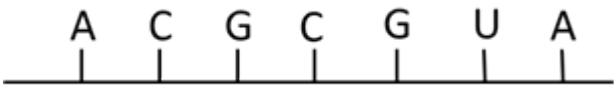


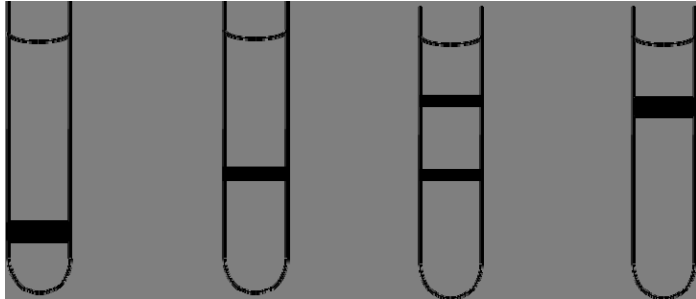
Question			Expected Answers	Mark	Additional Guidance																		
1	(a)	(i)	thymine ;	1																			
1	(a)	(ii)	correct complementary sequence ; bases joined by a backbone drawn below the letters ;	2	<p><b>IGNORE</b> bonds between bases</p> <p style="text-align: center;">  </p> <p style="text-align: right;">= 2 marks</p>																		
1	(b)		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">Statement</th> <th style="width: 20%;">Incorrect statements</th> </tr> </thead> <tbody> <tr> <td>The DNA molecule unwinds</td> <td></td> </tr> <tr> <td>Hydrogen bonds between the base pairs break</td> <td></td> </tr> <tr> <td>Free RNA nucleotides join to bases on the exposed DNA strands</td> <td style="text-align: center;">X ;</td> </tr> <tr> <td>Both polypeptide strands act as a template</td> <td style="text-align: center;">X ;</td> </tr> <tr> <td>Hydrogen bonds form between complementary bases</td> <td></td> </tr> <tr> <td>3 hydrogen bonds form between bases A and T</td> <td style="text-align: center;">X ;</td> </tr> <tr> <td>DNA polymerase links the new nucleotides</td> <td></td> </tr> <tr> <td>Covalent bonds form between the phosphate of one nucleotide and the pentose sugar of the next nucleotide</td> <td></td> </tr> </tbody> </table>	Statement	Incorrect statements	The DNA molecule unwinds		Hydrogen bonds between the base pairs break		Free RNA nucleotides join to bases on the exposed DNA strands	X ;	Both polypeptide strands act as a template	X ;	Hydrogen bonds form between complementary bases		3 hydrogen bonds form between bases A and T	X ;	DNA polymerase links the new nucleotides		Covalent bonds form between the phosphate of one nucleotide and the pentose sugar of the next nucleotide		3	<p>Four 'X's – max 2 Five 'X's – max 1 Six or more 'X's – <b>DO NOT CREDIT</b> any marks If candidate does not use 'X', <b>ACCEPT</b> unambiguous system of indicating correct answers.</p>
Statement	Incorrect statements																						
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Question		Expected Answers	Mark	Additional Guidance
1	(c)	<p>1 individuals / organisms / species / phenotypes ;</p> <p>2 genetic ;</p> <p>3 environment ;</p> <p>4 <u>intra</u>specific ;</p> <p>5 selection / survival ;</p>	5	<p><b>Mark the first answer.</b> If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = <b>0 marks</b></p> <p><b>IGNORE</b> offspring</p> <p><b>ACCEPT</b> inherited / genetical</p> <p><b>IGNORE</b> named example of environment, e.g. diet</p> <p><b>ACCEPT</b> intraspecies</p> <p><b>ACCEPT</b> breeding / reproduction</p> <p><b>ACCEPT</b> natural selection / survival of the fittest</p>
		<b>Total</b>	<b>[11]</b>	

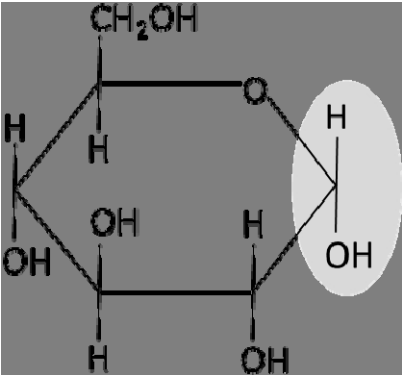
Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	3 ;	1	<b>IGNORE</b> triplet
2	(a)	(ii)	4 <sup>3</sup> <b>or</b> 4 x 4 x 4 <b>or</b> 4 x 4 <sup>2</sup> ;	1	
2	(a)	(iii)	Several, triplet(s) / codon(s) , code for one amino acid ;  (some are used as) start / stop / termination ;  <i>idea that</i> mutation may , not result in change in amino acid / have a neutral effect / result in silent mutation ;	2 max	<b>Must be clear that base combination is a group of 3 bases</b> <b>IGNORE</b> degenerate <b>DO NOT CREDIT</b> makes/ produces/ creates , amino acids  <b>DO NOT CREDIT</b> deletion / insertion (as would create frame shift)
2	(a)	(iv)	adenine / A <b>and</b> cytosine / C <b>and</b> guanine / G ;	1	<b>Mark the first 3 answers.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>DO NOT CREDIT</b> adenosine  <b>DO NOT CREDIT</b> cysteine  <b>DO NOT CREDIT</b> glycine

