Section B

For Examiner's Use

Answer all the questions.

- 21 Lactate dehydrogenase (LDH) is an enzyme found in many organisms. Within the same organism, it can be found in different forms, called isoenzymes. The isoenzymes are structurally different but all catalyse the same reaction.
 - (a) (i) Fig. 21.1 shows a reaction catalysed by lactate dehydrogenase that occurs during anaerobic respiration in muscle tissue.

Complete Fig. 21.1 by identifying the compounds A, B and C.

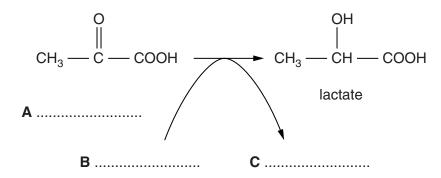


Fig. 21.1

_	

(ii)	State where in the cell this reaction takes place.
	[1
(iii)	Explain the importance of this reaction in mammalian muscle tissue.
	IA

Lactate dehydrogenase isoenzymes are globular proteins, each consisting of four polypeptides.

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Hea

(b)	Describe the structure of an enzyme, such as lactate dehydrogenase, and explain how this structure is suited to its role.
	[4]

Lactate dehydrogenase isoenzymes are made up of two types of polypeptide: polypeptide M, which is coded for by the LDH-A gene and polypeptide H, which is coded for by the LDH-B gene.

Table 21.1 shows the composition of different human lactate dehydrogenase isoenzymes and examples of tissues and organs where each can be found.

Table 21.1

isoenzyme	polypeptide composition of enzyme	example of isoenzyme location
LDH-1	НННН	heart red blood cells
LDH-2	НННМ	heart red blood cells
LDH-3	ННММ	brain lungs
LDH-4	НМММ	kidneys placenta
LDH-5	ММММ	liver skeletal muscles

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	ith reference to Table 21.1, suggest how cells of different tissues of the same individual an produce different isoenzymes.
	[2]
L	OH can be present in blood plasma as a result of tissue damage.
	ood samples can be taken and tested to measure the concentrations of different LDH oenzymes.
(i)	This test can help in the diagnosis of heart attacks resulting from atheroma formation.
	Explain how atheroma can lead to a heart attack.
	[3]
(ii)	

(e) The base sequences of the *LDH-A* and *LDH-B* genes and the sequences of the amino acids encoded by these genes were determined.

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ile

ala

leu

Fig. 21.2 shows the first ten amino acids of polypeptides M and H and the corresponding base sequences of one of the DNA strands of each gene.

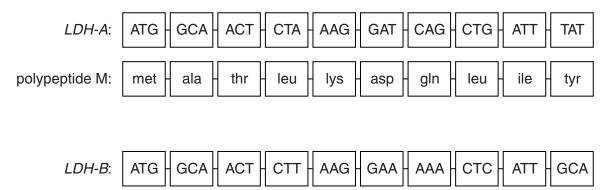


Fig. 21.2

lys

glu

lys

leu

Table 21.2 shows the genetic code (mRNA codons).

ala

thr

polypeptide H:

met

Table 21.2

first	second position			third	
position	U	С	А	G	position
	phe	ser	tyr	cys	U
U	phe	ser	tyr	cys	C
U	leu	ser	STOP	STOP	Α
	leu	ser	STOP	trp	G
	leu	pro	his	arg	U
С	leu	pro	his	arg	С
	leu	pro	gln	arg	Α
	leu	pro	gln	arg	G
	ile	thr	asn	ser	U
Α	ile	thr	asn	ser	С
A	ile	thr	lys	arg	Α
	met	thr	lys	arg	G
	val	ala	asp	gly	U
G	val	ala	asp	gly	С
G G	val	ala	glu	gly	Α
	val	ala	glu	gly	G

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Comment on the sequences shown in Fig. 21.2. You may refer to Table 21.2.
[6]
[Total: 26]

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