1. March/2023/Paper_ 9700/42/No.6

(a) Fig. 6.1 is a diagram of a section through a mitochondrion.

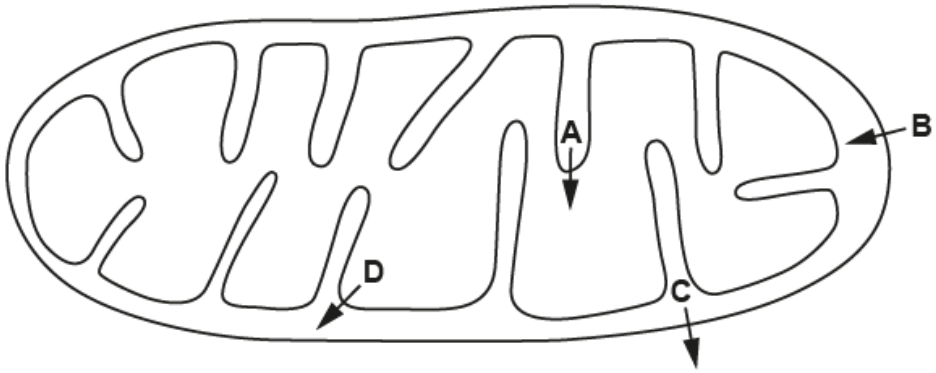

Fig. 6.1

The four arrows, **A**, **B**, **C** and **D**, show the movement of molecules and ions.

Use the letters to identify **all** the arrows (one or more) that show:

(i) active transport of protons

..... [1]

(ii) diffusion of carbon dioxide.

..... [1]

(b) Outline the role of the mitochondrial matrix in respiration.

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..... [3]

(c) Explain how a lack of oxygen affects oxidative phosphorylation.

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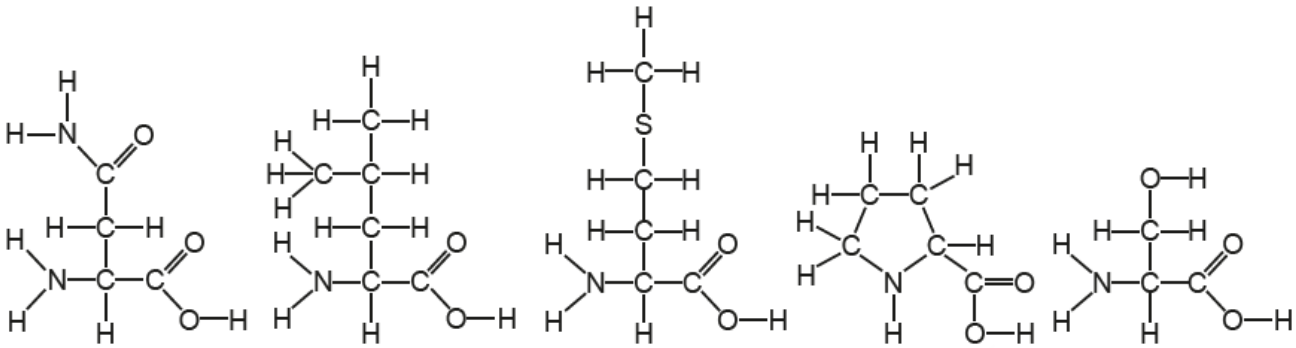
..... [4]

[Total: 9]

2. June/2023/Paper_ 9700/41/No.7

Amino acids are the monomers that are used to produce proteins in organisms. Amino acids also have other, non-protein, roles in the body.

(a) Fig. 7.1 shows the structures of five amino acids with varying numbers and arrangements of carbon atoms.



asparagine leucine methionine proline serine

Fig. 7.1

In the liver, one of these amino acids can be converted to pyruvate and one of these amino acids can be converted to oxaloacetate.

Suggest which of the amino acids shown in Fig. 7.1 would be most directly converted to:

- pyruvate
- oxaloacetate.

amino acid converted to pyruvate .....

amino acid converted to oxaloacetate .....

[2]

(b) The amino acid glycine can act as a neurotransmitter.

A glycinergic synapse is shown in Fig. 7.2.

