1. Nov/2023/Paper_9700/41/No.7

When an impulse arrives at a neuromuscular junction, it stimulates a muscle fibre of striated muscle to contract.

(a) (i) Outline the **similarities** in structure between a neuromuscular junction and a cholinergic synapse.

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..... [4]

(ii) The hydrolysis of ATP during muscle contraction releases inorganic phosphate (P_i).

Calcium ions (Ca^{2+}) can combine with P_i in the sarcoplasmic reticulum to form insoluble calcium phosphate. This may result in fewer power strokes occurring in sarcomeres.

Suggest why calcium phosphate formation in the sarcoplasmic reticulum may result in fewer power strokes occurring in sarcomeres.

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..... [3]

(b) Adrenaline is a hormone that can affect muscle contraction. Adrenaline binds to G-protein-coupled receptors on T-tubule membranes.

The cell signalling pathway that occurs in response to the binding of adrenaline is similar to the pathway that occurs in liver cells in response to the binding of glucagon.

Fig. 7.1 is an outline of the cell signalling pathway of adrenaline.

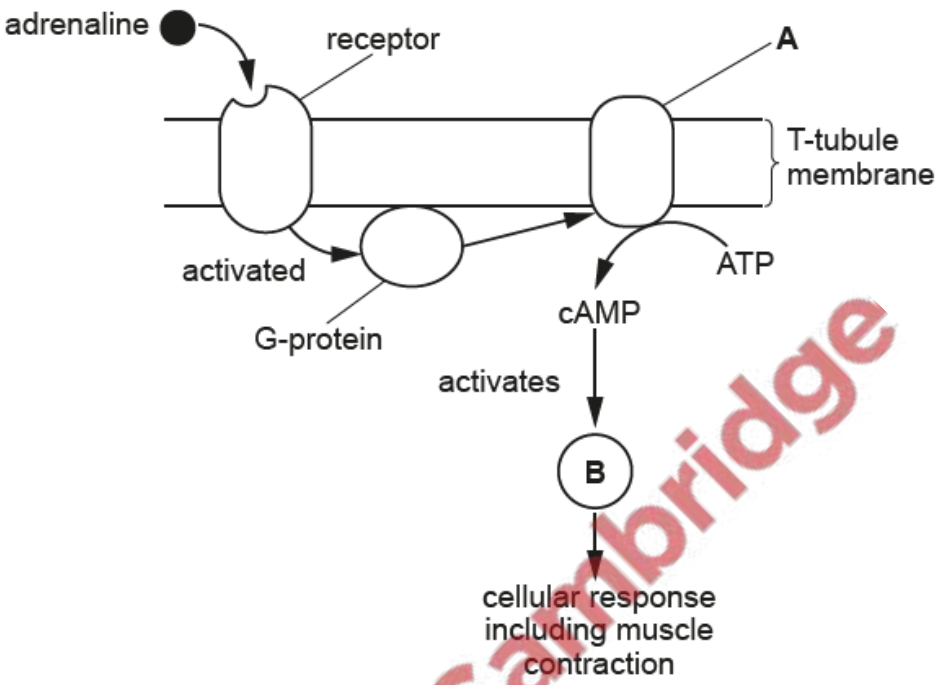

Fig. 7.1

Identify the molecules represented by **A** and **B** in Fig. 7.1.

A .....

B ..... [2]

[Total: 9]

(a) (i) When blood glucose concentration decreases, glucagon is released by the pancreas into the blood and is transported to the cells.

Fig. 6.1 outlines the effect of glucagon on liver cells.

