

lecture (5) of physiology

synapses

electrical synapses (directly)
(Gap junctions which contain tubular connexons)
(synchronization: produce action potentials in unison)

chemical synapses (indirectly)
(synaptic cleft)
(releases neurotransmitter)
(receptors)
(required 0.5 msec)

1_ visceral smooth muscles

2_ cardiac muscle

3_ brain

4_ developing embryo

postsynaptic potentials

excitatory postsynaptic potential (EPSP)

inhibitory postsynaptic potential (IPSP)

depolarization

hyperpolarization

receptors

ionotropic receptors

1- neurotransmitter binding site and the ion channel are components of the same protein.

2_acts quickly (direct)

3_ligand gated

metabotropic receptors

1- neurotransmitter binding site and the ion channel are components of different proteins.

2_slower (indirect)

3_ligand gated

4_activate a G-protein which activates as a secondary messenger that open the ion channels

removal of neurotransmitter

diffusion

(diffuse away from the synaptic cleft)

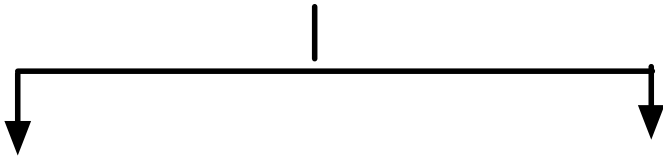
enzymatic degradation

(inactivated)

uptake by cells

(reuptake by the same neuron or uptake by neighboring neuroglia)

the summation (only for the graded potential)



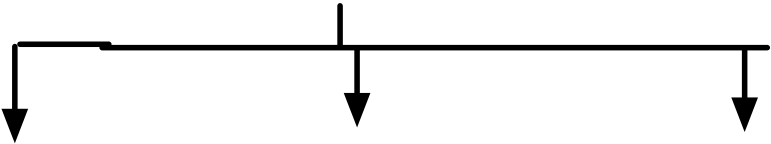
spacial summation

*(effect on several presynaptic neurons)
(EPSP spread from several synapse to axon hillock)*

temporal summation

*(effect on one presynaptic neuron)
(EPSP spread from one synapse to axon hillock)*

small molecule neurotransmitters

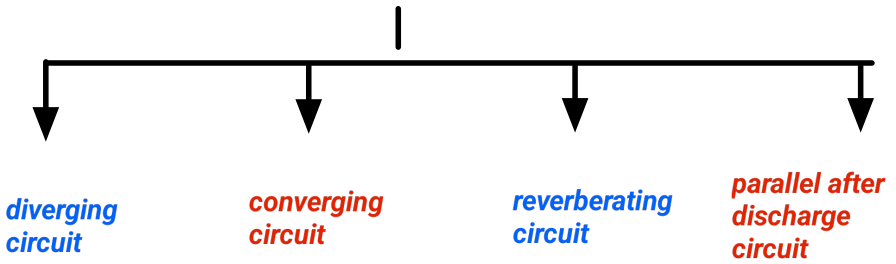


acetylcholine (ACh)
*(release by many PNS and some CNS)
(either excitation or inhibition)
(inactivated by acetylcholinesterase)*

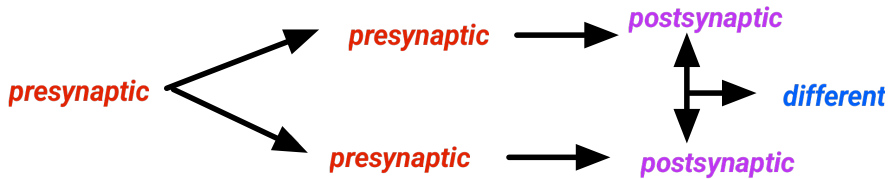
amino acids
*(Glutamate excitation and inactivated by glutamate specific transporters)
(Gamma aminobutyric acid (GABA) inhibition for 1/3 brain synapses and antianxiety drugs)*

biogenic Amines
*(decarboxylated amino acids)
(either excitation or inhibition)
(dopamine, histamine, serotonin, epinephrine and norepinephrine)*

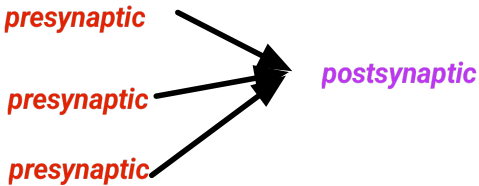
neural circuits



diverging circuit :



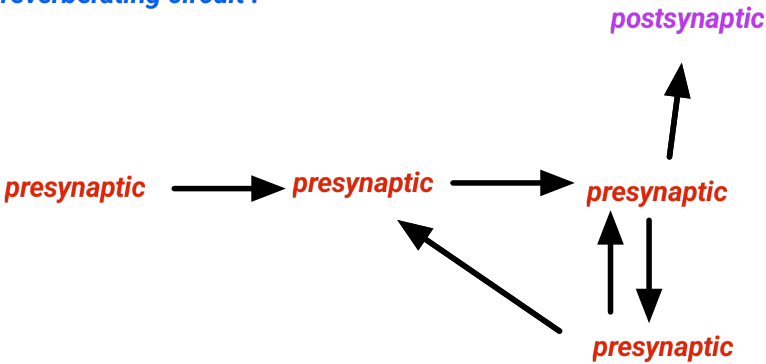
converging circuit :



في نوع كمان اسمه ال simple series circuit واحد بائر
على الثاني مباشرة



reverberating circuit :



parallel after discharge circuit:

