

**A Level Biology A**  
**H420/01 Biological Processes**

**Question Set 13**

- 13 (a) (i)** The greater blue-ringed octopus, *Hapalochlaena lunulata*, is one of the most venomous of all animals.
- Its bite contains tetrodotoxin (TTX), a neurotoxin that can cause paralysis and death within minutes.
- The following information has been discovered about the effects of TTX on nerve cells:
- TTX binds to the external surface of the voltage-gated sodium ion channels in the axon membrane.
- Binding of TTX changes the tertiary structure of the channel. This means the channel cannot open.
- Using the information provided, explain how TTX affects the activity of neurones. **[4]**
- 13 (a) (ii)** A common cause of death from TTX poisoning is suffocation (not getting enough oxygen) as a result of paralysis of the diaphragm.
- Explain how paralysis of the diaphragm could lead to suffocation. **[2]**
- 13 (a) (iii)** The greater blue-ringed octopus, *Hapalochlaena lunulata*, is one of the most venomous of all animals.
- Its bite contains tetrodotoxin (TTX), a neurotoxin that can cause paralysis and death within minutes.
- TTX is also known to reduce the speed of conduction in the Purkyne fibres of the heart.
- Suggest and explain what effect this would have on the heart rate. **[3]**
- 13 (b)** Molluscs such as *H. lunulata* have unmyelinated neurones. Saltatory conduction cannot occur in these neurones.
- Suggest why transmission of action potentials along the axon is slower in molluscs than in mammals? **[1]**

**Total Marks for Question Set 13: 10**

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