

**AQA – Biological Molecules – A2 Biology**

1. June/2021/Paper\_1/No.1

0 1 . 1

Describe the induced-fit model of enzyme action **and** how an enzyme acts as a catalyst.

**[3 marks]**

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0 1 . 2

Scientists investigated the action of the enzyme ATP synthase. They made reaction mixtures each containing:

- ATP synthase
- buffer (to control pH)
- substrates.

One of the substrates required in these reaction mixtures is inorganic phosphate (Pi).

Tick (✓) **one** box to show which other substrate the scientists must add to the reaction mixtures to produce ATP.

**[1 mark]**

Adenine

Adenosine diphosphate

Glucose

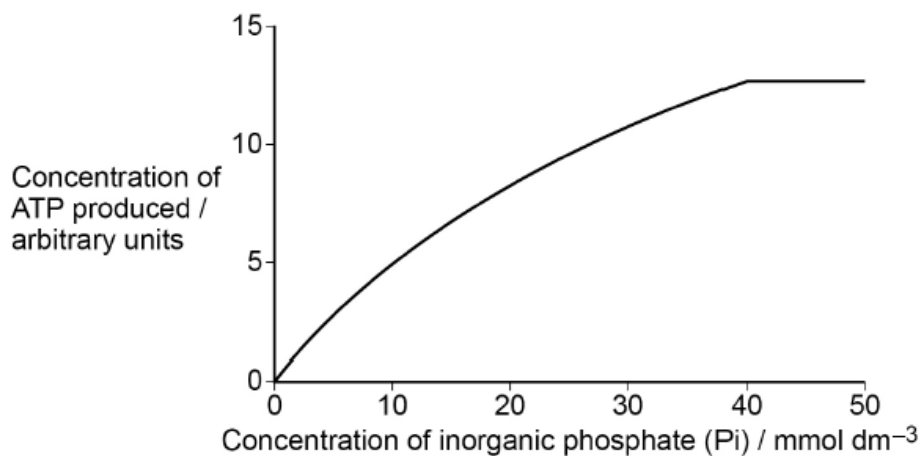
Ribose

0 1 . 3 The scientists investigated the effect of concentration of inorganic phosphate (Pi) on ATP synthase activity.

After 2 minutes, they stopped each reaction and then measured the concentration of ATP.

Figure 1 shows the scientists' results.

Figure 1



Suggest and explain a procedure the scientists could have used to stop each reaction. [2 marks]

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0 1 . 4 Explain the change in ATP concentration with increasing inorganic phosphate concentration. [2 marks]

[2 marks]

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Table 2 shows:

- mRNA codons and the amino acid coded for by each codon
- the type of bond formed by the R group of some of the amino acids.

Table 2

First base	Second base				Third base
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Leu		Stop	Stop Trp	C A G
C	Leu	Pro	His	Arg	U
			Gln		C A G
A	Ile	Thr	Asn	Ser	U
	Met		Lys	Arg	C A G
G	Val	Ala	Asp	Gly	U
			Glu		C A G

Key to the type of bond formed by the R group of each amino acid

Hydrogen bonds   
  Ionic bonds   
  Disulfide bridges

0 3 . 2

Crystallin is a structural protein found in the human eye. An inherited disease that leads to blindness is caused by changes in properties of crystallin. The replacement of the amino acid Arg with the amino acid Gly causes these changes.

Use information in Table 2 to suggest why this amino acid replacement changes the properties of crystallin.

[2 marks]

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0 3 . 3

The amino acid replacement of Arg with Gly is caused by a single base substitution mutation in the DNA. The non-mutant DNA triplet is TCC.

Complete **Table 3**.

Give:

- the mRNA codon complementary to the non-mutant DNA triplet
- the mutated mRNA codon that could cause the change from Arg to Gly in the crystallin protein
- the DNA triplet complementary to this mutated mRNA codon.

[2 marks]

**Table 3**

mRNA codon for the non-mutant triplet	
Mutated mRNA codon	
Mutated DNA triplet	

3. June/2021/Paper\_1/No.8

0 8 . 1

Describe how a triglyceride molecule is formed.

