

1)

(a)	(i)	nucleus / nuclear envelope / nuclear membrane / nucleolus ; membrane bound organelles / named organelle ; ribosomes larger ; (large) cell size / 20µm wide ;	2 max	Mark the first two suggestions. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet. ACCEPT SER / RER / vesicle / cilia DO NOT CREDIT presence of ribosome / vacuole / flagellum / undulipodium
	(ii)	Two marks for correct answer 4500 ; ;	2	No tolerance in initial measurement = exactly 90mm If answer is incorrect, allow one mark for correct working i.e. any measurement divided by 20 e.g. 8.9 / 20
	(iii)	1 provides, strength / stability / support (cell) ; 2 determines shape / changes shape / moves membrane (for endo / exocytosis) ; 3 movement of, organelles / named organelle / RNA / protein / chromosomes / chromatids ; 4 attachment to / hold, organelles / named organelle, in place; 5 make up, centrioles / spindle fibres ;	2 max	Mark the first two suggestions. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet. IGNORE structure IGNORE movement of (whole) cell e.g. vesicles, cilia, mitochondria, ribosome

2)

(a)		photosynthesis ; starch ; nucleic acids ; monomers ; cellulose ;	5	Mark the first answer in each space. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT minor mis-spellings
(b)		1 without fertiliser <u>yield</u> falls (over time) / fertiliser maintains <u>yield</u> / AW ; 2 application of fertiliser replaces lost , nitrogen / nitrates ; 3 nitrogen / N, required for , amino acids / (named) protein / growth / (named) nucleic acids / (named) nitrogenous base ; 4 <i>idea that</i> nitrogen / N / nitrate / NO ₃ ⁽⁻⁾ , removed (from soil / system) by , plant / harvesting ; 5 <i>idea of</i> denitrification ; 6 nitrates / NO ₃ ⁽⁻⁾ are soluble ; 7 nitrates / NO ₃ ⁽⁻⁾ are , leached / washed from soil ;	3 max	IGNORE 'nutrients/ minerals' throughout 1 ACCEPT it / nitrate / nitrogen as AW for fertiliser ACCEPT fertiliser increases yield 2 ACCEPT it / nitrate / nitrogen as AW for fertiliser 3 IGNORE 'development' IGNORE fertiliser / nitrate / N ₂ 4 Answers must refer to depletion (from soil) 'used' alone does not imply depletion

3)			
(a)		(enzymes are) proteins / used in metabolism / used in named metabolic pathway ; alter rate of (chemical) reaction / lowers activation energy / provides alternative route for reaction / is not changed / is not used up ;	ACCEPT 'used in reactions , in organisms / in the body' IGNORE 'biological / enzyme / in nature' ACCEPT does not take part in reaction 2 Note 'speed up metabolic reactions' = 2 marks
(b)	(i)	time ;	1 Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE 'how long' IGNORE correct units
(b)	(ii)	P1 idea of different samples have different concentrations of, catalase / enzyme ; M1 One of source the extract for the whole experiment from a single source ; M2 thorough , mixing , required before use ; M3 filter / purify , extract ; M4 idea of using , known / standard , concentration of enzyme ; M5 commercial source of catalase ;	2 The M mark can be awarded without a correct P mark P1 Look for the idea of variation within the sample (e.g. different amounts) CREDIT examples of lack of uniformity such as: breakage of cells / surface area / mixing / disruption of lysosomes / changes to enzyme shape (caused by blending process) / presence of other substances interfering with reaction IGNORE refs to celery being a poor source of catalase M1 ACCEPT 'from same plant'
(b)	(iii)	repeat / replicate ; compare replicate values / identify anomalous results ; mean / range / standard deviation / error bars / % error ; compare results with , others / book / internet , values / results ;	e.g compare replicates with Table 2.1 IGNORE average Must contain the idea of other investigators ACCEPT 'look up normal values on the internet' 2 max
(c)	(i)	1 rate , rises / increases , initially ; 2 peak at / maximum at / highest at / decrease after, 40(°C) ; 3 (overall) fall more rapid than rise ; 4 idea that before peak / after peak , temperature increase has increasing effect on rate ; 5 comparative figures to support any point ; 6 no , reaction / oxygen produced , at 60(°C) ;	IGNORE explanations 1 DO NOT CREDIT if 'rate' not stated for this mp only 2 ACCEPT optimum 3 Look for a comparative statement 4 ACCEPT, e.g., line is steeper between 30 and 40 than between 10 and 20. 5 Two temperatures and two rates, with units. Or calculated difference with appropriate units, e.g. rate doubles between 10 and 20°C or $Q_{10} = 2$ 6 ACCEPT rate is 0 at 60 4 max
(c)	(ii)	2 ;	1 IGNORE units
(c)	(iii)	temperature ; maximum / peak / V_{max} ; denatured ; active ;	4 Mark the first answer for each letter. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT kinetic energy / KE ACCEPT optimum / optimum temperature IGNORE descriptions

4)

