

- 20 (a) Fig. 20.1 is a flow diagram that shows the sequence of events in the body once a threat is perceived. The response is often described as the ‘fight or flight’ response as it prepares the body to respond physically to the threat in the short-term.

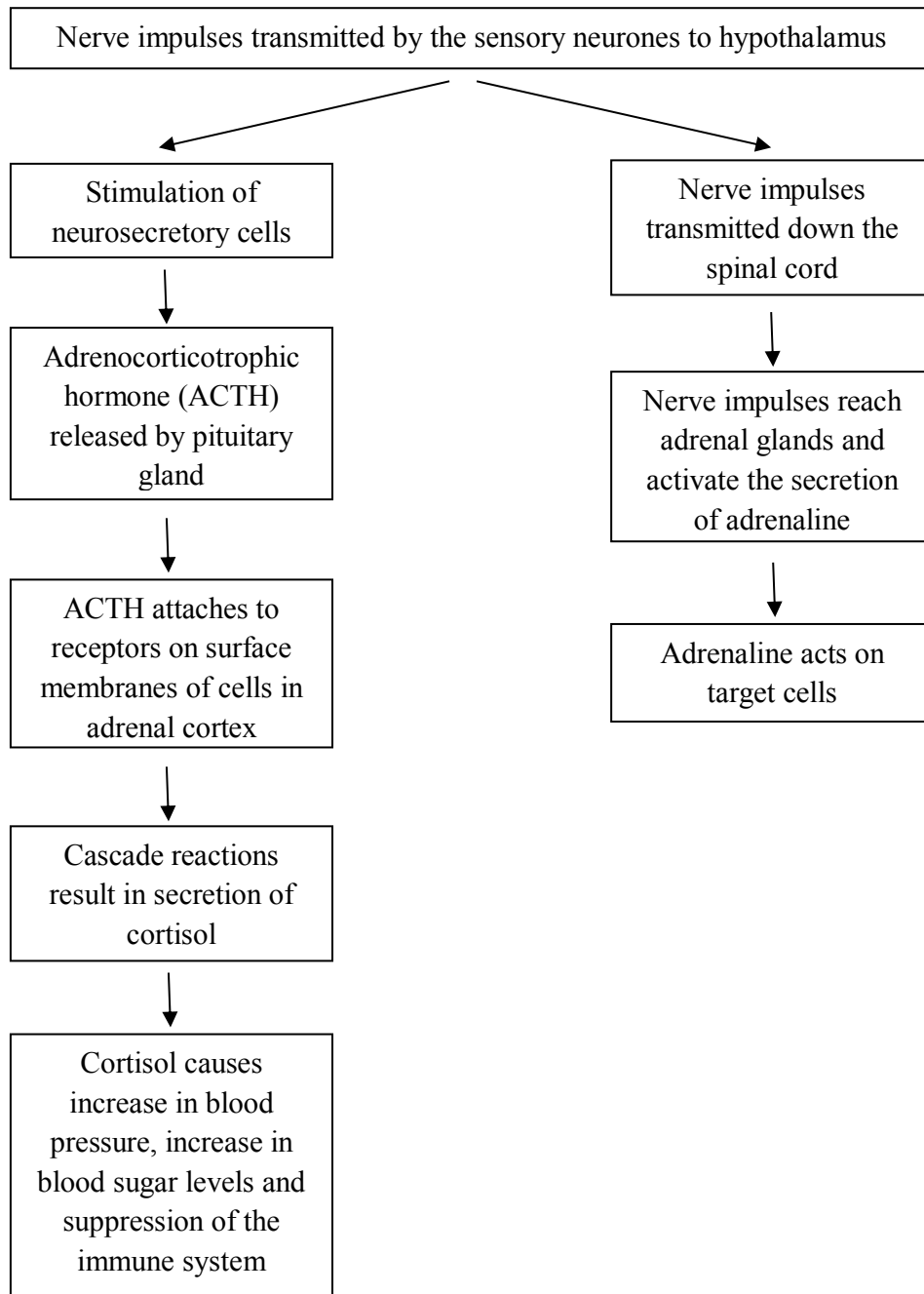


Fig. 20.1

- (i) Identify **two** signalling molecules named in Fig. 20.1.

1.....

2.....

[1]

(ii) Adrenaline acts on a variety of cell types with a variety of responses.

Complete the table by stating the effects of stimulating each target cell. The first one has been completed for you.

Target cell	Response	Role in the 'fight or flight' response
Smooth muscle in bronchioles	Muscle relaxes	Bronchioles dilate and allow more oxygen to reach blood
Sino-atrial node		
Liver cell		
Erector muscle in skin		

[6]

(iii) Describe the sequence of actions that occur once adenylyl cyclase is activated in the target liver cells.

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..... [2]

(iv) The response in **Fig. 20.1** also occurs when a person is subjected to stress. However, the body does not need to respond physically to the stimulus and so, for example, the bronchioles do not dilate.

From the information given and your own knowledge, suggest the long term adverse effects of continued exposure to stress on body function.

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..... [2]

- (b) Part of the body's response 'fight or flight' is to run away from the threat. Prolonged vigorous exercise puts high demands on the body's metabolism.

The muscle cells require an adequate supply of oxygen for respiration. If insufficient oxygen is available, the cells must respire anaerobically.

Fig. 20.2 outlines the process of anaerobic respiration in muscle cells.

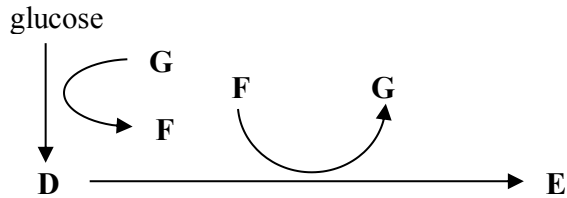


Fig. 20.2

- (i) Identify the compounds labelled **D** and **E** in Fig. 20.2.

D.....

E.....

[2]

- (ii) What is the role of compound **D** in anaerobic respiration?

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..... [1]

- (iii) Why is it important that compound **G** is formed during the reaction in which compound **D** is converted into compound **E** in anaerobic respiration?

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.....

..... [2]

- (iv) Compound **E** is toxic and is removed from the muscle cell. It is transported to an organ in the body.

Which organ is compound **E** transported to **and** how does it reach this organ?

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..... [1]

- (c) Athletic sprinters require large amounts of energy in short periods of time. Many elite sprinters can run 100 metre races in under 10 seconds.

Under normal conditions, exercise requires an increased rate of breathing. It has been observed that some of the best sprinters only take one breath at the start of the race and do not inhale again until the end of the race.

Suggest how these sprinters can expend so much energy without needing to carry out aerobic respiration.

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..... [2]

END OF QUESTION PAPER