[3 marks]

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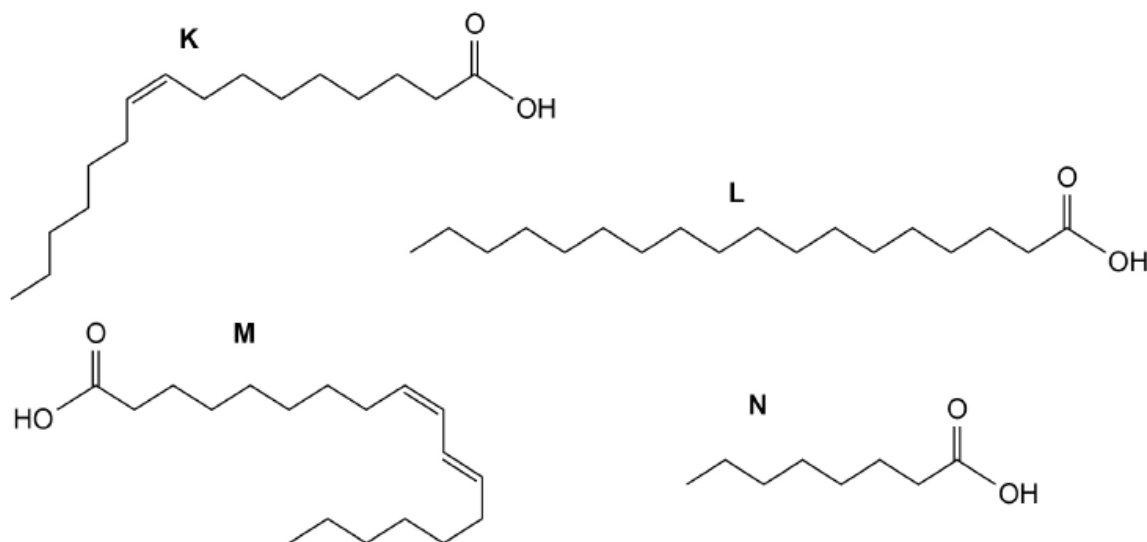
0 8 . 2 Table 5 shows some properties of four fatty acids.

Table 5

Fatty acid	Number of carbon atoms in the R group	Number of double bonds in the R group
Caprylic acid	8	0
Palmitoleic acid	16	1
Stearic acid	18	0
Linoleic acid	18	2

Figure 10 shows diagrams of these fatty acids.

Figure 10



Put a tick (✓) in **one** box that contains correct information about one of these fatty acids.

[1 mark]

Caprylic acid is an unsaturated fatty acid represented by diagram L.

Linoleic acid is a saturated fatty acid represented by diagram N.

Palmitoleic acid is an unsaturated fatty acid represented by diagram K.

Stearic acid is a saturated fatty acid represented by diagram M.

The percentage of saturated fatty acids compared with unsaturated fatty acids found in lipid stores in seeds differs in different populations.

Scientists investigated two populations of the plant, *Helianthus annuus*.

The scientists grew young plants from seeds collected from each population. They placed the seeds on wet tissue paper so that the root growth was visible.

They grew seeds from each population at two temperatures:

- warm temperature of 24 °C
- cool temperature of 10 °C

After 10 days, the scientists measured the length of each root.

**Table 6** shows some of the properties of the two populations and the scientists' results.

**Table 6**

Population	Temperature in natural environment	In the seed – Mean percentage of fatty acids that are saturated	Mean length of root after 10 days at 24 °C / mm ( $\pm 2 \times$ standard deviation)	Mean length of root after 10 days at 10 °C / mm ( $\pm 2 \times$ standard deviation)
1	Warm	10.9	8.2 ( $\pm 1.0$ )	3.1 ( $\pm 0.3$ )
2	Cool	6.1	5.5 ( $\pm 0.9$ )	4.3 ( $\pm 0.2$ )

The mean  $\pm 2 \times$  standard deviation includes 95% of the data.

0 8 . 3

The scientists used a data logger to measure the length of the root rather than a ruler.

Suggest **one** reason why they used a data logger **and** explain why this was important in this investigation.

[1 mark]

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