Question		Expected Answer	Mark	Additional Guidance
2	(b)	<p><i>transcription</i></p> <p>1 DNA / gene , copied / transcribed , into mRNA ;</p> <p>2 free / activated , (RNA) nucleotides / (RNA) nucleoside triphosphates ;</p> <p>3 (line up by) complementary base-pairing / described ;</p> <p>4 (to) one / template / reference / sense , (DNA) strand ;</p> <p>5 (catalysed by) RNA polymerase ;</p> <p><i>translation</i></p> <p>6 (mRNA moves to) ribosomes ;</p> <p>7 tRNA (molecules) bind to mRNA ;</p> <p>8 <u>anticodon</u>(s) , match / pair with / bind to , codons ;</p> <p>9 specific / correct , amino acid attached to tRNA ;</p> <p>10 formation of <u>peptide</u> bond between amino acids;</p>	6 max	<p><b>Marks may be awarded from an annotated diagram</b></p> <p>1 <b>IGNORE</b> 'used to make'</p> <p>2 <b>DO NOT CREDIT</b> DNA nucleotides</p> <p>3 <b>CREDIT</b> 'A-T, C-G and A - U'</p> <p>4 <b>ACCEPT</b> 'non-coding' for 'template'</p> <p>5 <b>DO NOT CREDIT</b> in context of breaking H bonds</p> <p>6 <b>CREDIT</b> translation occurs at ribosomes <b>Note:</b> tRNA anticodons bind to mRNA codons <b>= 2 marks</b> (mps 7 &amp; 8)</p> <p>10 <b>DO NOT CREDIT</b> dipeptide / polypeptide , bond</p>
		<p>QWC ;</p>		1
<b>Total</b>			<b>12</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	<p><b>X</b> cytosine / pyrimidine ;</p> <p><b>Y</b> nucleotide ;</p>	2	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>X ACCEPT</b> <u>nitrogenous</u> base / <u>organic</u> base</p> <p><b>X IGNORE</b> C</p>
3	(a)	(ii)	<p>at least one line between all opposite bases ;</p> <p>two lines between A and T <b>and</b> three lines between both instances of C and G ;</p>	2	<p><b>IGNORE</b> bond labels / H / O / <math>\delta^+</math> / <math>\delta^-</math></p> <p>Bases on left strand do not need to be labelled but <b>CON</b> this mark if incorrectly labelled</p>
3	(a)	(iii)	<p>polypeptide ;</p> <p>ribosome ;</p>	2	<b>ACCEPT</b> protein
3	(a)	(iv)	<p>(usually) single stranded / would not have 2 strands ;</p> <p>uracil / U, instead of thymine / T ;</p>	2	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>IGNORE</b> shorter</p> <p><b>ACCEPT</b> only one backbone</p> <p><b>DO NOT CREDIT</b> incorrect spelling of thymine with 'a'</p> <p><b>IGNORE</b> difference in sugar as on the diagram ribose and deoxyribose would appear the same</p>
	(b)	(	<p>one strand, from original DNA <b>and</b> one strand newly formed ;</p> <p>an , (original) strand / polynucleotide , acts as template (for new strand) ;</p>	2	<p><b>ACCEPT</b> one old and one new strand</p> <p><b>ACCEPT</b> each strand is copied</p>

Question			Answer	Marks	Guidance
3	(b)	(i)	(DNA) can be replicated without error / same sequence of nucleotides is produced ;  reduces occurrence of mutation ;  allows (re-)formation of , hydrogen / H , bonds ;	2	<b>ACCEPT</b> formation of identical DNA <b>ACCEPT</b> same / correct , order / sequence , of bases  This mark point is for the correct use of the term 'mutation' and does not imply without error. <b>ACCEPT</b> prevents mutation  <b>DO NOT CREDIT</b> H <sup>+</sup> / H <sub>2</sub> bonds
3	(c)	(i)	horizontal band drawn in tube <u>R1</u> clearly higher than band in <sup>15</sup> N tube and clearly lower than band in <sup>14</sup> N tube ;	1	<b>DO NOT CREDIT</b> if more than one band drawn <b>IGNORE</b> thickness of bands and whether bands are shaded  <b>DO NOT CREDIT</b> if there is any overlap with a band in another tube
3	(c)	(ii)	one band (in <u>R2</u> ) clearly at the same height as that in tube <u>R1</u> <b>and</b> one band (in <u>R2</u> ) clearly at the same height as that in the <sup>14</sup> N tube ;	1	 <p style="text-align: center;"><u>R1</u>                      <u>R2</u></p> <b>DO NOT CREDIT</b> if more than two bands drawn <b>IGNORE</b> thickness of bands and whether bands are shaded

