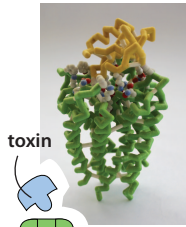
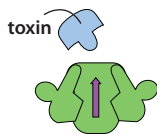
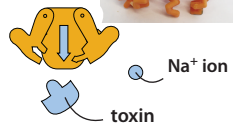


Sodium channel

- Transports sodium ions into the cell, depolarizing the membrane, initiating an action potential

- Tetrodotoxin** (from pufferfish) blocks the transport of sodium ions, and thus inhibiting an action potential



Potassium Channel

- Transports potassium ions out of the cell, repolarizing the membrane

- Scorpion toxins** and **tarantula toxins** block the transport of potassium ions, thus inhibiting action potential

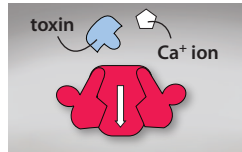
- Some potassium channels are not gated (leaky), but are open, allowing potassium ions to flow in the direction of the concentration gradient

Calcium Channel

- Voltage-gated calcium channels are activated when an action potential, moves calcium ions into the cell

- Calcium is necessary for vesicular fusion required for neurotransmitter release

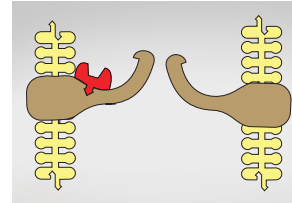
- Inhibited by the **cone snail toxin**



SNAP/SNARE proteins

- Present in the vesicle and neuronal membranes

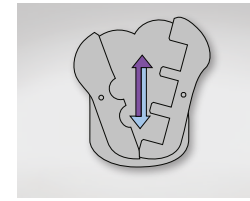
- The influx of calcium ions triggers conformational changes enabling vesicle fusion with neuron membrane, releasing neurotransmitters into synapse



