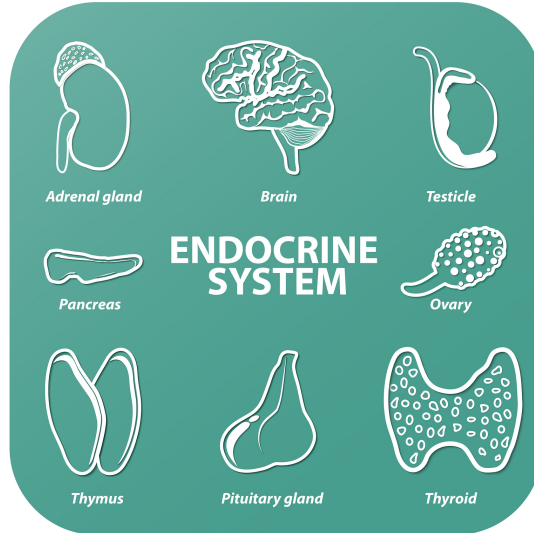
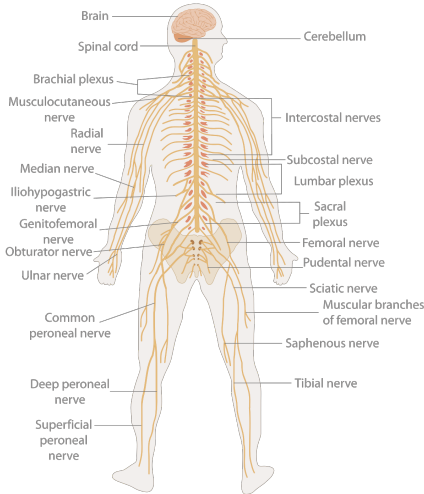




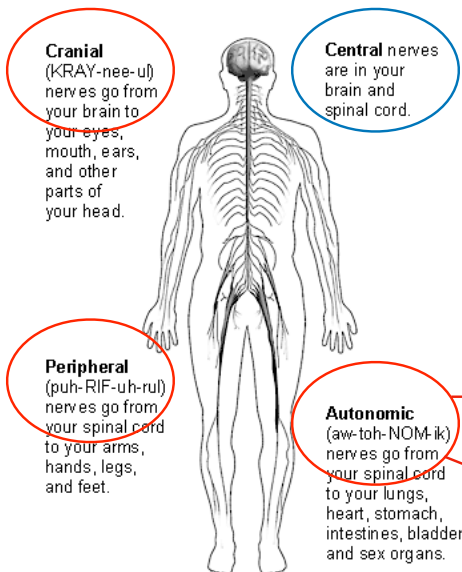
03b – HOMEOSTASIS

The Nervous & Endocrine Systems



1

Nervous System



Cranial
(KRAY-nee-ul)
nerves go from your brain to your eyes, mouth, ears, and other parts of your head.

Central nerves are in your brain and spinal cord.

Peripheral
(puh-RIF-uh-rul)
nerves go from your spinal cord to your arms, hands, legs, and feet.

Autonomic
(aw-toh-NOM-ik)
nerves go from your spinal cord to your lungs, heart, stomach, intestines, bladder, and sex organs.

1. Central NS

- brain
- spinal cord

2. Periferal NS

- carries info to/from periphery to CNS

Sympathetic Nervous System

- "fight or flight response"
- speeds body up; heart races, etc.

Parasympathetic Nervous System

- "rest and digest response"
- calms body down; slows heart, etc.

2

Structure and Function of Nerves

- ☑ Compare the structure and function of sensory neurons, interneurons, and motor neurons.

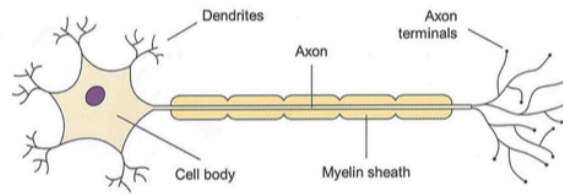


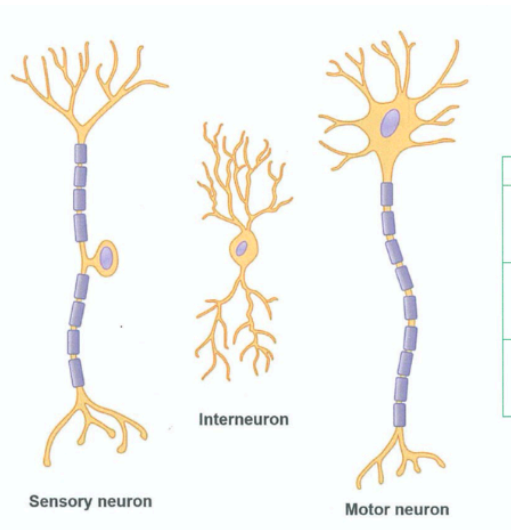
Figure 3.10: Structure and general features of a neuron.

