Kompetensi

Memahami peran sistem syaraf dan hormon dalam koordinasi serta memahami mekanisme kerja syaraf dan hormon dalam mengantarkan informasi

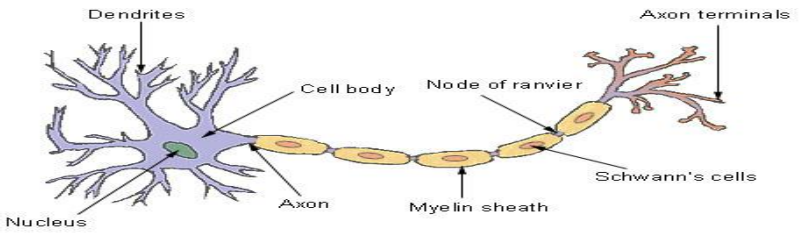
SISTEM KOORDINASI

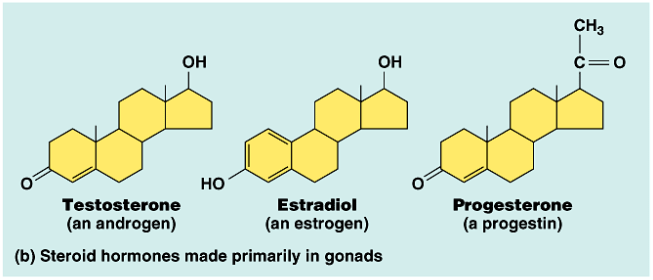
Sistem Syaraf

1. Informasi disampaikan oleh potensial aksi (imfuls)
2. Media sel syaraf itu sendiri
3. Bekerja cepat
4. Reseptor hanya pada membran sel

Sistem Endokrin

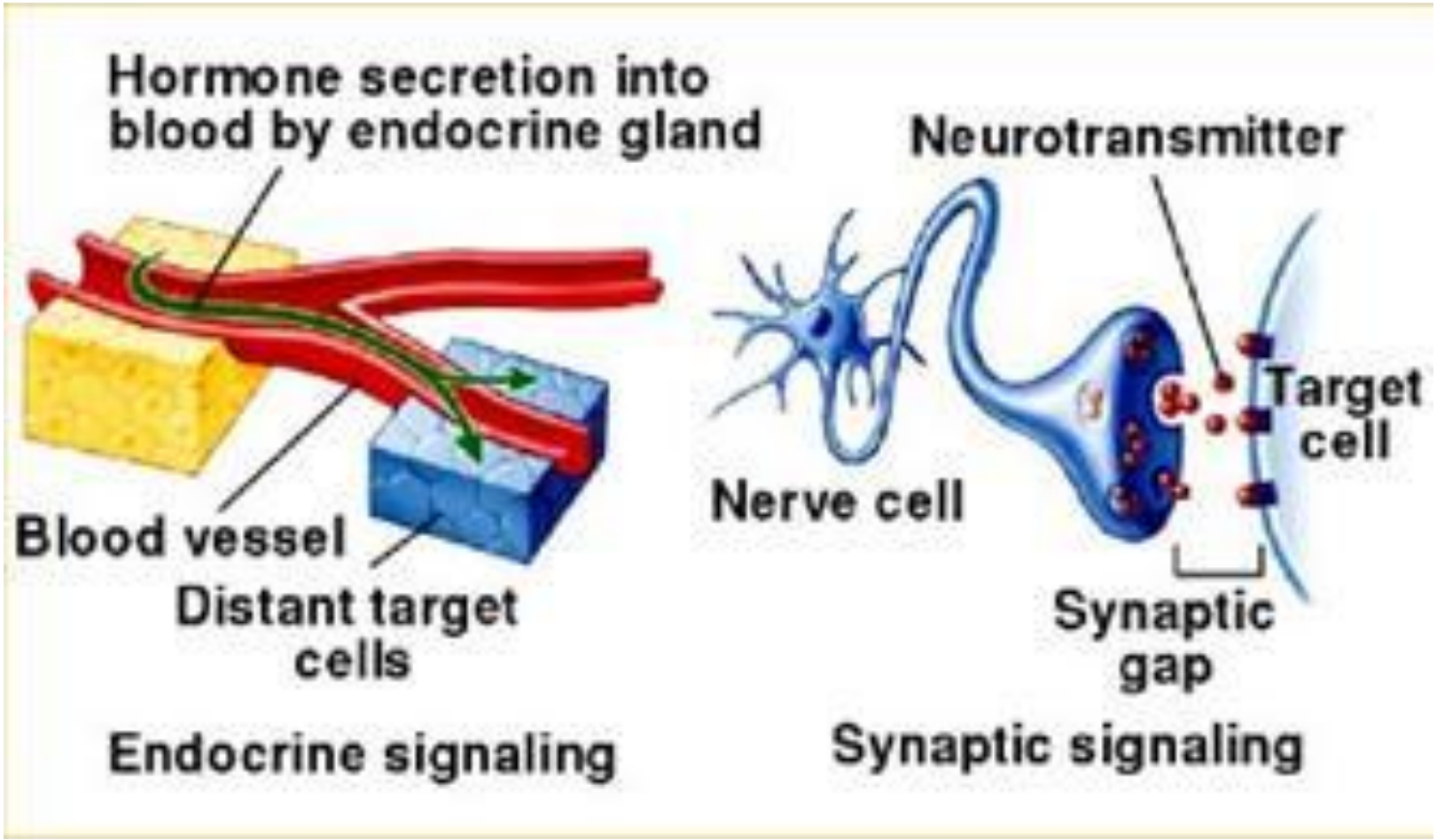
1. Informasi disampaikan oleh hormon
2. Media sistem peredaran darah
3. Bekerja lambat
4. Reseptor ada di membran atau di dalam sel