(a)	(i)	D ; A ; F ;	3	Mark the first answer for each letter. If an additional answer is given then = 0 mark																		
(a)	(ii)	B ; E ; F ; F ;	4	Mark the first answer for each letter If an additional answer is given then = 0 marks																		
(b)		1 insoluble ; 2 does not , change / affect , water potential / Ψ , of cell ; 3 can be , broken down / hydrolysed / built up , quickly / easily ; 4 lots of branches for <u>enzymes</u> to attach ; 5 compact ; 6 (therefore) high energy content for mass / energy dense / AW ;	3 max	2 ACCEPT osmotically inactive / AW 3 Answers must contain the idea of ease or speed of breakdown IGNORE broken up Answers must imply density, e.g. 'it is compact and so stores a lot of energy' = 2 marks																		
(c)	(i)	α /alpha , glucose ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT 'a'																		
(c)	(ii)	1 respiratory substrate / used for respiration ; 2 source of / releases / provides, energy ; 3 formation of ATP ; 4 conversion into named compound ;	1 max	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT any answer that clearly states that glucose is energy, makes energy, produces energy or creates energy 1 ACCEPT used in respiration ACCEPT 'releases energy for respiration' 2 IGNORE used for energy 4 e.g. starch / cellulose / polysaccharide / disaccharide / glycogen / protein / lipid / sucrose / maltose / fructose / fat																		
(c)	(iii)	D ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT F IGNORE triglyceride / fat / lipid / haemoglobin																		
(d)		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">glycogen</th> <th style="width: 50%;">cellulose</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><i>no hydrogen bonding</i></td> <td style="text-align: center;"><i>hydrogen bonding</i></td> </tr> <tr> <td>α / alpha , glucose</td> <td>β / beta , glucose</td> </tr> <tr> <td>1,4 <u>and</u> 1,6-glycosidic bonds or 1,6-glycosidic bonds present</td> <td>1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present</td> </tr> <tr> <td>branched</td> <td>not branched / linear / straight</td> </tr> <tr> <td>no , fibres / fibrils</td> <td>fibres / fibrils</td> </tr> <tr> <td>granules</td> <td>no granules</td> </tr> <tr> <td>all glucose units in same orientation</td> <td>adjacent glucose units in opposite orientation</td> </tr> </tbody> </table>	glycogen	cellulose	<i>no hydrogen bonding</i>	<i>hydrogen bonding</i>	α / alpha , glucose	β / beta , glucose	1,4 <u>and</u> 1,6-glycosidic bonds or 1,6-glycosidic bonds present	1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present	branched	not branched / linear / straight	no , fibres / fibrils	fibres / fibrils	granules	no granules	all glucose units in same orientation	adjacent glucose units in opposite orientation	3 max	Comparative statements must be made on the same line Award 1 mark for each correct side by side comparison. ALLOW two valid comparisons in the same pair of boxes, e.g <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">α-glucose in a branched chain</td> <td style="width: 50%; text-align: center;">β-glucose in a straight chain</td> </tr> </table> = 2 marks ACCEPT 'a' and 'b' ACCEPT helical / spiral / coiled vs linear / straight DO NOT CREDIT α -helix	α -glucose in a branched chain	β -glucose in a straight chain
glycogen	cellulose																					
<i>no hydrogen bonding</i>	<i>hydrogen bonding</i>																					
α / alpha , glucose	β / beta , glucose																					
1,4 <u>and</u> 1,6-glycosidic bonds or 1,6-glycosidic bonds present	1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present																					
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all glucose units in same orientation	adjacent glucose units in opposite orientation																					
α -glucose in a branched chain	β -glucose in a straight chain																					

5)

(a)	<p>X phosphate ;</p> <p>Y <u>deoxyribose</u> ;</p> <p>Z <u>thymine</u> ;</p>	3	<p>Mark the first answer for each letter. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>DO NOT CREDIT PO₄ or 'phosphate , molecule / backbone' IGNORE group</p> <p>DO NOT CREDIT deoxyribose IGNORE (pentose) sugar</p> <p>DO NOT CREDIT incorrect spelling IGNORE (nitrogenous) base / T</p>
(b)	<p>1 <u>semi-conservative</u> (replication) ;</p> <p>2 (double) <u>helix</u>, untwists / uncoils / unwinds / unravels ;</p> <p>3 hydrogen bonds (between bases) break ;</p> <p>4 each strand acts as the <u>template</u> (for the formation of a new molecule) ;</p> <p>5 free (DNA) <u>nucleotides</u> (align with exposed bases) ;</p> <p>6 complementary base pairing / purine to pyrimidine ;</p> <p>7 hydrogen bonds (re)form ;</p> <p>8 sugar-phosphate backbone forms / adjacent nucleotides join ;</p> <p>9 <u>DNA</u> polymerase joins , backbone / strands ;</p> <p>10 each new molecule has 1 old and 1 new strand ;</p> <p>11 AVP ;</p> <p>QWC ~ events in correct sequence so long as no ref to transcription / translation , seen ;</p>	<p>6 max 1</p>	<p>CREDIT answers from clearly labelled diagram IGNORE anything after it becomes clear that a candidate is <i>describing</i> transcription</p> <p>2 IGNORE straightens DO NOT CREDIT α-helix</p> <p>3 IGNORE unzips</p> <p>5 IGNORE in cytoplasm</p> <p>6 IGNORE A to T / C to G (as given in Q) ACCEPT base pair rule</p> <p>8 CREDIT formation of phosphodiester bond</p> <p>9 ACCEPT in context of H bonds forming</p> <p>10 DO NOT CREDIT half old and half new strand</p> <p>11 e.g. correct ref to , (DNA) helicase (in context of unwinding or unzipping) / (DNA) ligase (in context of joining Okazaki fragments or role in backbone formation) / leading or lagging strand / 3' / 5' / antiparallel / activation of free nucleotides / 3 H bonds between C and G / 2 H bonds between A and T / Okazaki fragments / proof reading</p> <p>1 mark from mps 2 to 4 <i>then</i> 1 mark from mps 5 to 7 <i>then</i> mp 8 or 9</p>