



BIOLOGY MIND

Edexcel

A-Level

BIOLOGY

Biological Molecules

DNA & Protein Synthesis 3

Time allowed
60 minutes

MARK SCHEME



Score

/50

Percentage

%

Question Number	Answer	Additional Guidance	Mark
1(a)	<ol style="list-style-type: none">1. mutation changes the sequence of bases / eq ;2. reference to stop code / idea of {insertion / deletion / eq} changes all triplets / frame shift / eq ;3. {transcription / translation} does not occur / mRNA too short / protein too short / a different protein is made / eq ;	<ol style="list-style-type: none">1. CCEPT correct sequence of bases not there2. IGNORE changes one triplet / codon ACCEPT no start codon, no ribosome binding site3. IGNOR change of an amino acid ACCEPT wrong protein made, different sequence of amino acids	(2)



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Question Number	Answer	Additional Guidance	Mark
1(b)	<ol style="list-style-type: none"> in the (cell surface) membrane ; of mucus-producing cells / eq ; 	<ol style="list-style-type: none"> ACCEPT in phospholipid bilayer, apical membrane NOT on, attached, basal membrane ACCEPT {epithelial/endothelial / lining} cells of appropriate named organ or system e.g. cells lining respiratory, digestive, reproductive 	(2)

Question Number	Answer	Additional Guidance	Mark
1(c)	<ol style="list-style-type: none"> (change in) {number / type / sequence / eq} of {amino acids / R groups} ; So the {bonding / named bond } will be different / eq ; 	<ol style="list-style-type: none"> ACCEPT hydrogen, disulfide bridges, van der Waal forces, ionic NOT peptide, glycosidic, ester bond, etc IGNORE references to shape including active sites 	(2)

Question Number	Answer	Additional Guidance	Mark
1(d)	<ol style="list-style-type: none"> CFTR is a channel protein / eq ; idea that {fewer / no} chloride ions will be able to {enter / bind to / pass through / eq} the CFTR protein ; idea that fewer chloride ions will leave the cell ; 	<p>NOT chlorine penalise once</p> <ol style="list-style-type: none"> NOT carri ACCEPT CFTR has a specific shape for chloride ions ACCEPT other ions can pass through 	(2)

Question Number	Answer	Additional Guidance	Mark
1(e)	<ol style="list-style-type: none"> less {chloride ions / water} in mucus / eq ; idea that mucus is different e.g. thicker, stickier ; in the {respiratory system / lungs / digestive system / pancreas / reproductive system / oviducts / fallopian tubes / cervix / sperm duct / vas deferens / eq } ; credit correct reference to a consequence of thicker mucus ; 	<p>E.g. less ventilation, enzyme release, absorption of nutrients, more chest infections, reduced fertility, etc</p>	(2)

Question Number	Answer	Additional Guidance	Mark
1(f)	<ol style="list-style-type: none"> by {enzymes / proteases} ; by hydrolysis / eq ; of peptide bonds ; 		(2)



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Question Number	Answer	Additional Guidance	Mark
2 (a) (i)	B ;		(1) comp

Question Number	Answer	Additional Guidance	Mark
2 (a) (ii)	B ;		(1) comp

Question Number	Answer	Additional Guidance	Mark
2 (a) (iii)	C ;		(1) comp

Question Number	Answer	Additional Guidance	Mark
2 (b) (i)	C ;		(1) comp

Question Number	Answer	Additional Guidance	Mark
2 (b) (ii)	D ;		(1) comp

Question Number	Answer	Additional Guidance	Mark
2 (c)	nucleus ;	ACCEPT chloroplast, mitochondria	(1) clerical



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Question Number	Answer	Additional Guidance	Mark
2 (d) (i)	<p>Advantage any one from:</p> <ol style="list-style-type: none"> 1. prevent child dying late in pregnancy / eq 2. idea of less stress for parents / eq 3. parents can prepare for child { with / without } achondroplasia / eq 4. idea of making an informed choice ; <p>Disadvantage any one from:</p> <ol style="list-style-type: none"> 5. risk of miscarriage of healthy child / eq 6. idea of more stress for parents / eq 7. cost / eq 8. risk of false { negatives / positives } / eq ; 	<ol style="list-style-type: none"> 4. CCEPT may choose termination 5. CCEPT risk of spontaneous abortion 	(2) p

Question Number	Answer	Additional Guidance	Mark
2 (d) (ii)	<ol style="list-style-type: none"> 1. genoty of parents shown ; 2. alleles in the gametes shown ; 3. possible genotype of children shown AND corresponding phenotypes shown ; 4. (probabilit ⇒) 1/4 / 25% / 1 in 4 / 0.25 ; 	<ol style="list-style-type: none"> 4. NOT a ratio e.g. 1:4 ACCEPT 1/3, 33(.3)% , 1 in 3, 0.3 this assumes AA dies 	(4) p



