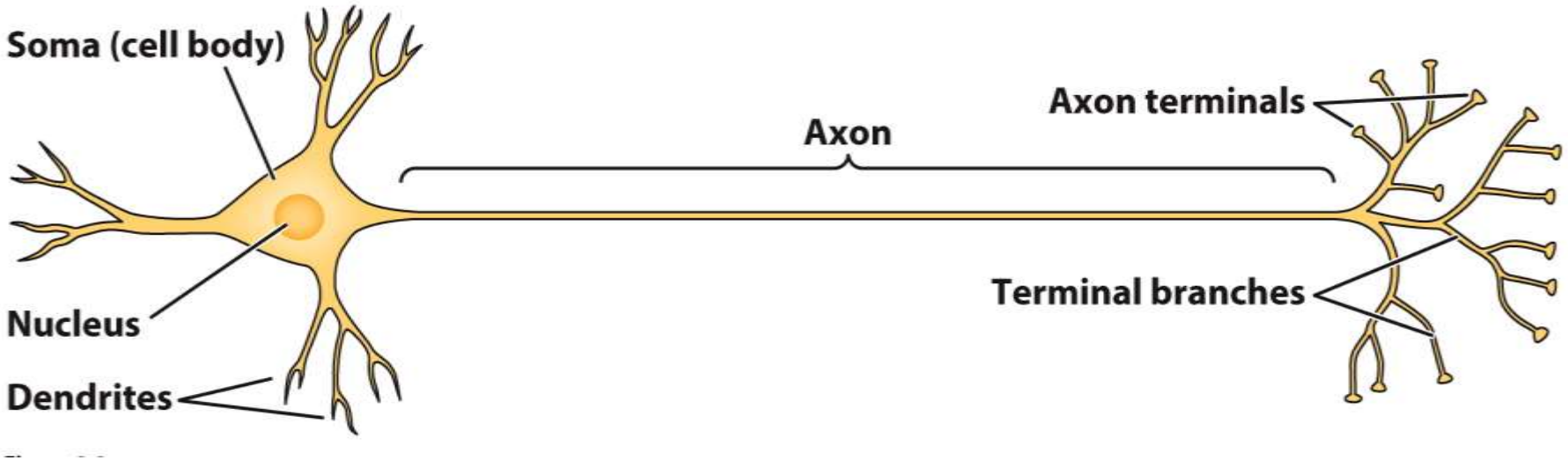
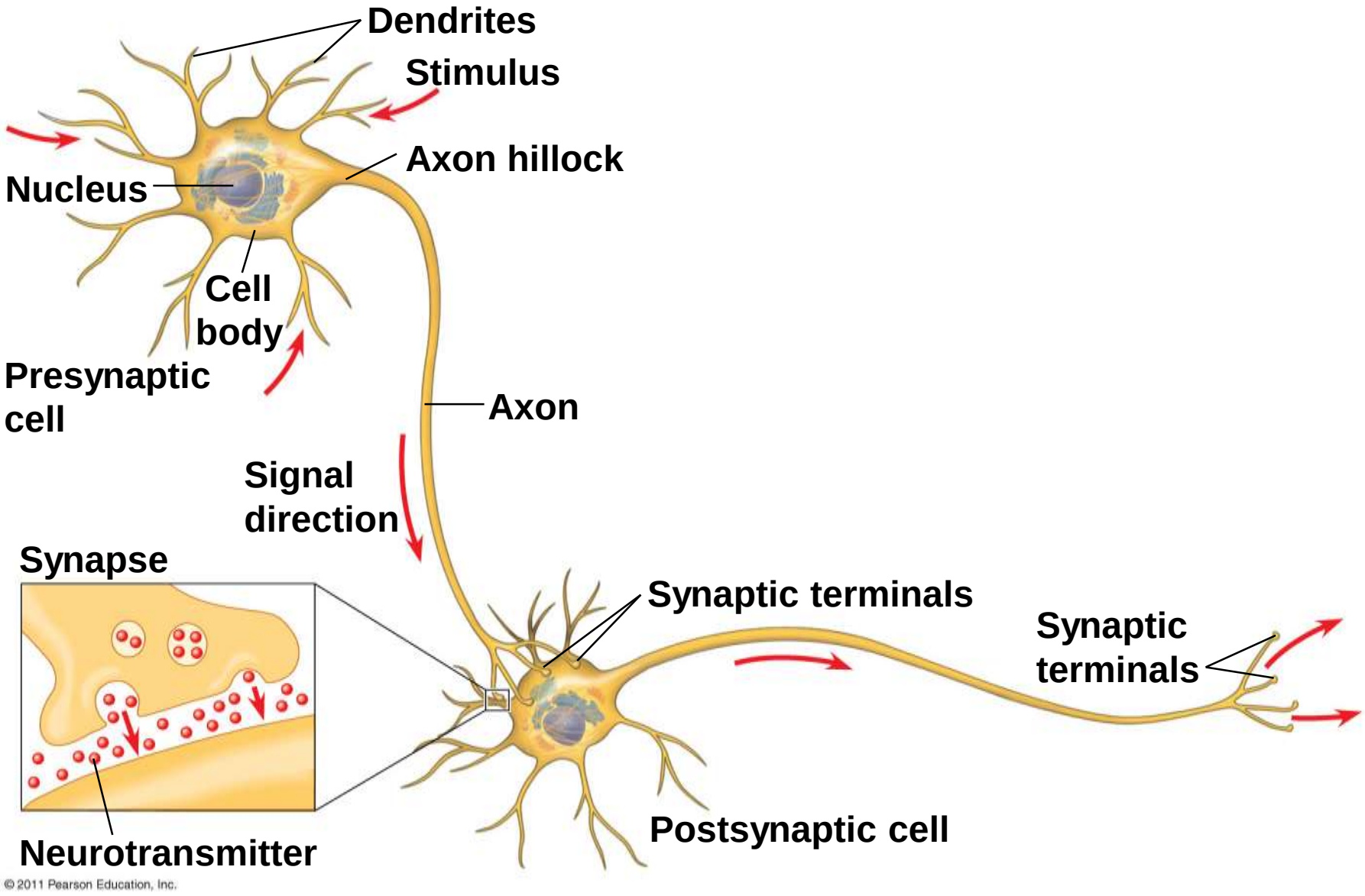
Neurophysiology