Feature	Description
Cell body	Contains the nucleus, cytoplasm, mitochondria, endoplasmic reticulum, ribosomes, the Golgi body and lysosomes.
Axon	A long fibre that conducts nerve impulses from the cell body to dendrites.
Myelin sheath	An insulating layer that increases the rate at which a nerve impulse is conducted along the axon.
Axon terminals	Small branches of the axon that form the connections (synapses) with other neurons in the nervous system.
Dendrites	Extensions of the cell body that receive chemical signals from the axon termini of other neurons. Dendrites convert these signals into nerve impulses that are transmitted to the cell body.

3

3

Types of Neurons

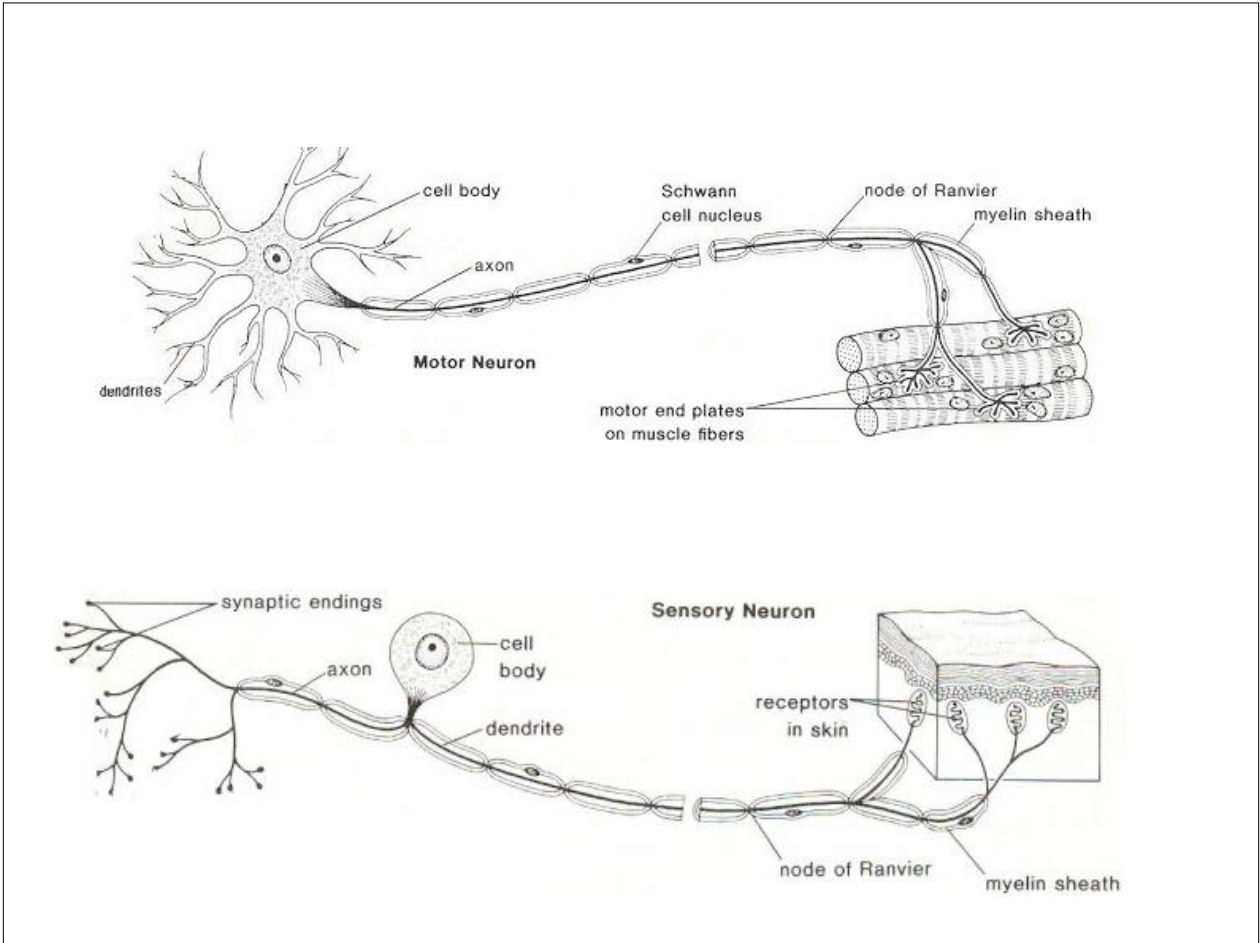


Cell type	Location	Structural features	Function
Sensory neuron	PNS	<ul style="list-style-type: none"> Long axon Myelinated or unmyelinated Cell body on the side of axon 	Conduct nerve impulses from sensory receptors to the CNS.
Interneuron	CNS	<ul style="list-style-type: none"> Very short axon Unmyelinated Cell body on the side of axon 	Relay nerve impulses between sensory and motor neurons.
Motor neuron	PNS	<ul style="list-style-type: none"> Long axon Usually myelinated Cell body at one end. 	Conduct impulses from the CNS to effectors.

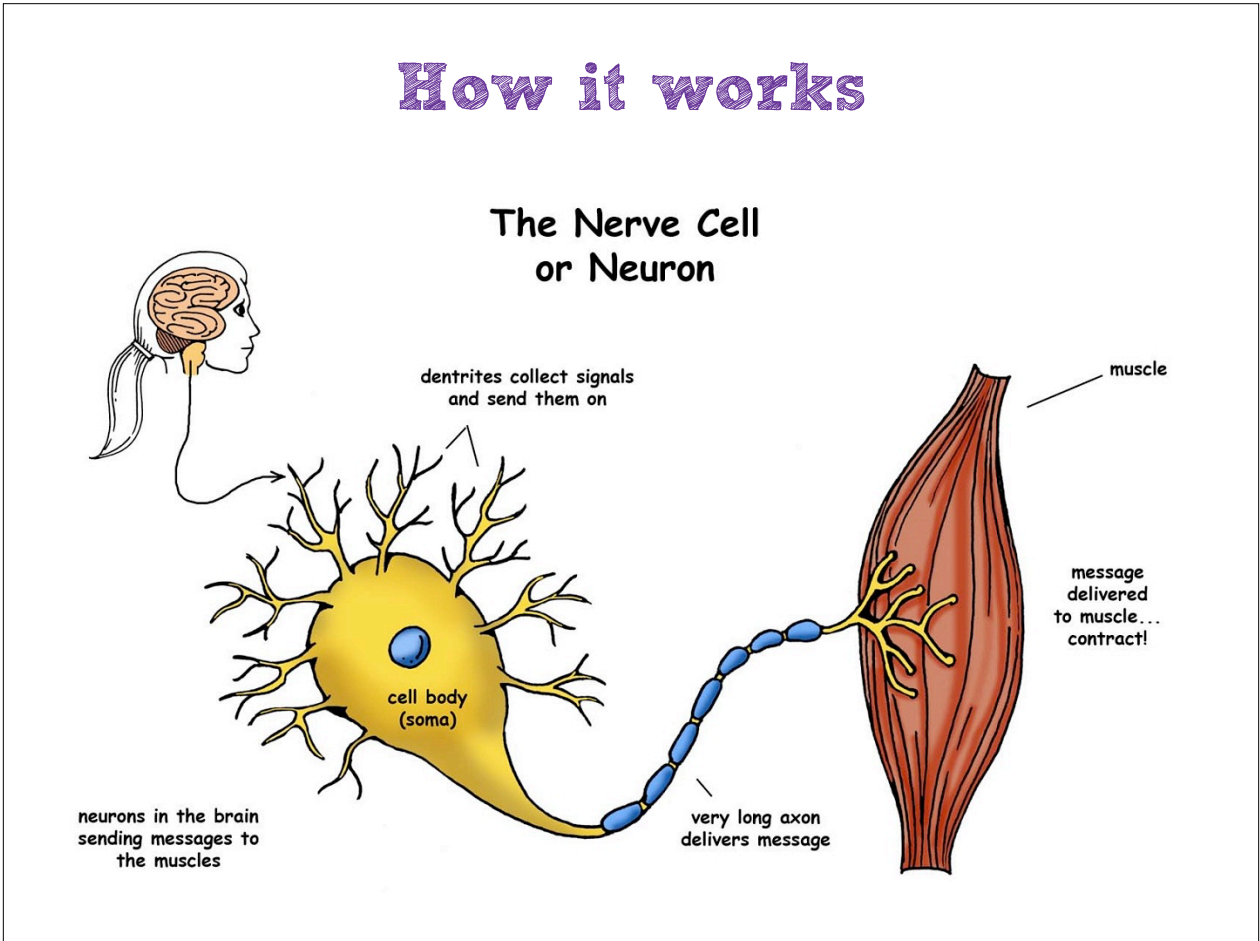
Brain = 3 billion neurons
Rest of N.S. = 3 billion

