1 Proteins are made up of amino acids.

(a) The table shows the DNA bases that code for some of the amino acids found in proteins.

DNA bases	AAA	AAC	CAA	TAC	TTC
Amino acid	phe	leu	val	met	lys

Part of the DNA coding for a protein is:

T A C C A A T T C

(i) State the order of amino acids coded for by this sequence of DNA.

(1)

.....

(ii) These amino acids will be joined together during protein synthesis.

During which stage of protein synthesis will this take place?

(1)

.....

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Amino acids are joined together

(1)

☒ **A** at the membrane

☒ **B** in the mitochondria

☒ **C** in the nucleus

☒ **D** at the ribosome

(b) DNA can code for the amino acids in the active site of an enzyme.

Explain the role of the active site of an enzyme.

(2)

(c) Mutations can occur in DNA.

Describe what effect a mutation could have on the action of an enzyme.

(3)

(Total for Question 1 = 8 marks)

2 Phenolphthalein is an indicator. It is pink in alkaline solutions and turns colourless as the pH decreases.

It can be used to measure the activity of the enzyme lipase on the breakdown of lipids.

Samples of milk containing phenolphthalein were incubated with lipase at different temperatures.

The time taken for the phenolphthalein to turn colourless was recorded and used to calculate the rate of enzyme activity.

Figure 10 shows these results.

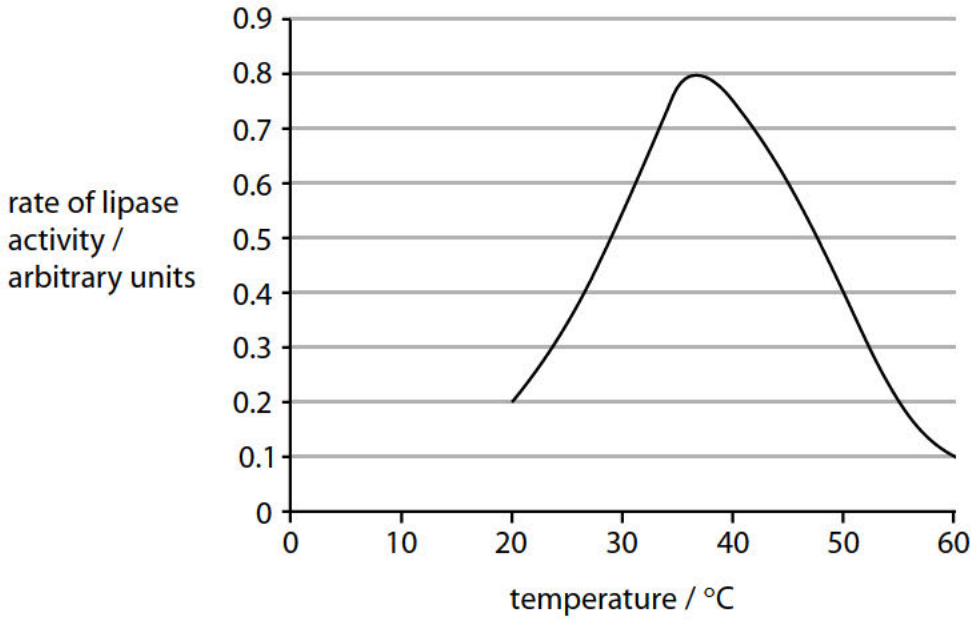


Figure 10

(a) (i) Explain why phenolphthalein turns colourless when lipase breaks down the lipids in milk.

(2)

.....

.....

.....

.....

(ii) Describe the effect of temperature on the activity of lipase, as shown in Figure 10.

(2)

.....

.....

.....

.....

(iii) Explain why the activity of lipase changes above a temperature of 40 °C.

(2)

.....

.....

.....

.....

(b) A student investigated the time taken for amylase to breakdown a 10% starch solution into glucose at 37 °C. The student repeated the investigation five times.

Figure 11 shows the results.

time taken for amylase to produce glucose (s)				
test 1	**test 2**	**test 3**	**test 4**	**test 5**
120	125	110	115	118

Figure 11

(i) Calculate the rate of amylase enzyme activity for the 10% starch solution.

(3)

rate = ... s^{-1}

The investigation was done at 37 °C.

(ii) State **one** other variable that the student should have controlled during this investigation.

(1)

.....

.....

(c) Different enzymes catalyse specific reactions.

Explain why enzymes can only catalyse specific reactions.

(2)

.....

.....

.....

.....

(Total for Question 2 = 12 marks)

3 DNA and RNA are involved in the synthesis of proteins such as enzymes.

(a) Protein synthesis involves transcription and translation.

Which row shows the molecules involved in both transcription and translation?

Place a cross (☒) in the box next to your answer.

(1)

	transcription	translation
☐ **A**	tRNA	tRNA
☐ **B**	mRNA	DNA
☐ **C**	tRNA	DNA
☐ **D**	mRNA	mRNA

(b) Describe what happens to the molecule produced by transcription before it is translated.

(2)

.....

.....

.....

.....

(c) Explain how the lock and key hypothesis models how enzymes work.

You may use labelled diagrams in your answer.

(3)

*(d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)

(Total for Question 3 = 12 marks)