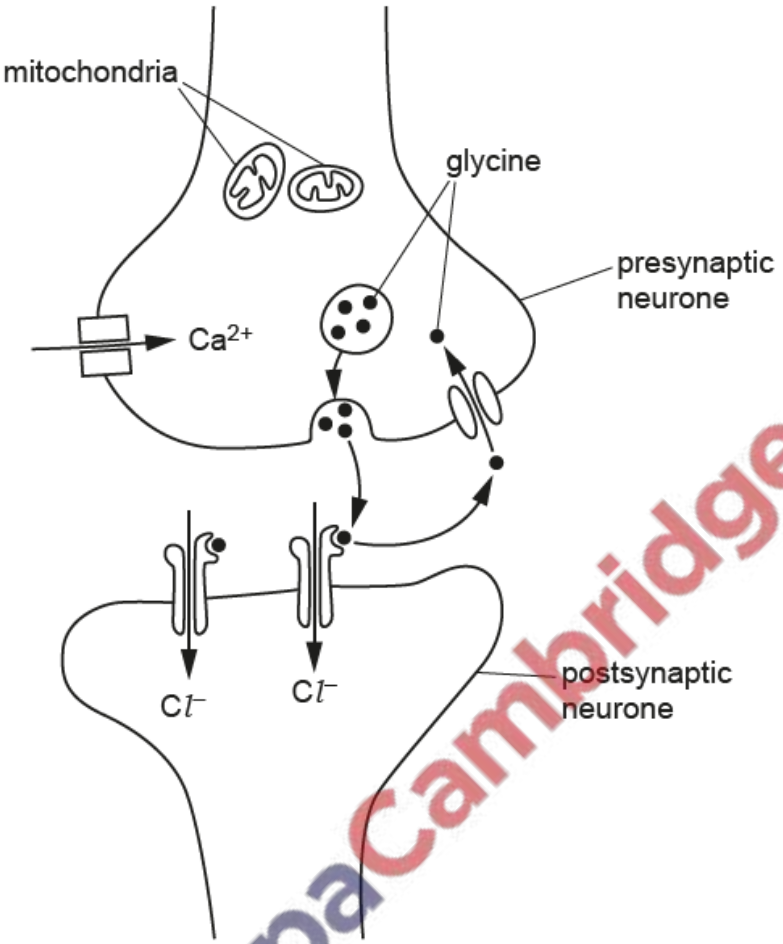


Fig. 7.2

(i) The glycinergic synapse and a cholinergic synapse use different neurotransmitters and different postsynaptic receptors.

Describe differences between the glycinergic synapse shown in Fig. 7.2 and a cholinergic synapse.

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..... [2]

(ii) The binding of glycine to receptors, as shown in Fig. 7.2, makes an action potential less likely to occur in the postsynaptic neurone.

Suggest why an action potential is less likely to occur after the binding of glycine to receptors.

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..... [2]

(iii) Neurones need to maintain a resting potential before an action potential can occur.

Describe how a neurone maintains a resting potential.

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..... [4]

[Total: 10]

3. June/2023/Paper_ 9700/41/No.9

Many factors affect the rate of cellular respiration.

(a) Pyruvate carboxylase (PC) deficiency is a rare disease. The rate of respiration in the cells of a person with PC deficiency is much lower than normal.

The passage describes the occurrence of PC deficiency in human populations.

Complete the passage by using the most appropriate scientific terms.

PC deficiency affects one in 250 000 people. A person either has the disease or does not, so there are no intermediate forms of the disease. PC deficiency is caused by a genetic mutation in one gene. Whether a person develops the disease is not influenced by ..... factors. The distribution of PC deficiency in human populations shows ..... variation. [2]

(b) Coenzymes are important in aerobic respiration.

Outline the roles of named coenzymes in aerobic respiration.

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..... [5]

[Total: 7]

(a) Glycolysis is a biochemical pathway that occurs in the cytoplasm of cells.

In glycolysis, a molecule of glucose is metabolised to two molecules of pyruvate. The process is outlined in Fig. 1.1.