Sodium/Potassium ATP Pump

- Active transport of sodium and potassium to re-establish gradient

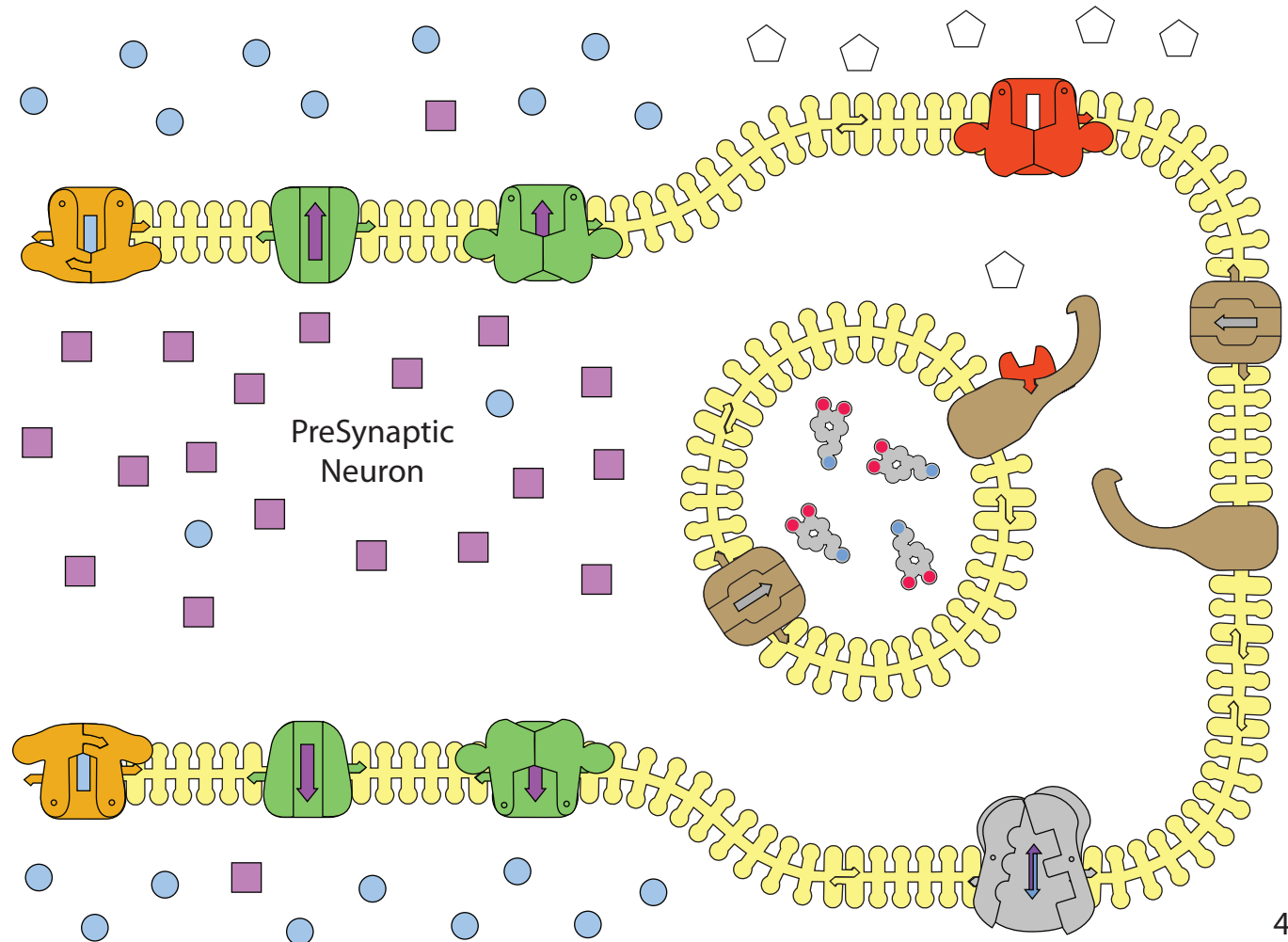
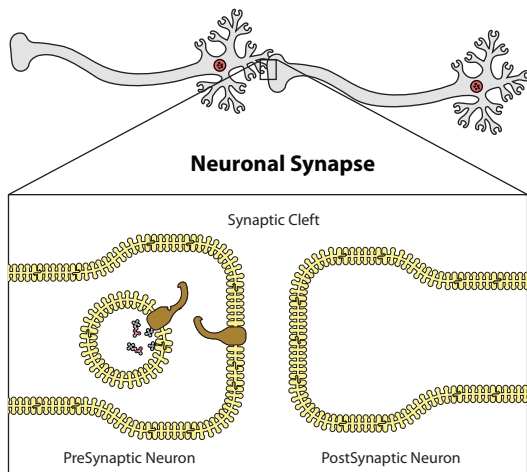
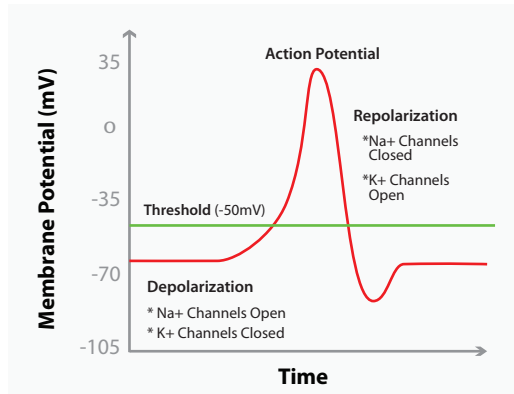
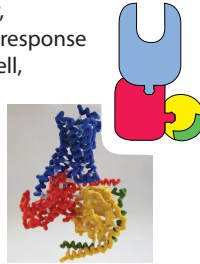
- 3 sodium ions are pumped out of the cell in exchange for 2 potassium ions