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Question Number	Answer	Additional Guidance	Mark
3(a)	A = adenine C = cytosine G = guanine T = thymine ;	Accept reasonable phonetic spellings Not: adenosine cysteine glycine thiamine, thymine, tyrosine	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. idea that each amino acid is coded for by three {nucleotides / bases} ; 2. credit quoted example / idea that 12 {nucleotides / bases} code for 4 amino acids ;	Accept in context of RNA AAT / AAC = leucine, CAG = valine, TTT = lysine	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. idea that each {triplet is discrete / each base is only used once in a triplet / eq } ; 2. idea that AAT + AAC + CAG + TTT gives 4 (distinct) { triplets / codes } ;	Accept a specific example eg the first T can only be used in code for first leucine Accept a description of how the code could be read if overlapping	(2)



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Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	<ol style="list-style-type: none"> idea that more than one code can be used for a {particular amino acid/ stop code} ; AAT and AAC code for leucine ; 	Accept more codes than are needed to code for all the amino acids (and stop code)	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)	B ;		(1)

Question Number	Answer	Additional Guidance	Mark
3*(d)	<p>QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence</p> <ol style="list-style-type: none"> reference to mRNA with sequence UUA UUG GUC AAA ; idea that ribosome is involved ; idea that each tRNA molecules is attached to one (specific) amino acid ; credit example of tRNA anticodon with specific amino acid reference to anticodons on tRNA {bind / link to / line up against / eq} codons on mRNA ; credit a specific example (from this DNA) ; idea of hydrogen bonds between bases (of tRNA and mRNA) ; reference to formation of peptide {bonds / links} between (adjacent) amino acids ; 	<p>QWC emphasis is logical sequence NB The mps do not have to be given in this order necessarily</p> <p>Not tRNA carries amino acids</p> <p>AAU /AAC = leucine, CAG = valine, UUU = lysine</p> <p>Ignore complementary</p> <p>eg UUA codon and AAU anticodon</p> <p>Accept between codon and anticodon</p>	(5)



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Question Number	Answer	Additional Guidance	Mark
4(a)(i)	{Met Gly Ile} / {methionine glycine isoleucine} ;	Not other abbreviations	(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	idea that each {triplet is discrete / base is only used once in a triplet / eq} ;	Accept a description of how the code could be read if overlapping	(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	<ol style="list-style-type: none">idea that each amino acid needs a code ;idea that {using three bases give enough codes / using less bases does not give enough codes} ;idea of three bases means there can be 64 { triplets / codes / combinations / eq} ;	Accept codons	(2)



Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	<ol style="list-style-type: none"> 1. idea that {effects of mutations are reduced / the amino acid may not be altered} ; 2. reference to the third base (being the one that can be changed with no effect) ; 3. no effect on (resulting) {polypeptide / protein} / eq ; 	<p>1. Accept description of effect Accept from a description of a specific example Accept always results in same amino acid Not similar amino acid</p> <p>2 NB If mp 2 is awarded it will usually incorporate mp 1 as well = 2 marks</p>	(2)

Question Number	Answer	Additional Guidance	Mark
4(c)	<ol style="list-style-type: none"> 1. reference to (TAA, TAG and TGA as) stop codons ; 2. occur at the end of the gene (on the DNA) / eq ; 3. reference to transcribed as mRNA / eq ; 	<p>1. No codes, triplets</p>	

	<ol style="list-style-type: none"> 4. as AUU, AUC and ACU ; 5. idea that they are recognised by ribosome ; 6. idea that they signal the end of the polypeptide (chain) ; 7. reference to (during) translation ; 	<p>6. Accept stops the synthesis of the polypeptide / the polypeptide is finished</p>	(4)
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Question Number	Answer	Additional Guidance	Mark
4(d)	<ol style="list-style-type: none"> 1. ref to peptide {bond / link} ; 2. between (amino group / NH₃ / NH₄⁺) and {carboxyl group / COOH / COO⁻} ; 3. ref to condensation (reaction) ; 4. idea of role of {tRNA / ribosome / enzymes / correctly named enzyme} in joining amino acids together ; 	<p>Accept mp 1 and 2 from correctly drawn and labelled diagram</p> <p>2. N formulae must be correct if only these are given</p> <p>4. Accept e.g. hold the amino acids next to each other, ribosome contains enzyme</p>	(3)