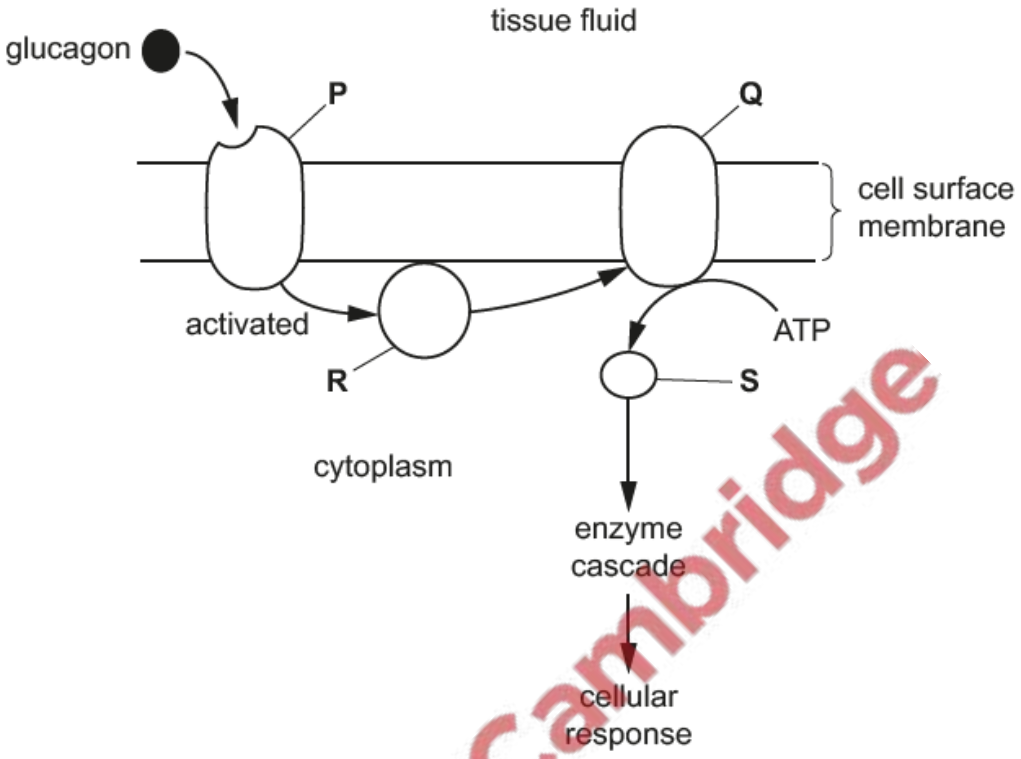

Fig. 6.1

Identify **P**, **Q**, **R** and **S** shown in Fig. 6.1.

P .....

Q .....

R .....

S .....

[4]

(ii) Table 6.1 shows four processes carried out by liver cells that are affected by a decrease in blood glucose concentration. Some of these are cellular responses from cell signalling by glucagon.

Complete Table 6.1 by stating whether the rate of each process **increases** or **decreases** when blood glucose concentration decreases.

Table 6.1

process	effect on rate of process when blood glucose concentration decreases
glycogenolysis (glycogen breakdown)	.....
glycogenesis (glycogen formation)	.....
glycolysis	.....
fatty acid synthesis	.....

[3]

(b) Type 2 diabetes is a condition affecting the homeostatic control of blood glucose concentration. In type 2 diabetes, target cells have a much lower response to insulin and some glucose is excreted in the urine.

Test strips can be used to measure the concentration of glucose in a sample of urine, but many people with type 2 diabetes measure blood glucose concentration using a biosensor.

Explain the principles of operation of a test strip for glucose **and** suggest advantages for a person with type 2 diabetes of using a biosensor instead of a test strip.

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[Total: 14]

3. Nov/2023/Paper_9700/42/No.9

(a) Antidiuretic hormone (ADH) is involved in the maintenance of a constant blood water potential.

A student drank 0.5 dm^3 of water and the concentration of ADH in their blood was measured every 30 minutes for 3 hours.

Fig. 9.1 shows the results of this investigation.