World Population
= about 7 billion

4

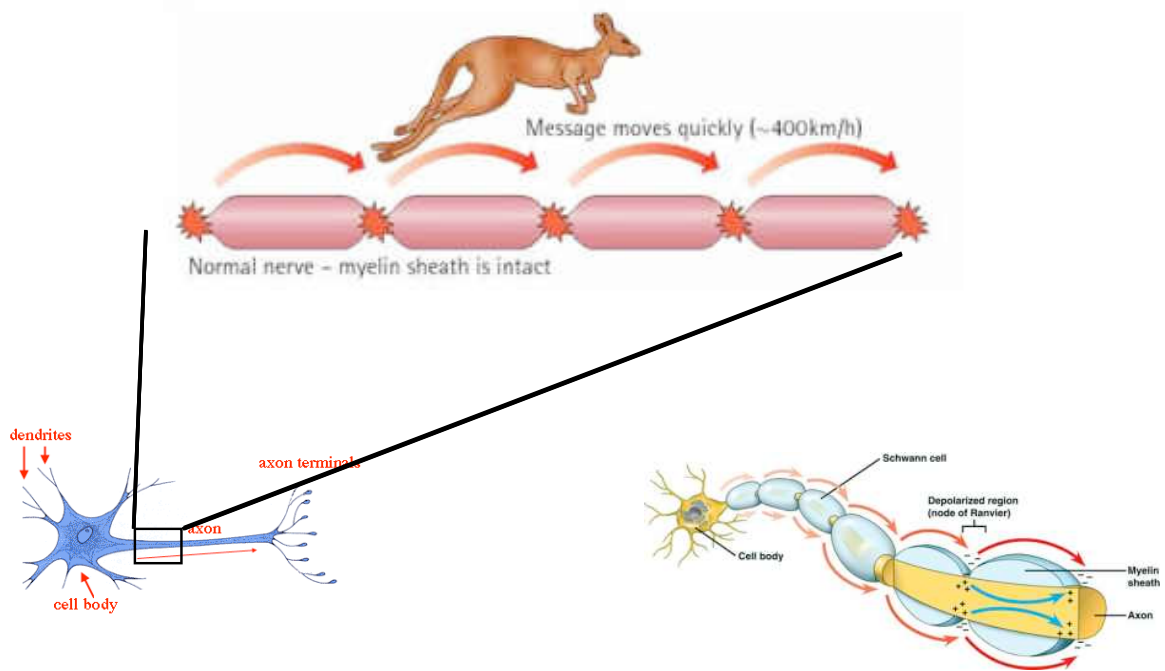


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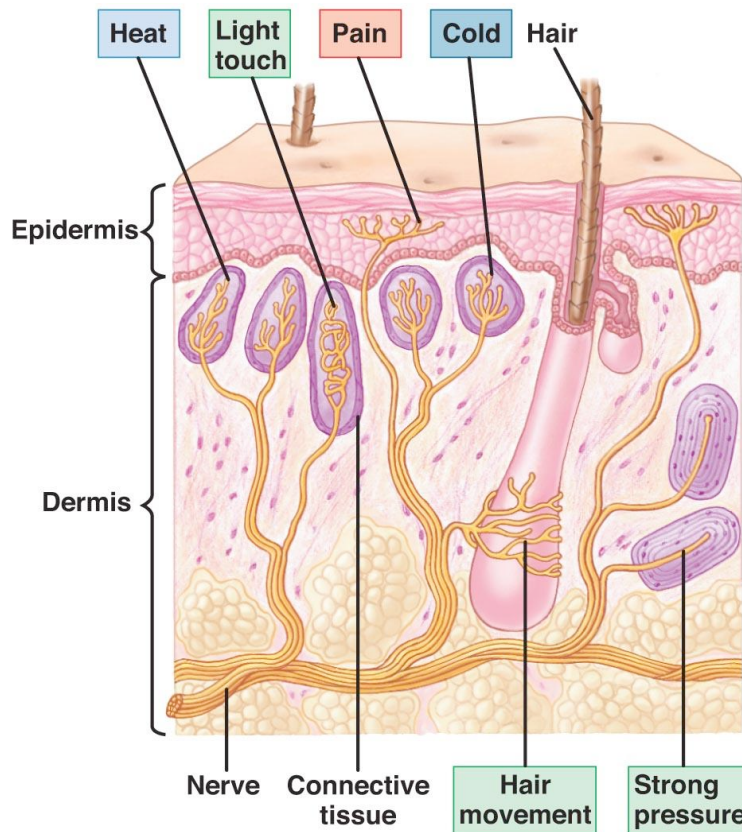
6

Message traveling along axon



7

Sensory receptors in skin



8

Stimulus - Responses

Skin - temperature, touch

Eye - light/shape (rods), colour (cones)

Ear - sound (frequency in Hz)

Tongue - chemicals

Broadly, sensory receptors respond to one of four primary stimuli:

- Chemicals (chemoreceptors)
- Temperature (thermoreceptors)
- Pressure (mechanoreceptors)
- Light (photoreceptors)

- *also Proprioceptors =

9

Stimulus - Response Model

- Describe the structure of a nerve pathway from receptor to effector.