Question		Answer	Marks	Guidance
3	(d)	<p>same concentration of sugar (solution in each tube) ;  same volume of, mixture / solution / sugar solution (in each tube) ;</p> <p>spin (all tubes) at same , speed / acceleration ;  spin (all tubes) for same (length of) time ;</p>	3	<p><b>IGNORE</b> prompt lines - mark as prose  <b>IGNORE</b> amount throughout</p> <p><b>IGNORE</b> mass  <b>IGNORE</b> mass  <b>IGNORE</b> volume , of sugar / DNA extract</p> <p><b>ACCEPT</b> tubes spun at constant speed</p> <p><b>IGNORE</b> temperature / pH  <b>IGNORE</b> mass of DNA</p>
		<b>Total</b>	<b>17</b>	

Question		Answer	Marks	Guidance
4	(a)	monosaccharide(s) ;	1	<b>ACCEPT</b> phonetic spelling
4	(b) (i)	<p>identical to diagram of <math>\beta</math>-glucose with inversion of OH and H on any <b>one</b> carbon atom ;</p> <p>correct inversion of OH and H on 1<sup>st</sup> C ;</p>	2	<p>A correct diagram as shown below = 2 marks</p>  <p><b>ACCEPT</b> displayed formula for CH<sub>2</sub>OH etc If the candidate has drawn <math>\alpha</math>-glucose upside down = 0 marks</p>



Question			Answer	Marks	Guidance
4	(b)	(ii)	<p>1 soluble so can be (easily) , transported / carried (around organism) ;</p> <p>2 small (molecule) so can , be transported / diffuse , across (cell) membranes ;</p> <p>3 <u>easily / quickly</u> , respired / oxidised / broken down , to , release energy / produce ATP ;</p> <p>4 molecules can , <u>join / AW</u> , to produce , (named) disaccharides / (named) polysaccharides ;</p>	2	<p><i>Answers need a feature plus an explanation of how the feature helps the function</i></p> <p><b>1 ACCEPT</b> soluble so is able to , react / AW  <b>1 ACCEPT</b> description of solubility in terms of chemical properties linked to transport or reactivity</p> <p><b>3 DO NOT CREDIT</b> 'hydrolysed'  <b>3 DO NOT CREDIT</b> 'easily broken down to provide energy for respiration'  <b>3 DO NOT CREDIT</b> 'easily broken down to produce energy'</p> <p><b>4 IGNORE</b> 'used to form glycogen' without idea of molecules , bonding / joining / condensation</p>
4	(c)		<p>1 part of nucleotide ;</p> <p>2 bonded / joined / attached , to (named) base <b>and</b> phosphate ;</p> <p>3 phosphate (joined) to C5 (and C3)  / base (joined) to C1 ;</p> <p>4 (deoxyribose is part of) backbone (of DNA) ;</p> <p>5 <i>idea of linking with</i> (second) phosphate on adjacent nucleotide ;</p> <p>6 nucleotide is , monomer / repeating unit , of DNA / polynucleotide ;</p>	3	<p><b>AWARD</b> making points from suitably labelled diagram</p> <p><b>2 IGNORE</b> 'made up of'  <b>2 DO NOT CREDIT</b> answers which state incorrect bond  <b>2 IGNORE</b> 'phosphate molecule'</p> <p><b>6 ACCEPT</b> 'DNA formed from a chain of nucleotides'</p>

Question			Answer	Marks	Guidance
4	(d)	(i)	<p>1 <math>\alpha</math>-glucose / <math>\beta</math>-glucose ;</p> <p>2 some / no , 1–6 bonds</p> <p><b>or</b></p> <p><u>only</u> 1 –4 bonds ;</p> <p>3 condensation / hydrolysis ;</p> <p>4 branches / straight chain ;</p>	3	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><i>Candidates may <b>identify</b> the error or <b>correct</b> the error</i></p> <p><b>If nothing is written on the answer lines, ACCEPT</b> a clear indication on the boxed list of which statements are incorrect</p> <p><b>1 ACCEPT</b> b / B for '<math>\beta</math>'</p>
4	(d)	(ii)	glycogen / amylopectin ;	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>IGNORE</b> starch</p> <p><b>DO NOT CREDIT</b> if spelling could be confused with another molecule, e.g. glucagon</p>
<b>Total</b>				<b>12</b>	