1. **(a)** S;
G_2;
mitosis; [3]

2	**(a)**	**(i)**	Hydrogen (bond);	[1]	
		(ii)	Hydrolysis (reaction);	[1]	
	(b)	**(i)**	5;	[1]	
		(ii)	13;	[1]	4

3.

(a) **Any two from**
- solvent should be placed in sealed chromatography jar/container beforehand (to allow vapour to saturate jar)
- avoid touching chromatography paper with bare hands
- all marks on chromatography paper should be in pencil
- solutions under investigation should not be placed too close together/ too close to the edge of chromatography paper/samples are same distance from bottom (starting from same point)
- solutions should be concentrated by repeated application in the same position
- chromatography paper should not touch the sides of the jar/container [2]

(b) Distance to solvent front = 74 mm, distance to middle of spot = 37 mm;
R_f = 37/74 = 0.5 [*consequential to values above*]; [2]

(c) Fructose
glucose
maltose
sucrose
4 correct for [3], 3 correct for [2], 2 correct for [1]; [3]

(d) α-glucose; [1] 8

4 **(a)** Activity increases between 5 °C and 40 °C, then falls sharply between 40 °C and 45 °C;
increase at lower temperatures is due to the greater kinetic energy of enzyme/substrate molecules;
causing more frequent formation of enzyme-substrate complexes;
above 40 °C, bonds within the tertiary structure are broken/the active site is distorted; [4]

(b) **(i)** There are two different enzymes present;
each peak represents a different optimum temperature; [2]

(ii) Allows enzyme activity to take place over a wide range of (washing) temperatures; [1]

(c) From 45 °C to 50 °C, one enzyme is being denatured;
from 50 °C to 55 °C, the activity of the second enzyme is increasing; [2] 9

5. Drawing skills:
block diagram showing tissue layers;
all tissue layers drawn (completeness of drawing to show the tissues obvious in the photograph);
accurate representation of the photograph, i.e. a drawing rather than a diagram;
accurate positioning and proportionality of the tissue layers;
quality of drawing (e.g. clear – smooth and continuous – lines drawn, not sketchy); [5]

		AVAILABLE MARKS
6 (a) (i)	C, H, O, N (not S); [1]	
(ii)	The protein consists of two or more polypeptide chains; [1]	
(b) (i)	Mucin; keratin/collagen; mucin/trypsin; trypsin; [4]	
(ii)	The keratin is produced in cells, not within the hair/ amino acids are obtained from the diet, rather than applied to the body/other appropriate response; [1]	
(c)	• Ribosomes are the site of production of a polypeptide chain; • Rough endoplasmic reticulum provides support for the ribosomes/ transports the polypeptide through the cell/is involved in folding the polypeptide into its tertiary structure; • Golgi body may add a prosthetic group (or by example)/packages proteins for transport or export; [3]	
(d)	Exocytosis; [1]	
(e)	Research groups working in different parts of the world can study the findings of other teams easily/may be of use to teams working on different areas of biology (or by example)/other appropriate response; [1]	12

		AVAILABLE MARKS
7. (a)	**Any four from:** • DNA is unzipped by breaking of hydrogen bonds • this is catalysed by DNA helicase • each strand acts as a template/semi-conservative mechanism • free nucleotides are attracted to their complementary bases/base pairing occurs, A with T and C with G • (phosphodiester) bonds form between the deoxyribose and the phosphate of adjacent nucleotides • catalysed by DNA polymerase [4]	
(b)	**Any two from:** • heat is used to break the hydrogen bonds/separate strands instead of an enzyme (helicase) • only a small section of the DNA is replicated • primers are used (to identify the section of DNA to be amplified) • a thermostable enzyme (e.g. Taq polymerase) is used [2]	
(c) (i)	Drug A: prevents the DNA being unzipped (due to cross linkage); Drug B: prevents addition of further nucleotides to the spine (due to three phosphates instead of one); [2]	
(ii)	S/synthesis phase; [1]	9

8.

		AVAILABLE MARKS
(a)	A: Rough endoplasmic reticulum; B: (ER) vesicles; C: Golgi body (apparatus)/dictysome; [3]	
(b)	Cytoplasm: amino acids; Nucleus: organic (nitrogenous) bases/named example of a base/ nucleotides; [2]	
(c)	In A (RER and ribosomes) are used to make the protein/polypeptide chains; polypeptides/proteins are transported in B (ER vesicles) to C (Golgi body); and modified into the final protein/glycoprotein in C (Golgi); proteins are transported to the cell membrane in D which fuses with the cell membrane; [4]	9

9.

Any thirteen points:

- osmosis is the net movement of water across a partially (selectively) permeable membrane
- from an area of higher water potential to an area of lower water potential
- pure water has a water potential of zero
- addition of solutes decreases the solute potential / creates a negative solute potential
- by restricting the movement of free water molecules / by creating hydration shells
- so they decrease the water potential of a solution
- all cells contain a range of dissolved solutes
- if a cell has a lower water potential than its environment (neighbouring cells), then water will move in / if a cell has a higher water potential than its environment (neighbouring cells), then water will move out
- in animal cells, only the dissolved solutes contribute to the water potential
- if animal cells take in water, they may swell and lyse (burst)
- because they have no cell wall
- if animal cells lose water, they will crenate
- the presence of a cell wall in plant cells creates a pressure potential
- thus the water potential of a plant cell = solute potential + pressure potential ($\Psi_{cell} = \Psi s + \Psi p$)
- when plant cells absorb water, they become turgid / the wall resists the inward movement of excess water
- when plant cells lose water, the cell becomes flaccid / the cell membrane begins to pull away from the cell wall / the cell begins to plasmolyse
- however, the membrane remains attached at the plasmodesmata
- if the cell can gain water, it can recover
- further loss of water will result in complete plasmolysis / will result in the plasmodesmata breaking the connection with neighbouring cells
- other appropriate response [13]

13

Quality of written communication:

2 marks: The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

1 mark: The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.

0 marks: The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account. [2]

2