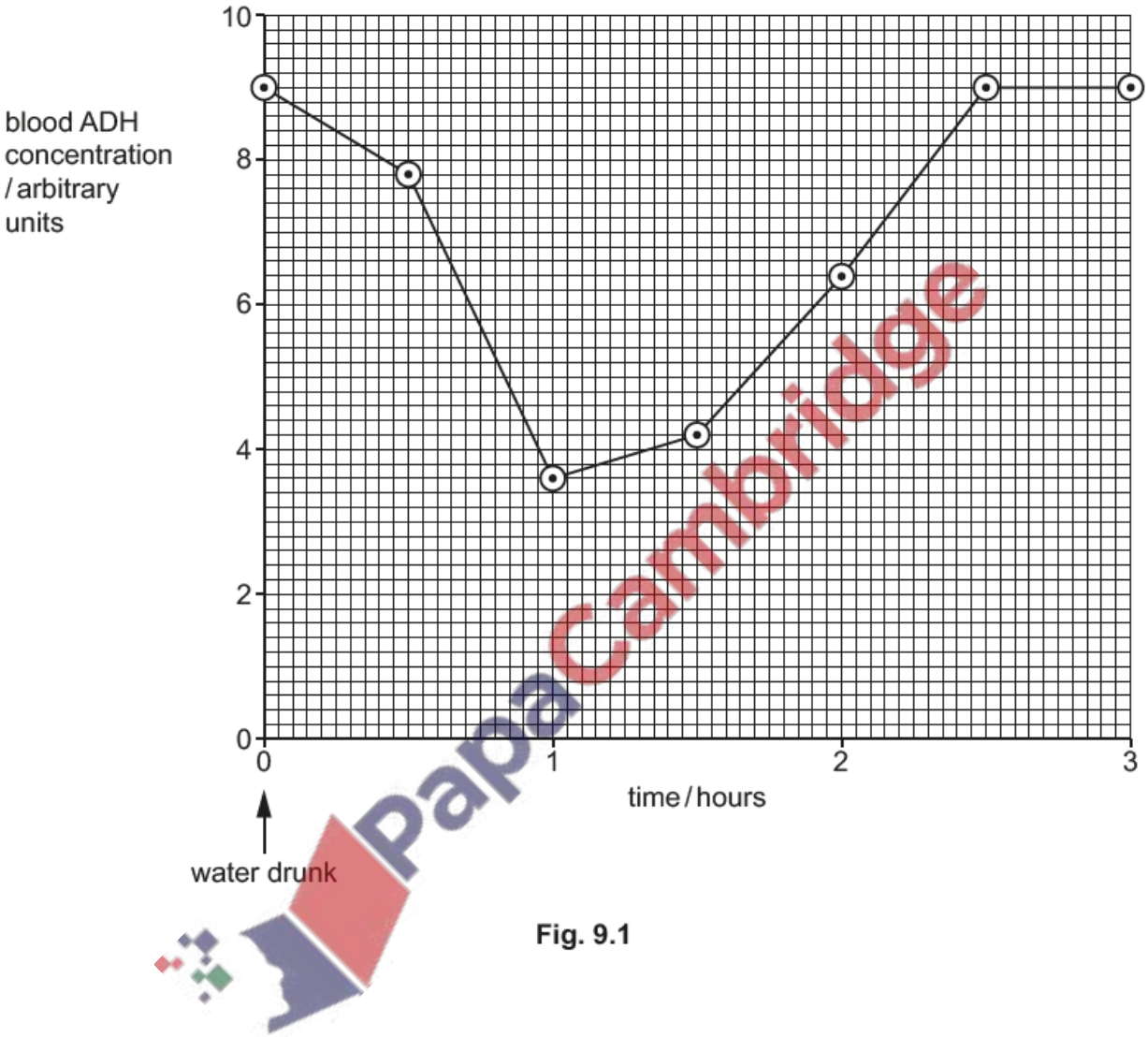

Fig. 9.1

Explain the results shown in Fig. 9.1.

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(b) Outline the differences between the endocrine system and the nervous system.

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[Total: 8]