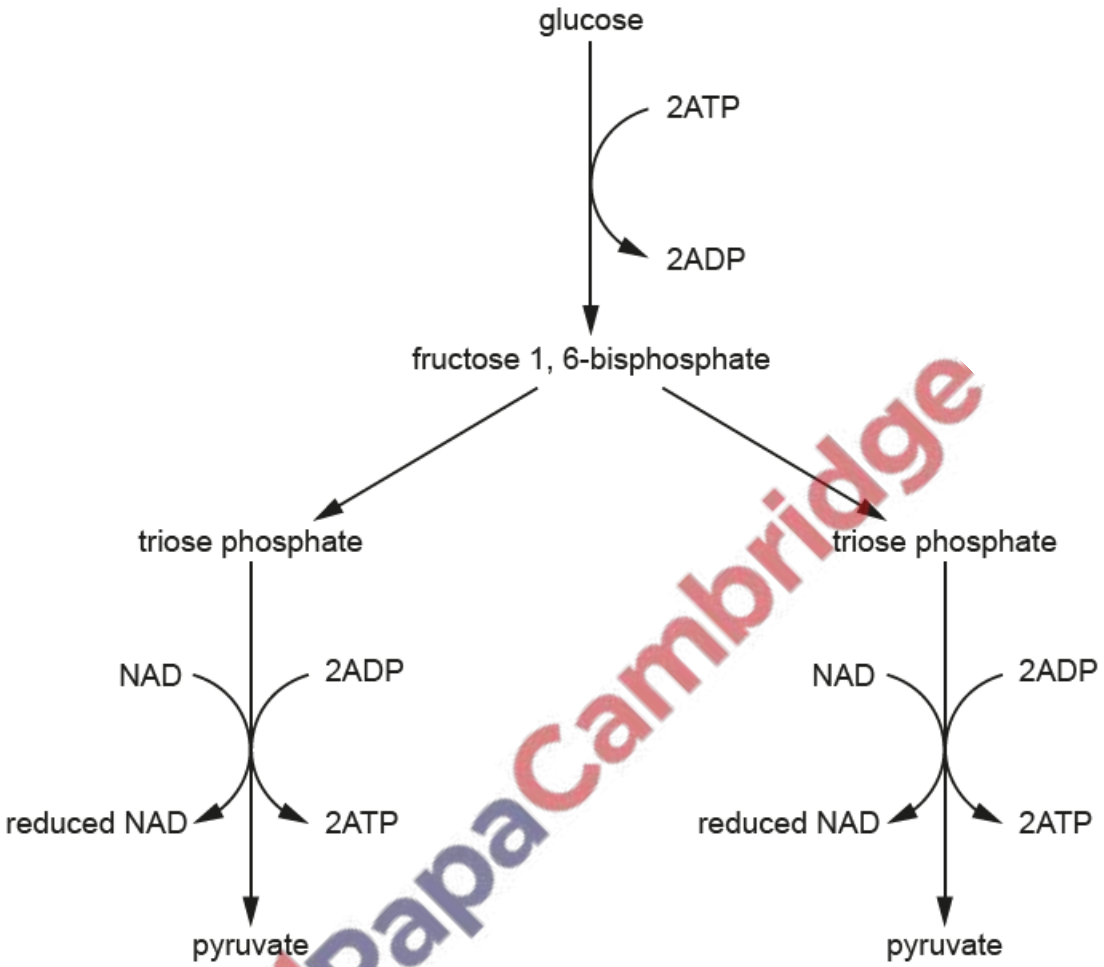

Fig. 1.1

(i) Explain why glucose is phosphorylated at the beginning of glycolysis.

.....

..... [1]

(ii) Suggest **one** use of the reduced NAD that is produced in glycolysis.

.....

..... [1]

(iii) Name the type of phosphorylation reaction by which ATP is made during glycolysis.

.....

..... [1]

(b) Pyruvate can enter the mitochondrion by active transport.

Describe the main conditions that are required for pyruvate to enter the mitochondrion by active transport.

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..... [3]

(c) Pyruvate is involved in the link reaction in the matrix of the mitochondrion.

Describe the link reaction.

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..... [3]

[Total: 9]

5. June/2023/Paper_ 9700/43/No.1

(a) The Krebs cycle was named after the biochemist Sir Hans Krebs, who worked out the sequence in 1937.

Fig. 1.1 is an outline of the Krebs cycle.

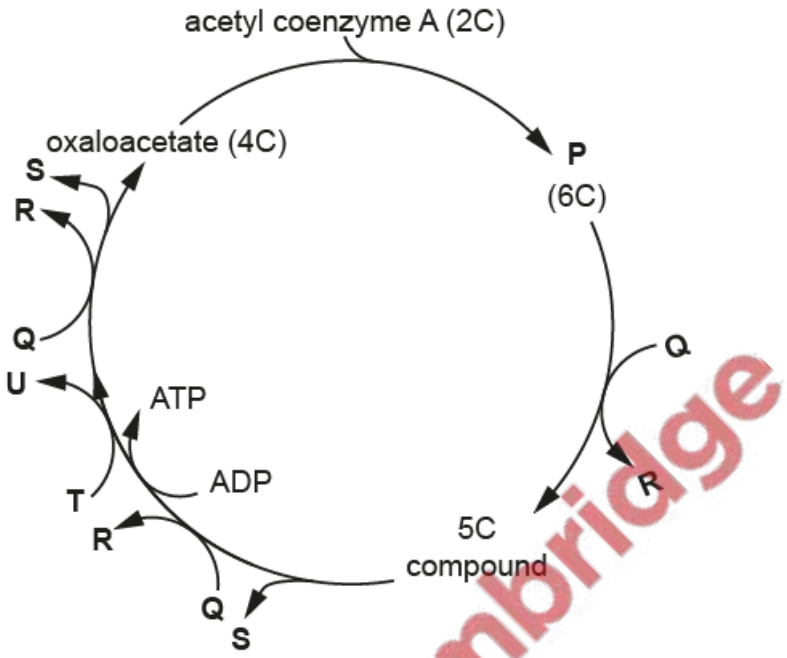

Fig. 1.1

Identify substances **P**–**U**.

P .....

Q .....

R .....

S .....

T .....

U .....

[3]

(b) Describe how ATP is produced from ADP in the Krebs cycle.

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..... [2]

(c) Describe **and** explain the features of ATP that make it suitable as the universal energy currency.

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..... [4]

[Total: 9]