3 Functional Zones of Neuron - CORRECT ANSWERS -1) Input - cell body w/ dendrites (leads to graded response)

2) Relay - axon (info travels as AP)

3) Output - terminal of neuron (info passed to target cell)

2 major types of neuron signals - CORRECT ANSWERS -graded potential & action potential

Graded Potential vs. Action Potential - CORRECT ANSWERS -Graded Potential:

- decays with distance
- can be inhibitory or excitatory
- amplitude proportional to duration & magnitude of stimulus
- no refractory period

AP

- no decay (self-regenerative_
- depolarizing
- triggered by net graded potential
- has threshold
- all-or-none
- refractory period

Funny Na current - CORRECT ANSWERS -Na channels activated when cell is hyperpolarized (instead of depolarized)

SNS on heart rate - CORRECT ANSWERS -released noradrenaline which increases Na & Ca2+ influx & increases HR

PSNS on heart rate - CORRECT ANSWERS -releases Ach, increases K+ conductance & decreases Ca2+ conduction & decreases HR

GPCR structure/function - CORRECT ANSWERS -7 transmembrane alpha-helices, inactive when GDP bound

when NT binds, GDP is released & GTP binds, alpha subunit dissociates from beta-gamma subunit

cAMP pathway - CORRECT ANSWERS -norepinephrine binds B1 receptor, G-alpha stimulates adenylyl cyclase to cataylyze synthesis of cAMP. cAMP activates PKA by binding to regulatory subunits. PKA phosphorylates calcium channels to increase calcium release (increases HR, & can also phosphorylate SERCA to decrease relaxation time)

How do G beta-gamma subunits activate K+ channel? How do we know this? - CORRECT ANSWERS -ACh binds to muscarinic GPCR on cardiac tissue, activated B-y subunits interact directly with K+ channels to increase efflux which hyperpolarizes SA node & decreases HR. Gi (alpha inhibitory) subunit also inhibits adenylyl cyclase activity to minimize Ca2+ influx.

Know this by inside-out patch clamp (place in bath with beta-gamma subunit & observed K+ conductance)

inositol phospholipid pathway - CORRECT ANSWERS -Gq (alpha) activates phospholipase C (PLC) which cleaves PIP2 which leads to the production of DAG & IP3

What does IP3 do? - CORRECT ANSWERS -Triggers release of Ca2+ from SR

What does DAG do? - CORRECT ANSWERS -activates PKC

Calcium-induced calcium release (CICR) - CORRECT ANSWERS -low cytosolic [Ca2+] increases opening of IP3-gated channels (calcium moves into the cell and stimulates release of calcium from the SR)

Negative feedback of calcium release - CORRECT ANSWERS -high [Ca2+] inhibits IP3-induced Ca2+ release (IP3 receptor has Ca2+ binding sites)

Calcium blips - CORRECT ANSWERS -Ca2+ release from SR by SINGLE IP3 receptor calcium channel (occurs in response to low IP3 levels)

Calcium puffs - CORRECT ANSWERS -Ca2+ release through CLUSTERS of Ip3 receptor calcium channels

DHPRs & RYR - CORRECT ANSWERS -DHPRs are L-type Calcium channels (long lasting voltage-gated) in T-tubule membrane. When depolarized, DHPR is activated which causes opening of its own Calcium channel and causes conformational change to open RYR channel on SR membrane

Calcium sparks - *CORRECT ANSWERS* -Ca2+ release through CLUSTERS of RYR channels (faster & smaller than puffs, equal to blips)

Cannabinoids - *CORRECT ANSWERS* -cannabinoids are produced by hydrolysis of phospholipids containing arachidonic acid during increases intracellular [Ca2+]

cannabinoids bind to CB1 (GPCR) receptors which inhibit NT release in nervous system, and SR Ca2+ release from skeletal muscle.

Overall leads to muscle weakness & fatigue

Nitric Oxide (NO) pathway - *CORRECT ANSWERS* -ACh acts on muscarinic AChR in IP3 pathway (calcium activates calmodulin which leads to NO synthase)

NO diffuses through membrane to activate guanylate cyclase which stimulates cGMP production which activates PKG

Causes muscle relaxation & vasodilation

Regulated by PDEs (phosphodiesterases) which degrade cGMP

Viagra - *CORRECT ANSWERS* -developed for hypertension by targeting PDE5 for inhibition (would increase cGMP), PDE5 was believed to be found in all blood vessels but is predominantly in lungs and penile tissue.