

Edexcel (A) Biology A-level

8.1 + 8.3 - Nervous Transmission

Flashcards

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Describe the features of all neurons.



Describe the features of all neurons.

Cell body: contains organelles & high proportion of RER.

Dendrons: branch into dendrites which carry impulses towards cell body.

Axon: long, unbranched fibre carries nerve impulses away from cell body.



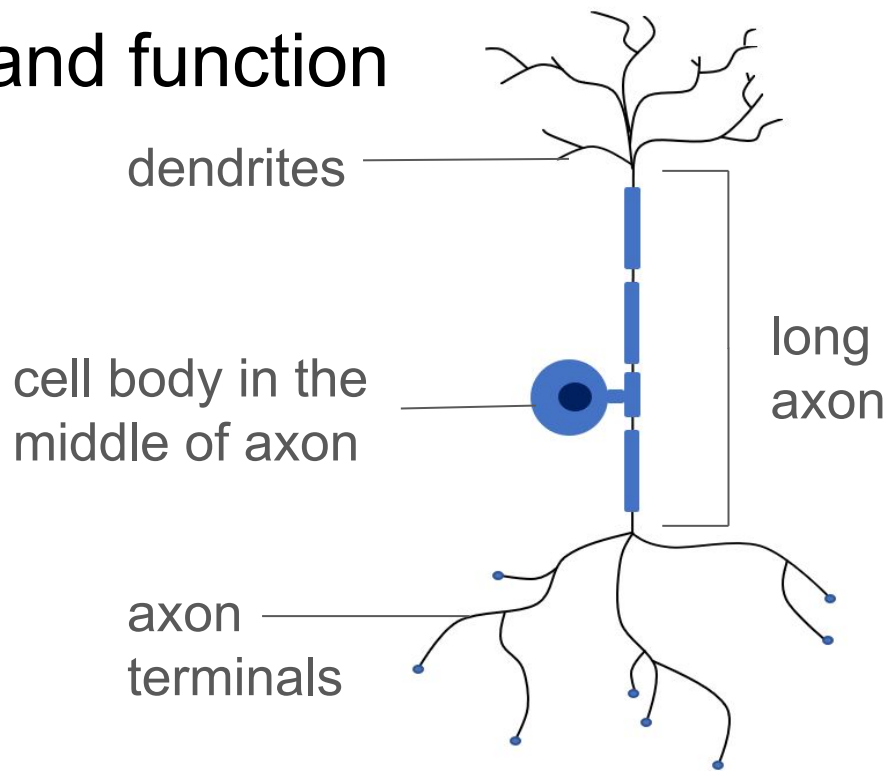
Describe the structure and function of a sensory neuron.



Describe the structure and function of a sensory neuron.

Usually unipolar.

Transmits impulses from receptors to CNS.



Describe the structure and function of a relay neuron.



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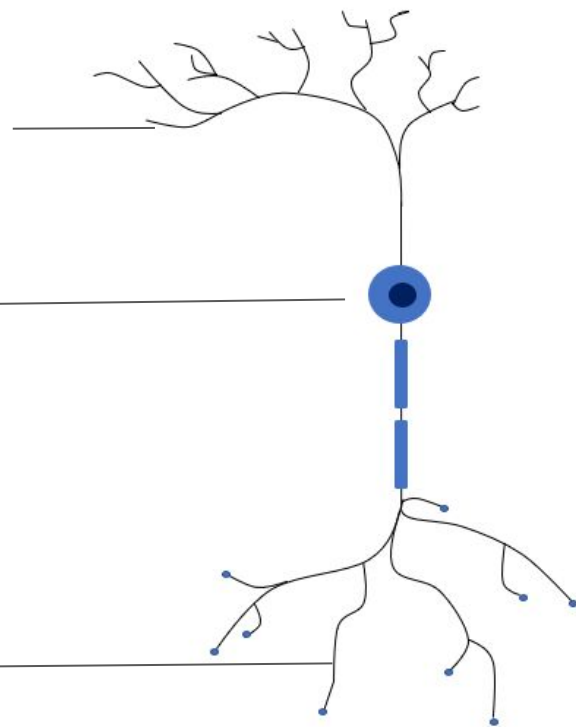
Usually bipolar.

Transmits impulses between neurons.