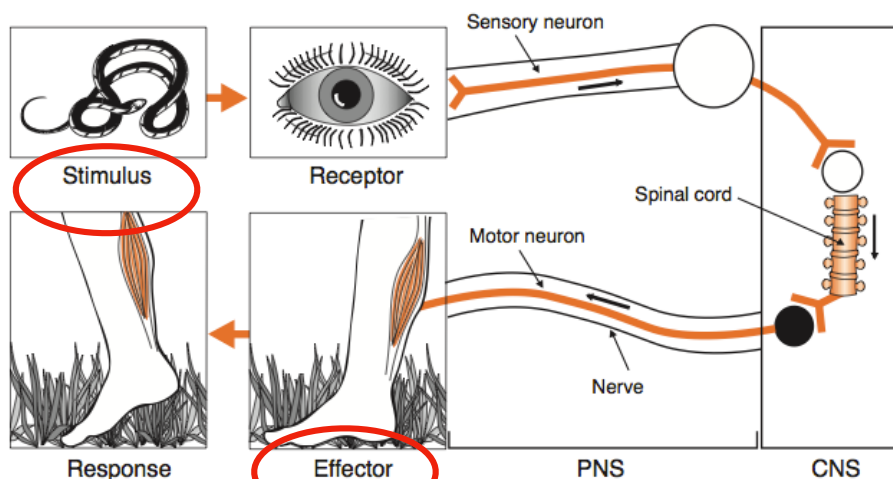
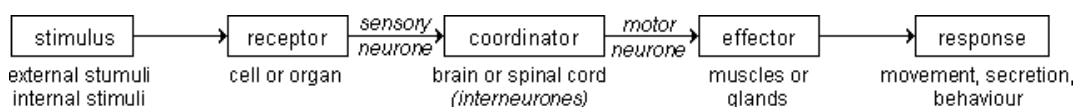
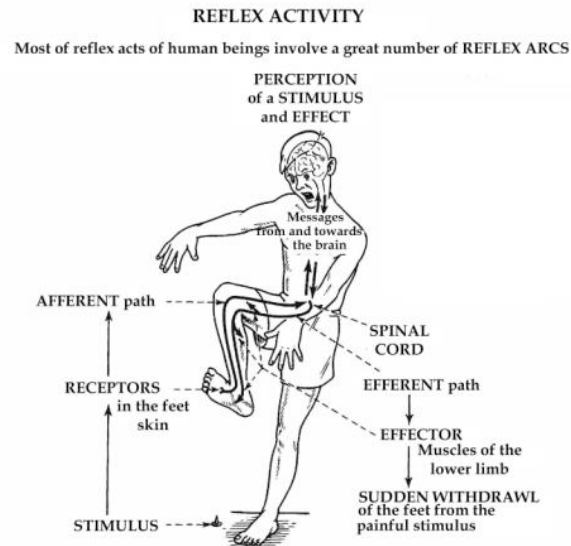


Figure 308 A stimulus - response pathway

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Reflex Arc Pathway

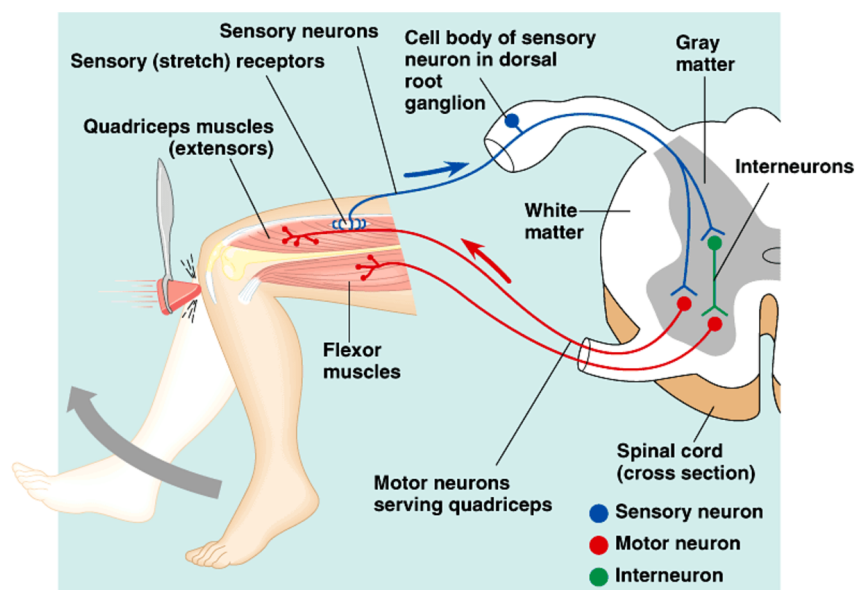
- ☑ Describe the role and pathway of reflex responses.



