



Command words + no. of marks

Analysis of the question

Relevant key terms

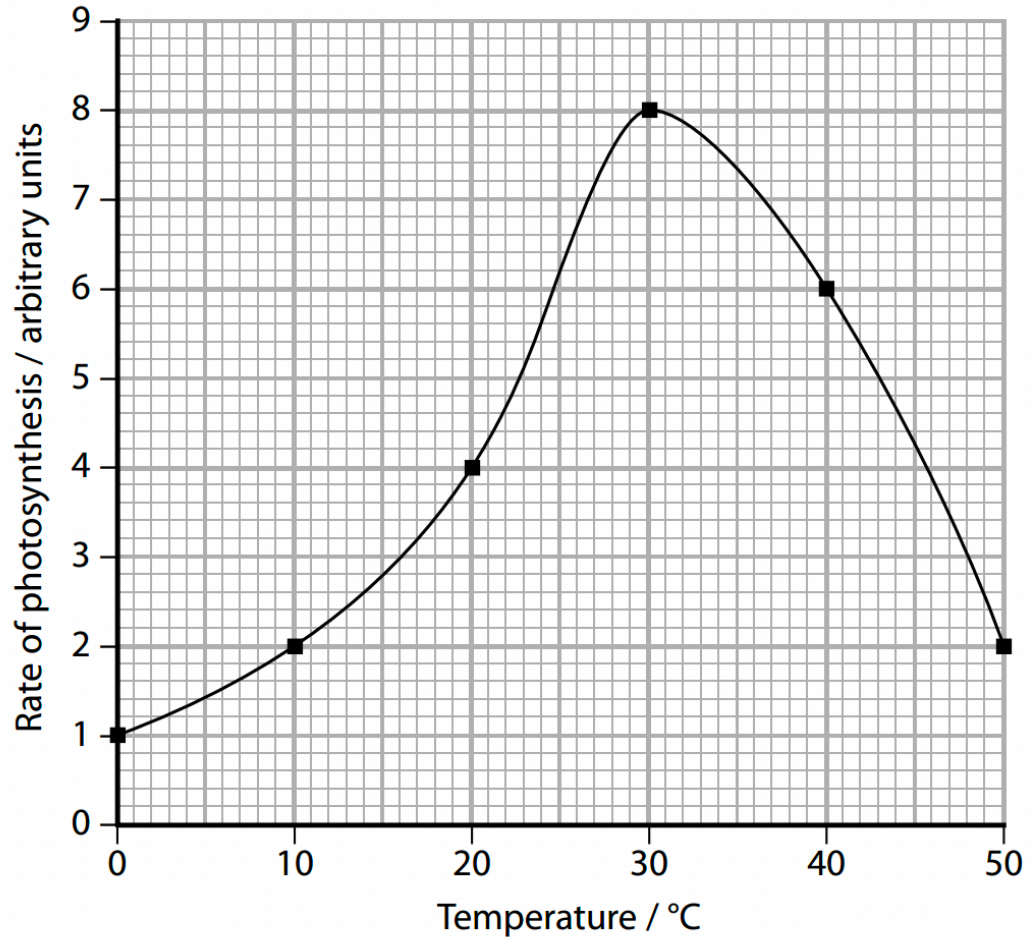
Bullet point answers

Self check

- Analyse the full question stem carefully the first time you read it
- There are clues in the question stem - it's your job to be Sherlock Holmes and find them
- Ask yourself what is the actual topic of the question here (not just the surface topic)
- Keep the command word the same and re-word the question so it's easier to understand
- Get the question 100% clear in your mind (so that you could answer it on a blank piece of paper)



- 1 The reactions involved in photosynthesis are affected by environmental factors. The graph shows the effect of temperature on the rate of photosynthesis in wheat.



- (b) Explain the effect of temperature on the rate of photosynthesis in wheat.