highly branched dendrites

cell body

highly branched axon terminals



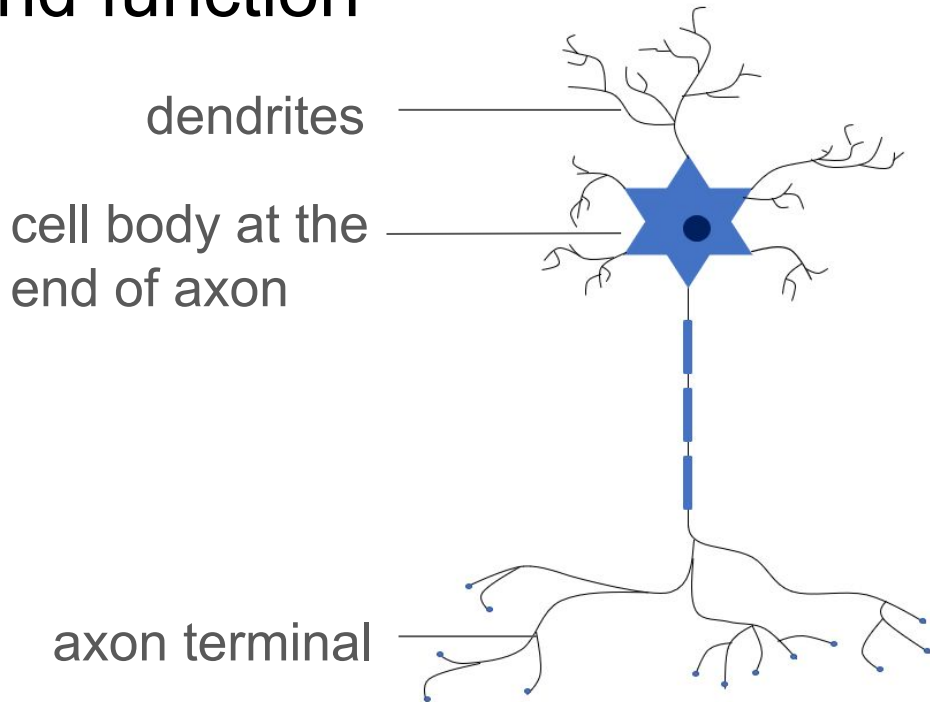
Describe the structure and function of a motor neuron.



Describe the structure and function of a motor neuron.

Usually multipolar.

Transmits impulses from relay neurons in the CNS to effectors.



Describe the additional features of a myelinated neuron.



Describe the additional features of a myelinated neuron.

Schwann cells: wrap around axon many times.

Myelin sheath: made from myelin-rich membranes of Schwann cells.

Nodes of Ranvier: very short gaps between neighbouring Schwann cells where there is no myelin sheath.



Name 3 processes Schwann cells are involved in.



Name 3 processes Schwann cells are involved in.

- Electrical insulation
- Phagocytosis
- Nerve regeneration



How does an action potential pass along
an unmyelinated neuron?



How does an action potential pass along an unmyelinated neuron?

1. Stimulus leads to influx of Na^+ ions. First section of membrane depolarises.
2. Local electrical currents cause sodium voltage-gated channels further along membrane to open. Meanwhile, the section behind begins to repolarise.
3. Sequential wave of depolarisation.



Explain why myelinated axons conduct impulses faster than unmyelinated axons.



Explain why myelinated axons conduct impulses faster than unmyelinated axons.

Saltatory conduction: Impulse 'jumps' from one node of Ranvier to another. Depolarisation cannot occur where myelin sheath acts as electrical insulator.

So impulse does not travel along whole axon length.



What is resting potential?



What is resting potential?

Potential difference (voltage) across neuron membrane when not stimulated (-50 to -90 mV, usually about -70 mV in humans).



How is resting potential established?



How is resting potential established?

1. Membrane is more permeable to K^+ than Na^+ .
2. Sodium-potassium pump actively transports $3Na^+$ out of cell & $2K^+$ into cell.

Establishes electrochemical gradient: cell contents more negative than extracellular environment.



Name the stages in generating an action potential.



Name the stages in generating an action potential.

1. Depolarisation
2. Repolarisation
3. Hyperpolarisation
4. Return to resting potential



What happens during depolarisation?



What happens during depolarisation?

1. Stimulus → facilitated diffusion of Na^+ ions into cell down electrochemical gradient.
2. p.d. across membrane becomes more positive.
3. If membrane reaches threshold potential (-50mV), voltage-gated Na^+ channels open.
4. Significant influx of Na^+ ions reverses p.d. to $+40\text{mV}$.



What happens during repolarisation?



What happens during repolarisation?

1. Voltage-gated Na^+ channels close and voltage-gated K^+ channels open.
2. Facilitated diffusion of K^+ ions out of cell down their electrochemical gradient.
3. p.d. across membrane becomes more negative.



What happens during hyperpolarisation?



What happens during hyperpolarisation?

1. 'Overshoot' when K^+ ions diffuse out = p.d. becomes more negative than resting potential.
2. Refractory period: no stimulus is large enough to raise membrane potential to threshold.
3. Voltage-gated K^+ channels close & sodium-potassium pump re-establishes resting potential.



What is the 'all or nothing' principle?



What is the 'all or nothing' principle?

Any stimulus that causes the membrane to reach threshold potential will generate an action potential.

All action potentials have same magnitude.



Name the factors that affect the speed of conductance.



Name the factors that affect the speed of conductance.

- Myelin sheath
- Axon diameter
- Temperature



How does axon diameter affect the speed of conduction?



How does axon diameter affect the speed of conductance?

Greater diameter = faster

- Less resistance to flow of ions (depolarisation & repolarisation).
- Less 'leakage' of ions (easier to maintain membrane potential).