Structure of neuron

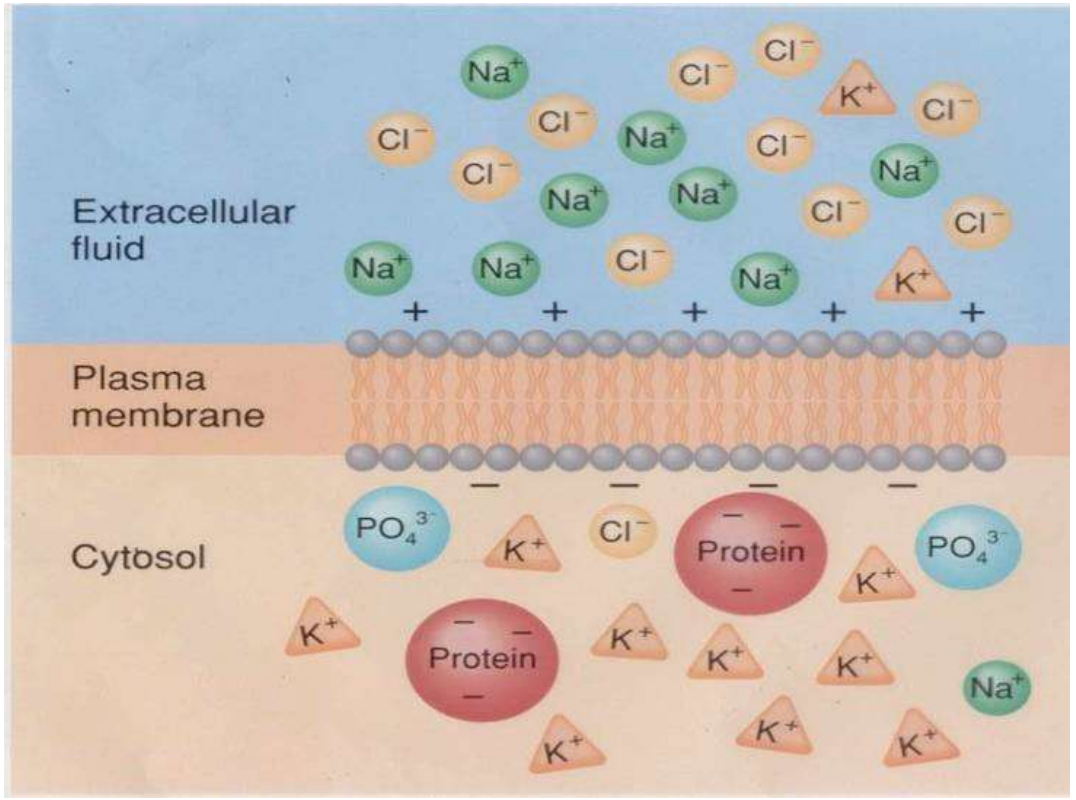


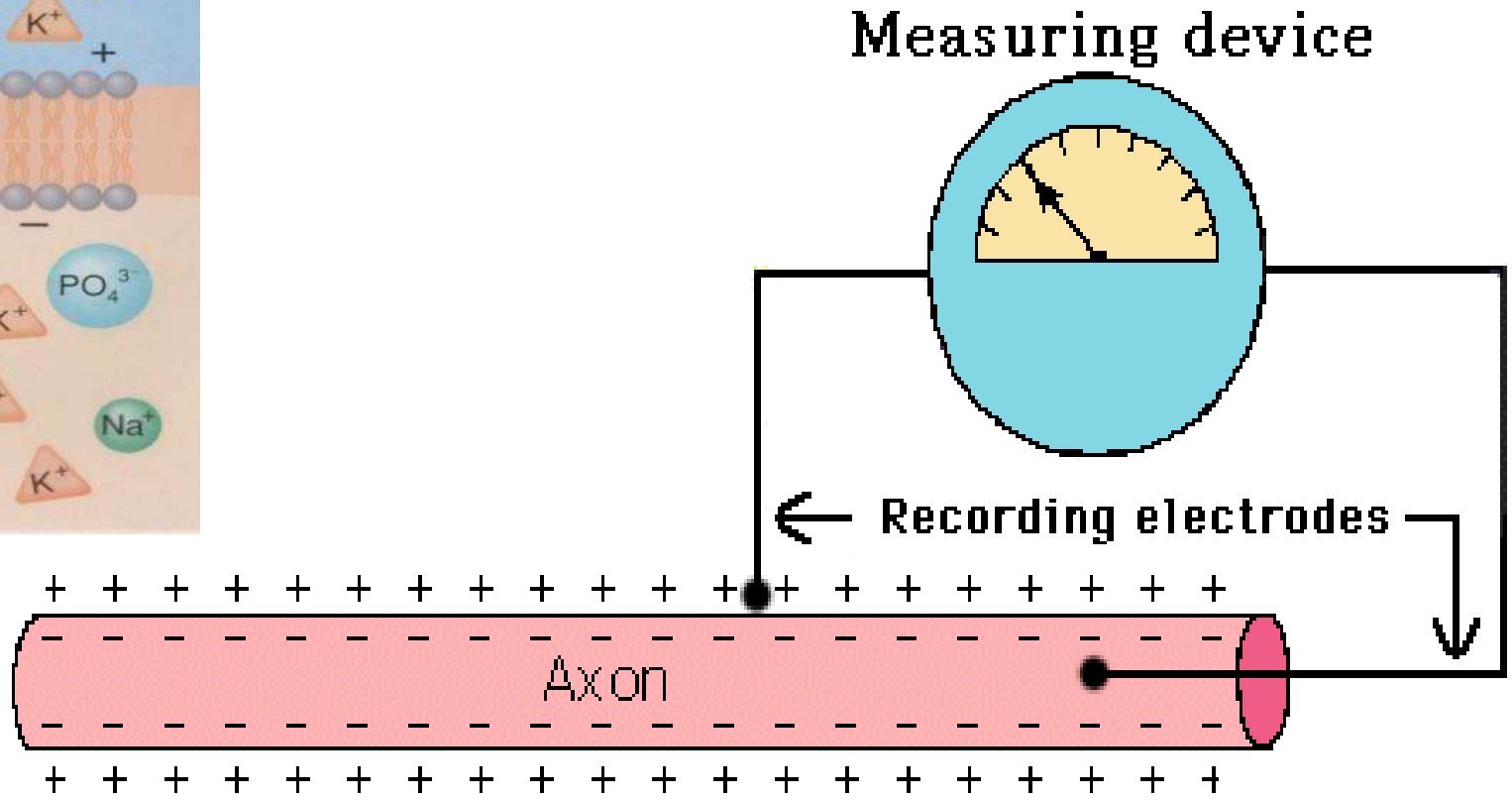
- Most of a neuron's organelles are in the **cell body**
- Most neurons have **dendrites**, highly branched extensions that *receive* signals from other neurons
- The **axon** is typically a much longer extension that transmits signals to other cells at synapses
- The cone-shaped base of an axon is called the **axon hillock**

Neuron – neuron synapse



Resting potential





- Cell's "resting membrane potential" is **-70mV**
- There is 30 times more **K+ inside** the cell than outside and about 15 times more **Na+ outside** than inside.

- There are also **large negatively** charged proteins trapped inside the cell.
- Special protein channels called **sodium-potassium pumps** moving **3** Na+ out and bringing **2** K+ back in, when the cell is at **rest**.

- In a **resting** cell there are **no** open channels for Na+ to easily move back into the cell. However, there are **some K+ channels open at all time**.
- Na+ causes the outside to be positive forcing more K+ into the cell. (Lots of potassium ions inside the resting cell.)

Depolarization

- There are sodium channels in our membrane. They **open** when we need to depolarize the membrane.
- This allows Na+ to rush **in** which makes the inside of the cells less **negative.**
- Cells depolarize to **+30mV** (when Na+ is at equilibrium with itself, there is still an excess of K+)
- Sodium ions rush into the neuron because of diffusion forces (high to low) and charge attraction (+ and -).
- The charge inside the cell eventually reaches about +30mV. (Relative to the outside of the cell the inside is now positive and the outside is negative.) At this point the sodium ion channels close.
- This change in polarization (- inside to +) is called depolarization

Repolarization

- K+ channels open slowly so that when the Na+ channels close, the K+ channels are fully open (**repolarization**). System resets when K+ channels close.