
3(c)	U G A A A G C G G G C U 1. both uracils correct ; 2. the rest of the sequence correct ;		(2)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3 (d)</td><td>Any three from:

<table>
<tr><th></th><th>replication</th><th>transcription</th></tr>
<tr><td>1</td><td>uses DNA nucleotides</td><td>uses RNA nucleotides / eq ;</td></tr>
<tr><td>2</td><td>uses DNA polymerase / eq</td><td>does not use DNA polymerase / uses RNA polymerase ;</td></tr>
<tr><td>3</td><td>reference to semi-conservative</td><td>not semi-conservative / eq ;</td></tr>
<tr><td>4</td><td>(copies) both DNA strands / eq</td><td>(copies) only {one strand / template / gene / eq} ;</td></tr>
<tr><td>5</td><td>makes DNA double helix / eq</td><td>Makes single strand mRNA / eq ;</td></tr>
</table>
</td><td>Must be clearly comparative for the mark
IGNORE destination of the molecules

1. ACCEPT thymine / T, uracil / U comparison, deoxyribose and ribose, DNA and RNA bases
2. ACCEPT no ligase in transcription

4. ACCEPT whole DNA molecule unzipped for replication with only part for transcription
ACCEPT all {DNA / genome} copied in replication only part in transcription
5. NOT just produces DNA and mRNA
ACCEPT two {new strands of DNA / DNA molecules} compared to one mRNA (each time)
ACCEPT if clear what is being produced elsewhere in the response</td><td>(3)</td></tr>
</table>