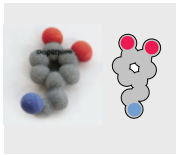


Dopamine Receptor

- A G protein coupled receptor on post synaptic neuron
- Triggers reaction in cell based on G protein coupled to receptor

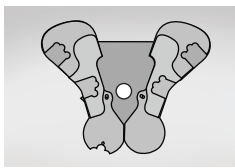
- Dopamine binds to the receptor, triggering a response within the cell, depending on the G protein coupled to receptor





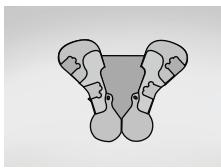
Dopamine

- Neurotransmitter, a chemical messenger
- Binds to dopamine receptor on post synaptic receptor
- Recycled through dopamine transporter



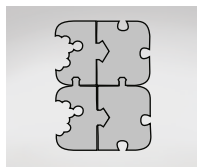
NMDA Receptor

- N-methyl-D-aspartate receptor
- Ionotropic receptor activated by glutamate and glycine (or D-serine)
- Nonselective cation channel allowing the passage of Na^+ , K^+ and Ca^{2+}



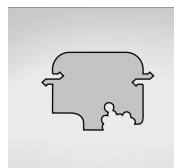
AMPA Receptor

- α -amino-3-hydroxy-5-methyl-4-isoxazole-propionic acid receptor
- Ionotropic glutamate activated receptor
- Nonselective cation channel allowing the passage of Na^+ , K^+ and Ca^{2+}



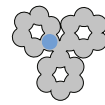
Adenylyl Cyclase

- membrane bound enzyme
- Catalyzes the conversion of adenosine triphosphate (ATP) to cyclic adenosine monophosphate (cAMP)



Protein Kinase A

- Enzyme activated by cAMP
- One of its many cellular functions includes phosphorylation of the NMDA receptor



PCP

- Phencyclidine (angel dust)
- Binds to and blocks the activity of the NMDA receptor (antagonist)



Ketamine

- Appears to inhibit the NMDA receptor by binding both in the open channel and at an allosteric site
- One of the "date rape" drugs