11

Reflex Arc Pathway

- ☑ Describe the role and pathway of reflex responses.



Note: see list of reflexes in SASTA text

12

Synapses & Neurotransmitters

☑ Describe the role of synapses and neurotransmitters.

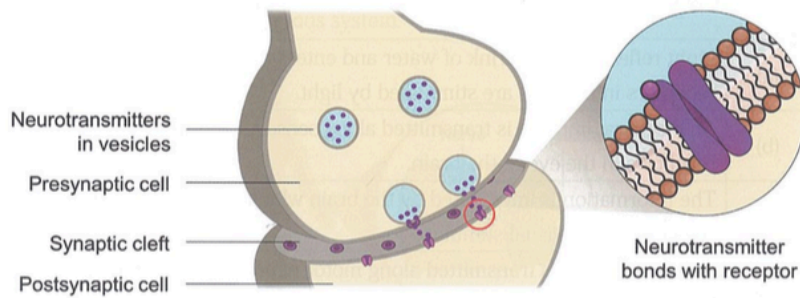
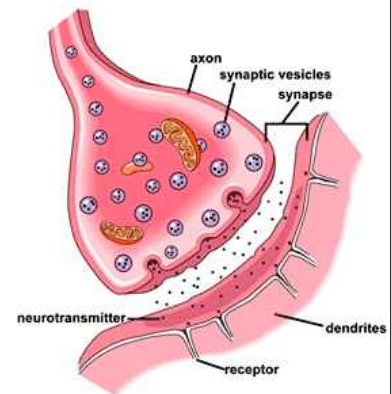


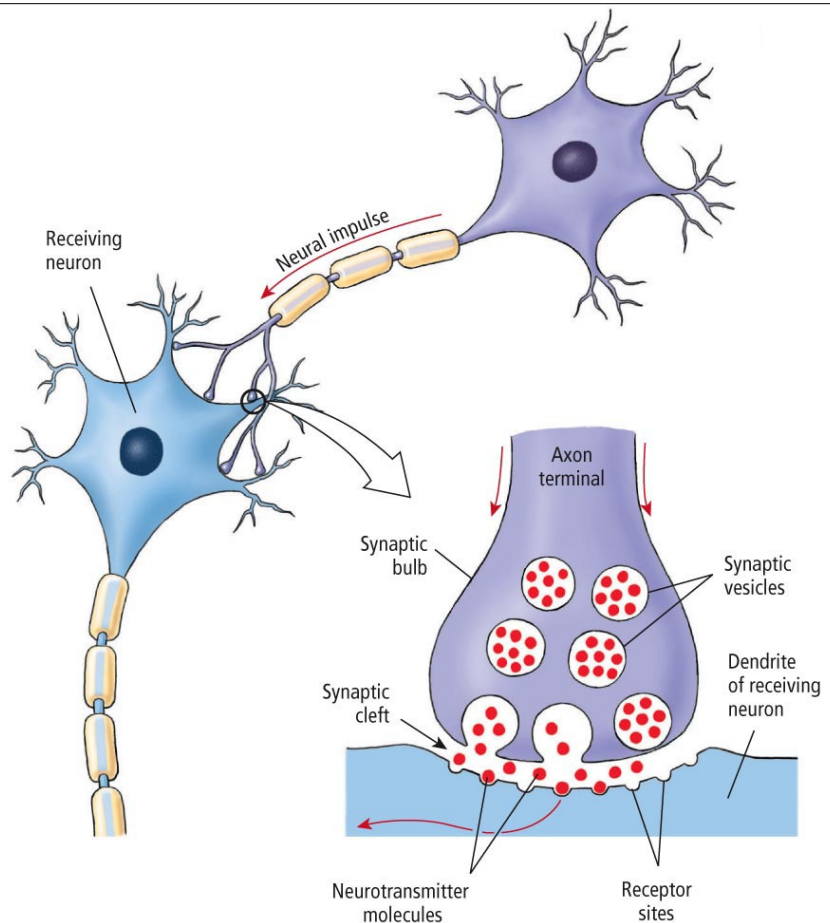
Figure 3.15: Diffusion of neurotransmitters across the synaptic cleft.



