

Question 11 (Answer: **A**)

- Polar groups on the outside of a protein are what let it dissolve in the watery cytoplasm.
- Replacing them with non-polar groups removes those interactions with water.
- The haemoglobin therefore becomes less soluble – which is what makes sickle cells form.

Question 10 (Answer: **C**)

- The secondary structure (α -helix and β -pleated sheet) is held by hydrogen bonds.
- Hydrogen bonds also help hold the tertiary structure, alongside ionic and disulfide bonds.
- Peptide bonds hold the primary sequence, and disulfide bonds appear only in the tertiary structure.

Question 11 (Answer: **D**)

- Peptidyl transferase catalyses condensation between amino acids on the ribosome.
- So it builds the primary structure of the polypeptide.
- The elasticity of resilin comes from its later folding, not from this enzyme.

Question 12 (Answer: **C**)

- Collagen is three polypeptides wound into a triple helix.
- Glycine is the smallest amino acid, and having it at every third position lets the chains pack tightly.
- Cross-links between the chains, and staggered ends between molecules, give the fibre its strength.

Question 11 (Answer: **D**)

- More charged and hydrophobic amino acids means more ionic bonds and more hydrophobic interactions.
- Those extra interactions hold the tertiary structure together more firmly.
- So a higher temperature is needed before the enzyme denatures.

Question 12 (Answer: **D**)

- Glycine is the smallest amino acid, so having it at every third position lets three chains wind tightly together.
- The chains form a triple helix held by hydrogen bonds.
- Covalent cross-links between neighbouring molecules, staggered along the fibre, give the strength.

2(a)(i)	any <i>two</i> from each polypeptide is a (left-handed), helix / helical shape ; R alpha helix (three) polypeptides are tightly, coiled / wound (around each other) / AW ; (three polypeptides form a) <u>triple helix</u> ; I bonding
2(a)(ii)	any <i>three</i> from <i>collagen molecules arranged</i> 1 in parallel ; 2 staggered / ends are not aligned / AW ; <i>molecules held together by – max 2</i> 3 covalent, bonds / links ; I hydrogen bonds R if part of a list that includes other bonds in proteins 4 between R-groups of amino acids on different molecules ; A side chains 5 AVP ; e.g. covalent bonds between lysine / hydroxylysine (residues)
2(b)(i)	provides (high tensile) strength to, help keep trachea open / support trachea ; A provides strength to prevent trachea collapsing allows flexibility for, breathing / change of diameter of trachea / bending of trachea / AW ;
2(b)(ii)	any <i>one</i> from: (inhalation) allow, stretching / expansion, without, rupture / AW ; A prevent overstretching elastic fibres recoil to help, expel air / exhalation / expiration ; R to empty
2(c)(i)	(gly)-pro-met-gly-pro-arg-gly-pro-pro-gly ;
2(c)(ii)	any <i>three</i> from: <i>allow gly for glycine</i> 1 glycine is every third amino acid ; 2 glycine, allows tight folding for the polypeptides / makes it easy for polypeptides to fit closely together / AW ; A compactness A glycine allows the turning points (of the polypeptide) 3 glycine has <u>smallest</u> R-group ; A glycine is the <u>smallest</u> (amino acid) / glycine has H as R-group <i>or</i> side chain 4 NH in glycine can form hydrogen bonds (with carboxyl group on another amino acid residue) 5 (so) allows many hydrogen bonds between polypeptides ; 6 AVP ; ala / pro, also has a small R-group / AW
2(c)(iii)	P <i>deletion of first nucleotide pair</i> changes the, sequence / order, of amino acids (in primary structure) ; I shorter A (GTC CAA TGG GTC CCC GAG GTC CCC CAG GT_) val gln trp val pro glu val pro gln (val) Q <i>substitution in first triplet</i> (GGT to TGT in non-transcribed strand) cys (instead of gly) is first amino acid, <u>and</u> no change to the rest (of, sequence / order, of amino acids) ; A <u>only</u> first amino acid is different