Neurotransmitters - chemical messengers



Glycine

- Binds to two of the GluNI subunits of the NMDA receptor



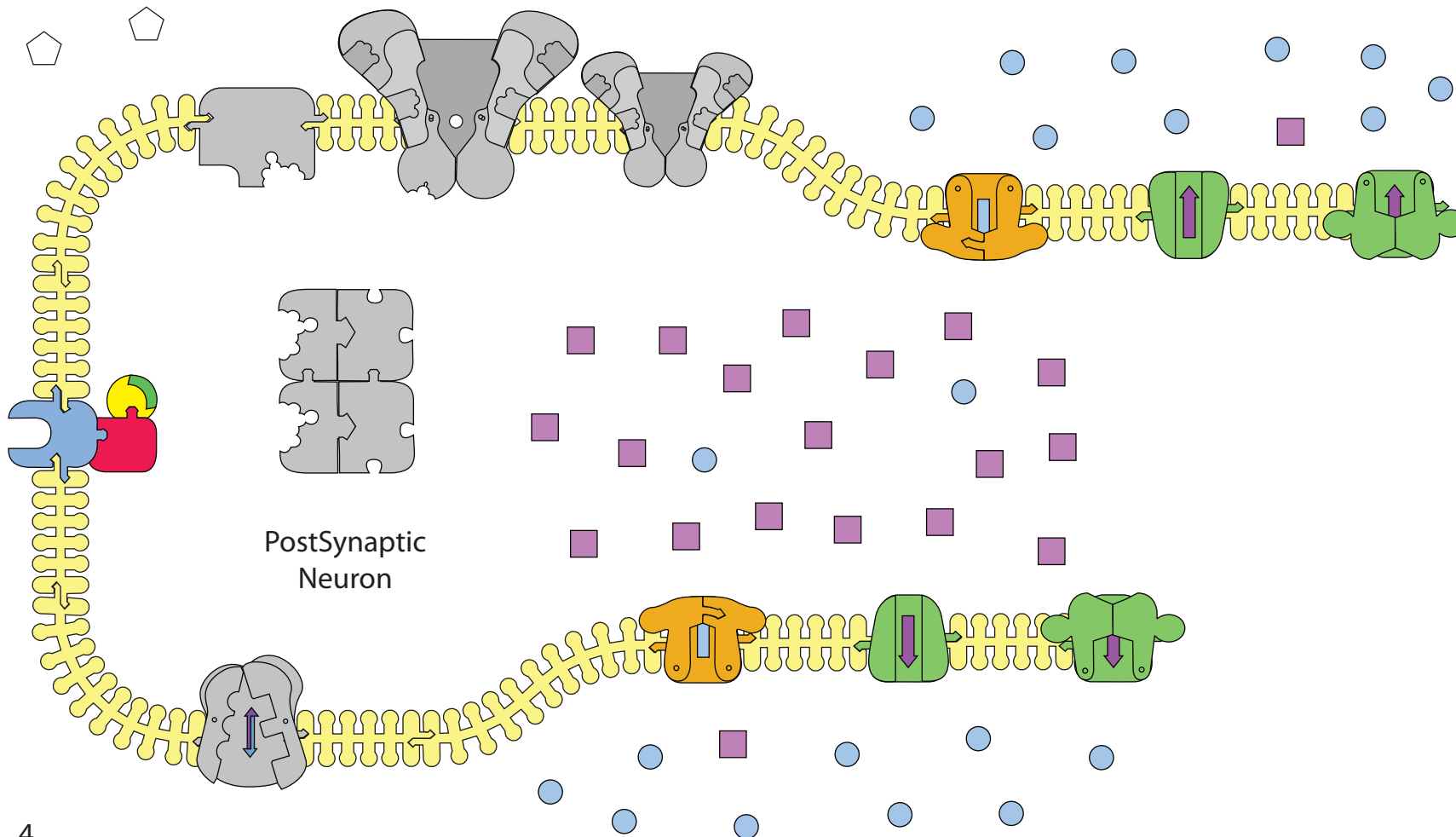
Glutamate (Glutamic Acid)

- Binds to two of the GluN2 subunits of the NMDA receptor and may bind to each of the four subunits of the AMPA receptor

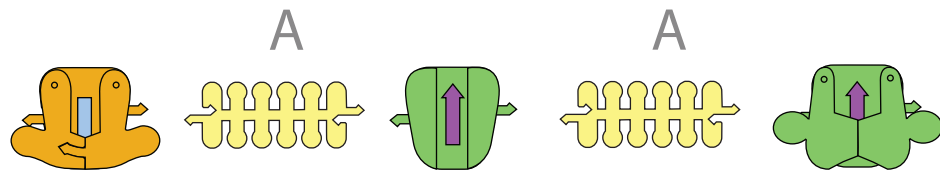
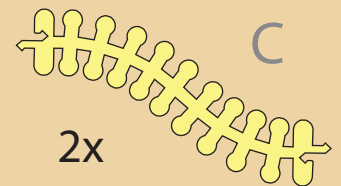
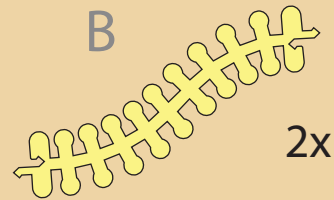
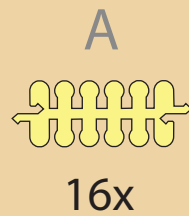


D-serine

- Binds to two of the GluNI subunits of the NMDA receptor



Complex Synapse (NMDA and AMPA Receptor)



PreSynaptic
Neuron