13

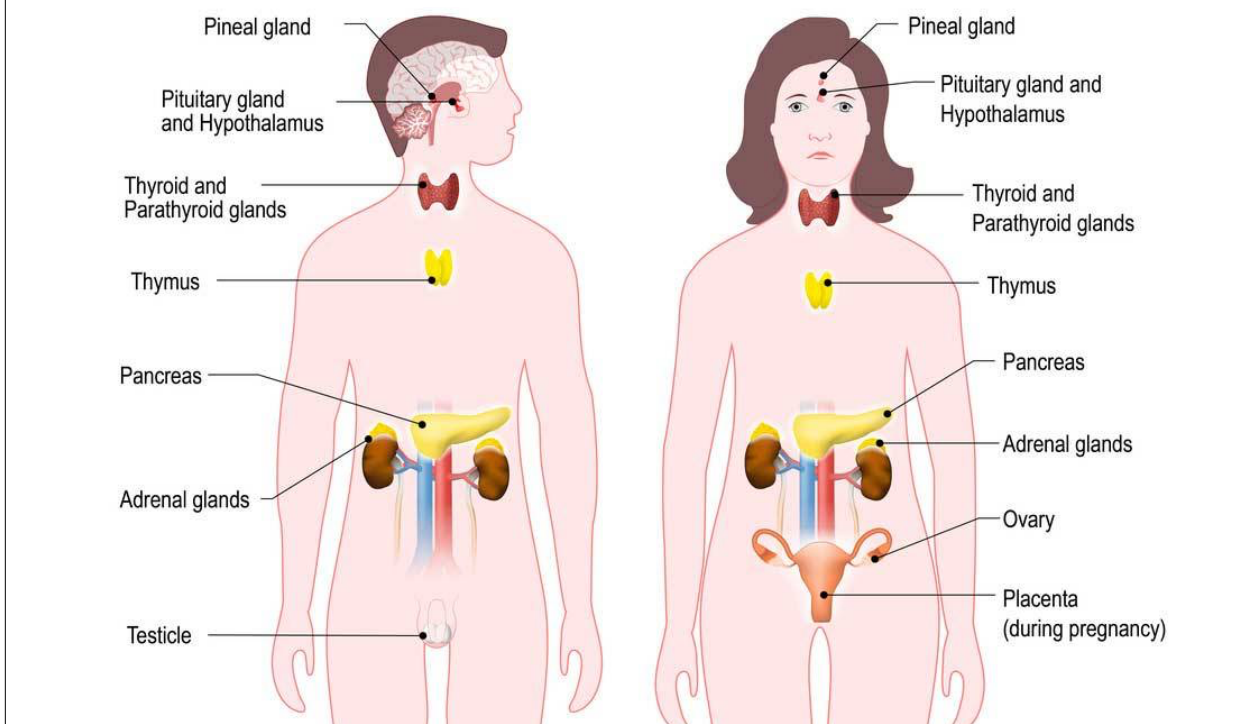
13

Synapse



14

Endocrine System

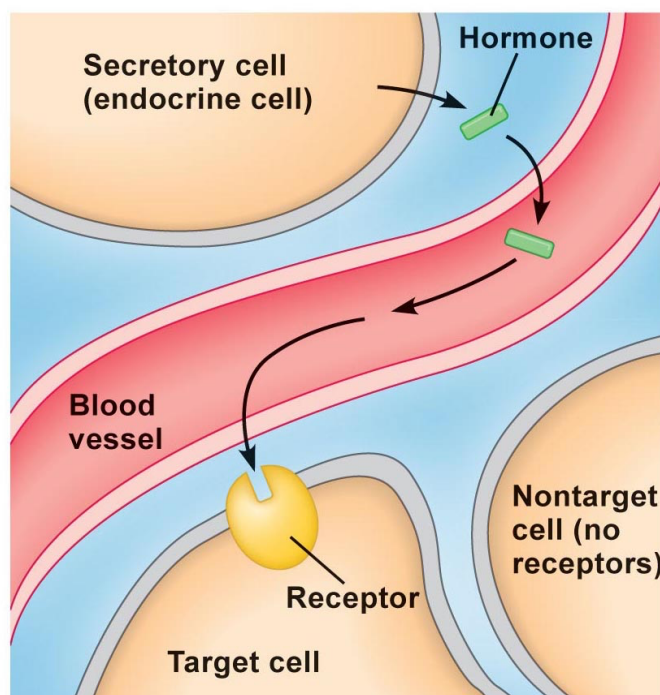


15

Hormone Delivery



3.3.2 Hormones travel to target sites via the blood.



16



3 Types of Hormones

3.3.1 The endocrine system releases hormones that are amino acid derivatives, peptides, proteins, or steroids.

Hormone Class	Components	Example(s)
Amine Hormone	Amino acids with modified groups (e.g. norepinephrine's carboxyl group is replaced with a benzene ring)	Norepinephrine
Peptide Hormone	Short chains of linked amino acids	Oxytocin
Protein Hormone	Long chains of linked amino acids	Human Growth Hormone
Steroid Hormones	Derived from the lipid cholesterol	Testosterone and Progesterone

Hormones:

1. Secreted into and travel through the circulatory system (slowish).
2. Affect metabolic in target cells.
3. Have physical properties (molecular size, shape, & solubility) that determine its action on target cells.

TARGET CELL:

- has specific receptors for specific hormones that allow hormone to bind and affect it.



3.3.2 Hormones travel to target sites via the blood.

Steroid vs Peptide Action

STERIOD HORMONES

- lipid soluble
- binds to receptor = HRC
- initiates DNA transcription

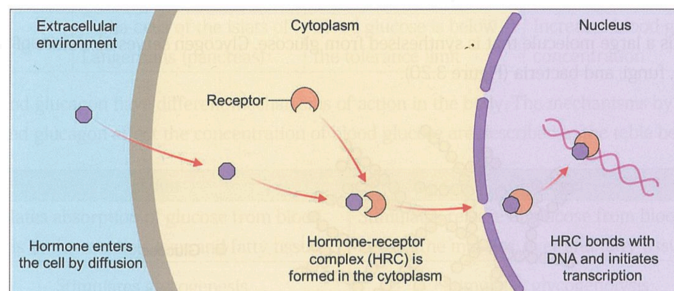


Figure 3.18: Action of a steroid hormone on a target cell.

PEPTIDE & PROTEIN HORMONES

- cannot cross membrane
- bind to surface receptors
- activates relay molecules
- initiates DNA transcription

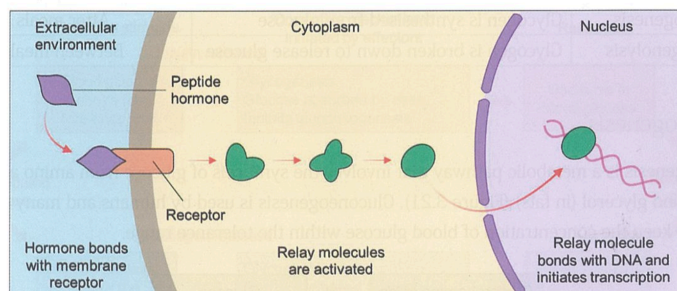


Figure 3.19: Action of a peptide hormone on a target cell.

Example Hormones