(3)

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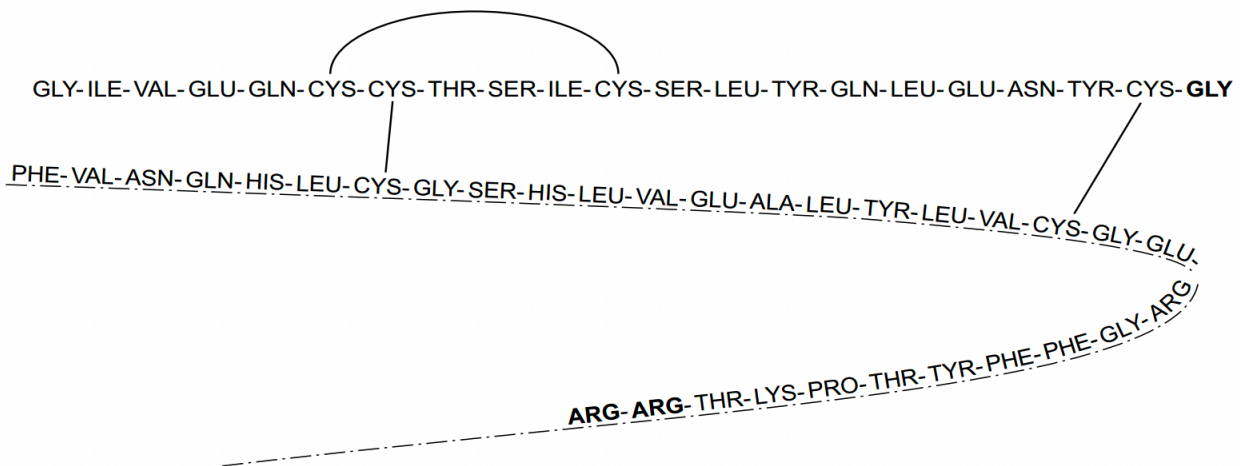


- (c) Insulin is a hormone that regulates blood glucose concentration. People with type 1 diabetes need to inject insulin, to reduce their blood glucose concentration, as they are unable to produce their own insulin.

Diabetics need to inject insulin before every meal as insulin has a short half-life. Enzymes in the liver cells break down insulin, which removes it from the blood.

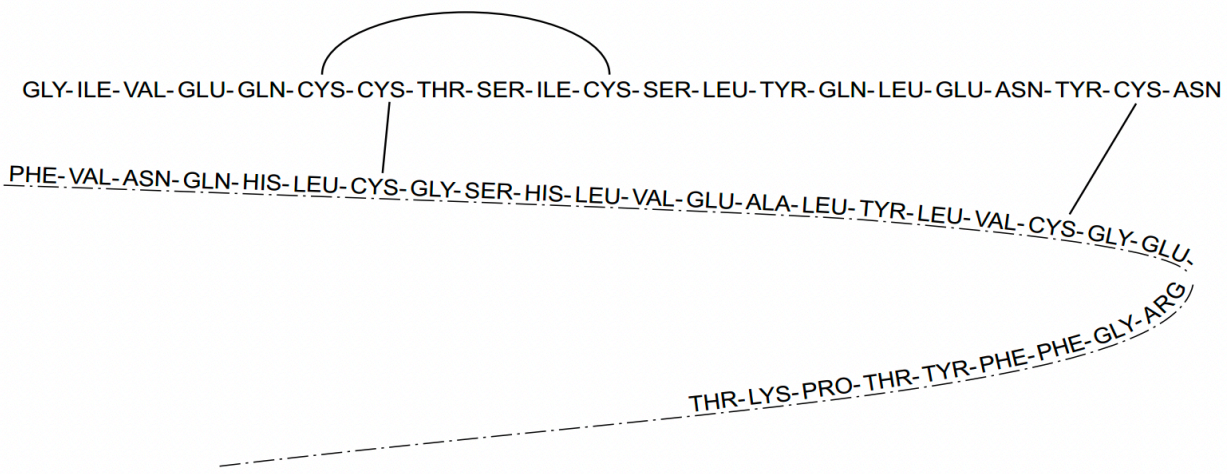
Insulin glargine is a modified version of human insulin that lasts much longer in the blood.

Fig. 21.3 shows the sequence of amino acids in one molecule of human glargine with the modifications in **bold**.



- 21 Human insulin is a globular protein with a quaternary structure. One insulin molecule has 51 amino acids.

Fig. 21.1 shows the sequence of amino acids in one molecule of human insulin.





The table shows some of the DNA triplet codes for amino acids.

