The blink reflex can be affected by anaesthetics. Local anaesthetics are used to stop people feeling pain but do not make them unconscious. General anaesthetics make people unconscious and stop them feeling pain.

Doctors investigated two ways of measuring the effect of general anaesthetics.

They gave:

•        anaesthetic **S** to 18 people

•        anaesthetic **Q** to 29 people

They recorded how long it took for the people to stop blinking.

The doctors then repeated the investigation. This time, they used a machine that measures brain activity to decide when a person was unconscious, rather than when blinking stopped. For each person, they recorded how long it took for the machine’s readings to show that the person was unconscious.

Their results are shown in the table. A value of ±2 × SD from the mean includes over 95% of the data.

|  |  |  |
| --- | --- | --- |
| **Anaesthetic** | **Mean time taken to stop blinking / minutes (±2 × SD)** | **Mean time taken for machine to show that person was unconscious / minutes (±2 × SD)** |
| **S** | 0.24 (±0.01) | 0.48 (±0.11) |
| **Q** | 0.28 (±0.02) | 0.44 (±0.07) |

(a)     Blinking involves cholinergic synapses. Anaesthetic **S** is a similar shape to acetylcholine. Suggest how anaesthetic **S** stops the transmission across the synapse.

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**(3)**

(b)     Should time taken to stop blinking be used as an indicator of when to start surgery?

Explain your answer.

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**(2)**

(c)     Each person was given the same volume of anaesthetic per kg of body mass.

Suggest why.

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**(1)**

**(Total 6 marks)**

**Mark Scheme**

(a)     1.      Complementary to receptor for acetylcholine;

2.      Binds to receptor;

3.      On postsynaptic (membrane);

4.      Prevents acetylcholine from binding;

5.      No action potential in postsynaptic neurone;

*2. Accept description of ‘binds’*

*3. Must be in context of membrane*

*5. Accept ‘depolarisation’ but not ‘impulse’*

**3 max**

(b)     1.      Takes longer to become unconscious than it does to stop blinking;

2.      No overlap of standard error;

*1. Accept reference to 0.24/0.28 and 0.48/0.44 in place of longer*

**2**

(c)     Different body masses but need to have comparable effects;

*Do not accept ‘same’ effects or unqualified references to ‘bias / comparison / fair test’.*

**1**

**[6]**

**Examiner report**

This question was generally well answered. Some students failed to gain marks because they confused enzyme terminology, e.g. active site, with specialist language relevant to a molecule binding to a receptor. Some students were unclear about the location of the receptor. Others came close to stating that there would be no action potential in the postsynaptic membrane but did not write an answer that was sufficiently clear to gain credit for that marking point.