Hormone	Structure	Gland	Primary function
Adrenaline	Amine	Adrenal	Fight or flight response.
Thyroxine (T ₄)	Amine	Thyroid	Involved in the regulation of metabolism.
Insulin	Peptide	Pancreas	Reduces blood glucose concentration.
Glucagon	Peptide	Pancreas	Increases blood glucose concentration.
Antidiuretic	Peptide	Pituitary	Stimulates reabsorption of water in kidneys.
Thyroid-stimulating	Protein	Pituitary	Stimulates the production and secretion of thyroid hormones that regulate metabolism.
Follicle-stimulating	Protein	Pituitary	Stimulates maturation of germline cells in males and females.
Luteinizing	Protein	Pituitary	Triggers ovulation in the female ovaries.
Oestrogen	Steroid	Ovary	Regulates several metabolic processes in females.
Progesterone	Steroid	Ovary	Involved in the menstrual cycle and pregnancy.
Testosterone	Steroid	Testis	development of male reproductive tissues Increases muscle and bone mass.

Awesome Site:

<https://www.yourhormones.info/hormones/>

19

Nervous vs Endocrine



3.3.5 The nervous system and endocrine system function independently or together to achieve homeostasis.

- Compare the action of the nervous and endocrine systems.

Property	System	
	Endocrine	Nervous
Signal used	hormone	nerve impulse
Origin of signal	endocrine gland	sensory receptor
Transmitted by	circulatory system	nervous system
Transmission speed	slow	fast
Target effector	target cells	muscles & endocrine glands
Effects	widespread & non-specific	localized & specific
Duration of action	generally long lasting	very short

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