1 st base of DNA triplet	2 nd base of DNA triplet								3 rd base of DNA triplet
	T		C		A		G		
A	ATT	(ILE) Isoleucine	ACT	(THR) Threonine	AAT	(ASN) Asparagine	AGT	(SER) Serine	T
	ATC		ACC		AAC		AGC		C
	ATA	ACA	AAA		(LYS) Lysine	AGA	(ARG) Arginine	A	
	ATG	(MET) Methionine	ACG			AAG		AGG	G
G	GTT	(VAL) Valine	GCT	(ALA) Alanine	GAT	(ASP) Aspartic acid	GGT	(GLY) Glycine	T
	GTC		GCC		GAC		GGC		C
	GTA		GCA		GAA	(GLU) Glutamic acid	GGA		A
	GTG		GCG		GAG		GGG		G

In order to produce insulin glargine, the human insulin gene is modified by genetic engineering. This is a process which can change the genetic code of the gene. The genetic code of DNA triplet 21 is changed so that the amino acid it codes for is glycine instead of asparagine.

- (iii) The modified polypeptides that form insulin glargine are made inside cells.

The process of making the modified polypeptides that form insulin glargine involves several steps. The process starts with the modified gene for insulin glargine.

Outline the steps involved in the process of making the modified polypeptides that form insulin glargine, starting with the gene for insulin glargine until when the modified polypeptides are made.

[4]

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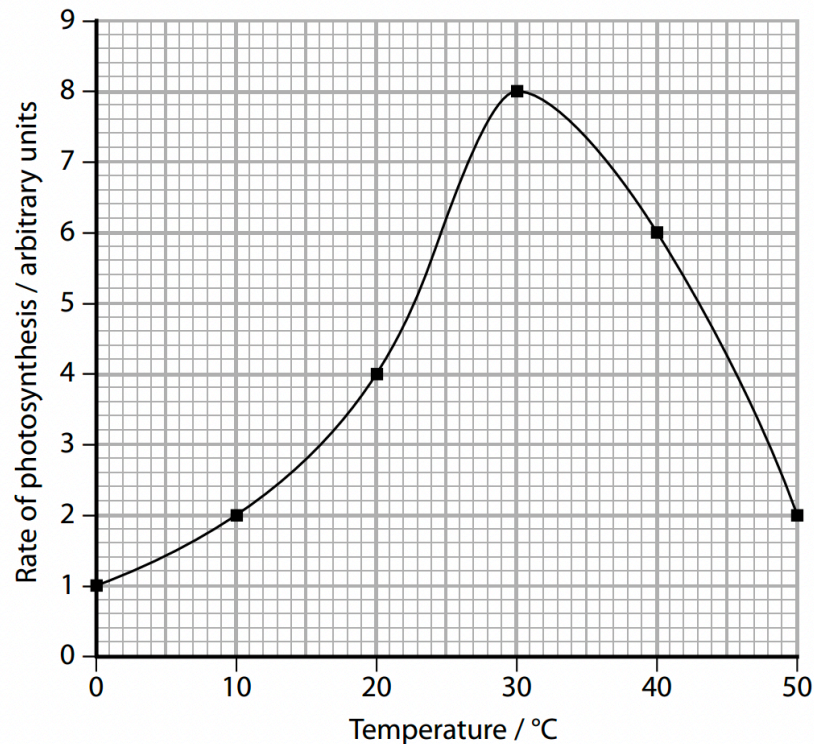
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- 1 The reactions involved in photosynthesis are affected by environmental factors.
The graph shows the effect of temperature on the rate of photosynthesis in wheat.



- (b) Explain the effect of temperature on the rate of photosynthesis in wheat.

(3)

An explanation that makes reference to three of the following:

1. increasing temperature increases {movement of both enzyme and substrate molecules / kinetic energy of molecules} (1)
2. therefore molecules collide {more often / with more force} causing the rate to increase (1)
3. resulting in {enzyme denaturation / change in bonding in the enzyme} above 30 °C (1)
4. which causes active site shape to change and causing the rate to decrease (1)

- (iii) The modified polypeptides that form insulin glargine are made inside cells.

The process of making the modified polypeptides that form insulin glargine involves several steps. The process starts with the modified gene for insulin glargine.

Outline the steps involved in the process of making the modified polypeptides that form insulin glargine, starting with the gene for insulin glargine until when the modified polypeptides are made.

[4]

1. (modified gene undergoes) transcription (in nucleus) ✓
2. production of (modified) mRNA / described ✓
3. mRNA, leaves nucleus / goes to ribosomes ✓
4. translation at ribosome(s) ✓
5. tRNA with specific amino acid binds its anticodon (to codon of mRNA) ✓
6. (formation of) peptide bonds between amino acids ✓