C2.2 Neural signalling (HL)

What the Cell · DP Biology · worksheet · HL statements C2.2.8–16

Name _____ **Date** _____ **Total** _____ / 40

About 40 minutes, or one section at a time. The number of marks shows how many separate points to make.

Section A: Recall

8 marks

1 **State** the approximate threshold potential of a neuron. C2.2.8 **[1]**

2 **State** the ion that enters the axon during depolarization. C2.2.8 **[1]**

3 **Name** one inhibitory neurotransmitter. C2.2.13 **[1]**

4 **State** where ion channels are concentrated in a myelinated axon. C2.2.11 **[1]**

5 **Outline** why consciousness is described as an emergent property. C2.2.16 **[2]**

6 **State** two stimuli that open the ion channels of pain receptors. C2.2.15 **[2]**

Section B: Understanding

16 marks

7 **Explain** how voltage-gated channels cause depolarization and repolarization. C2.2.8 **[4]**

8 **Explain** how local currents propagate an action potential along an axon. C2.2.9 **[3]**

9 **Explain** how neonicotinoids affect synapses in insects. C2.2.12 **[3]**

10 **Explain** how an inhibitory neurotransmitter produces an inhibitory postsynaptic potential. C2.2.13 **[3]**

11 **Explain** how summation decides whether a postsynaptic neuron fires. C2.2.14 **[3]**

Section C: Working with evidence

10 marks

All data in this section are invented for practice. The patterns are realistic.

12 C2.2.11, C2.2.9

The speed of nerve impulses was measured in axons of different diameters at 37 °C.

Axon diameter / μm	1	2	5	10	15	20
Myelinated: speed / m s^{-1}	6	12	30	60	90	120
Unmyelinated: speed / m s^{-1}	1.0	1.4	2.2	3.2	3.9	4.5

a **Describe** the relationship between diameter and speed in myelinated axons. **[2]**

b **Calculate** how many times faster a myelinated axon is than an unmyelinated one, at 10 μm. **[1]**

c **Explain** the difference in speed between myelinated and unmyelinated axons. **[2]**

d **Calculate** the time an impulse takes to travel 1.5 m along a myelinated axon 15 μm wide. Give your answer in ms. **[2]**

e **Suggest** why squid, which have no myelin, have axons up to 1 mm wide that control escape. **[2]**

f **State** why the temperature was kept the same. **[1]**

Section D: Longer answer

6 marks

13 **Explain** how touching a hot surface leads to the perception of pain. C2.2.15, C2.2.8 **[6]**