EXIT

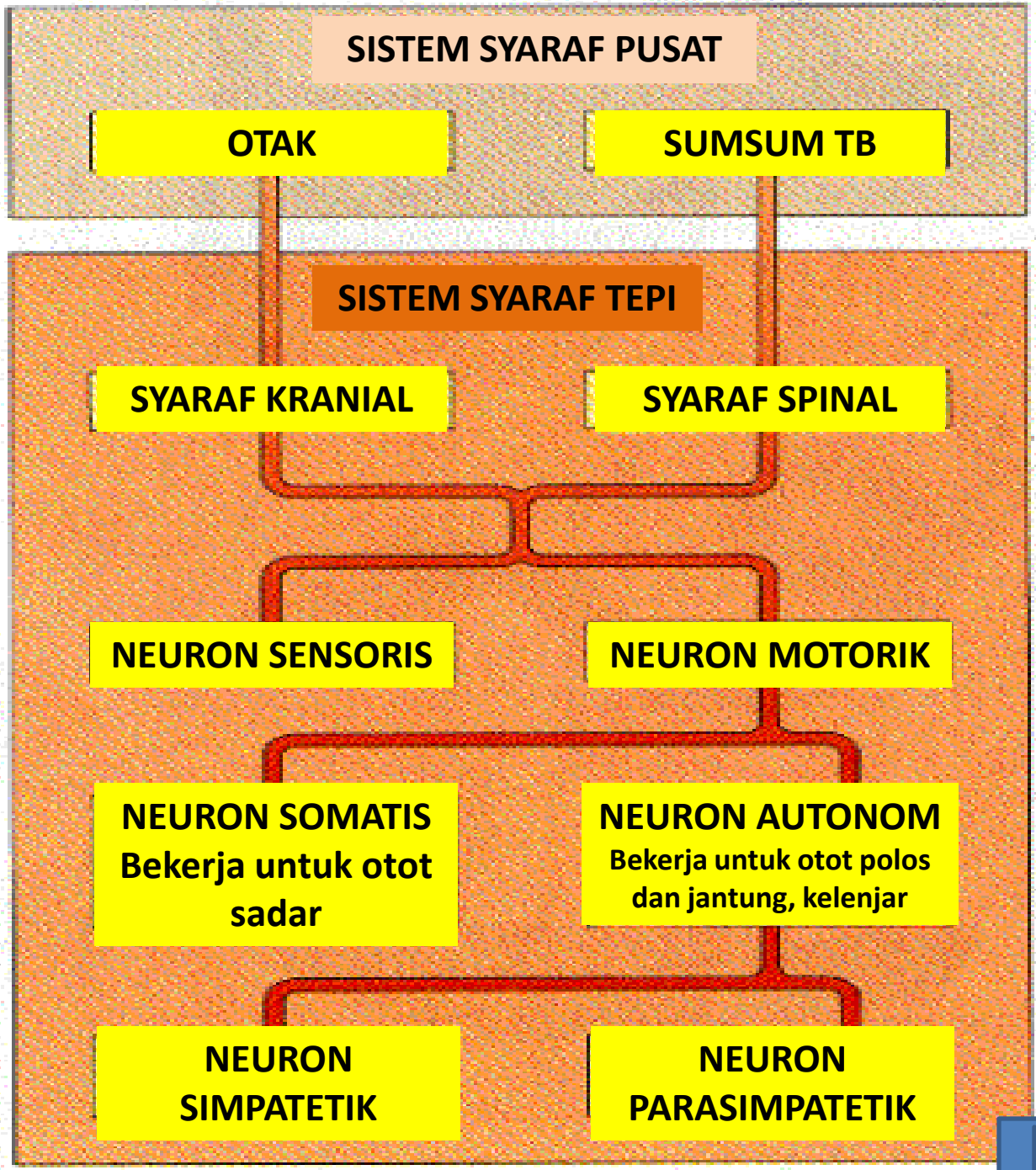
BEDA PENYAMPAIAN INFORMASI



BACK

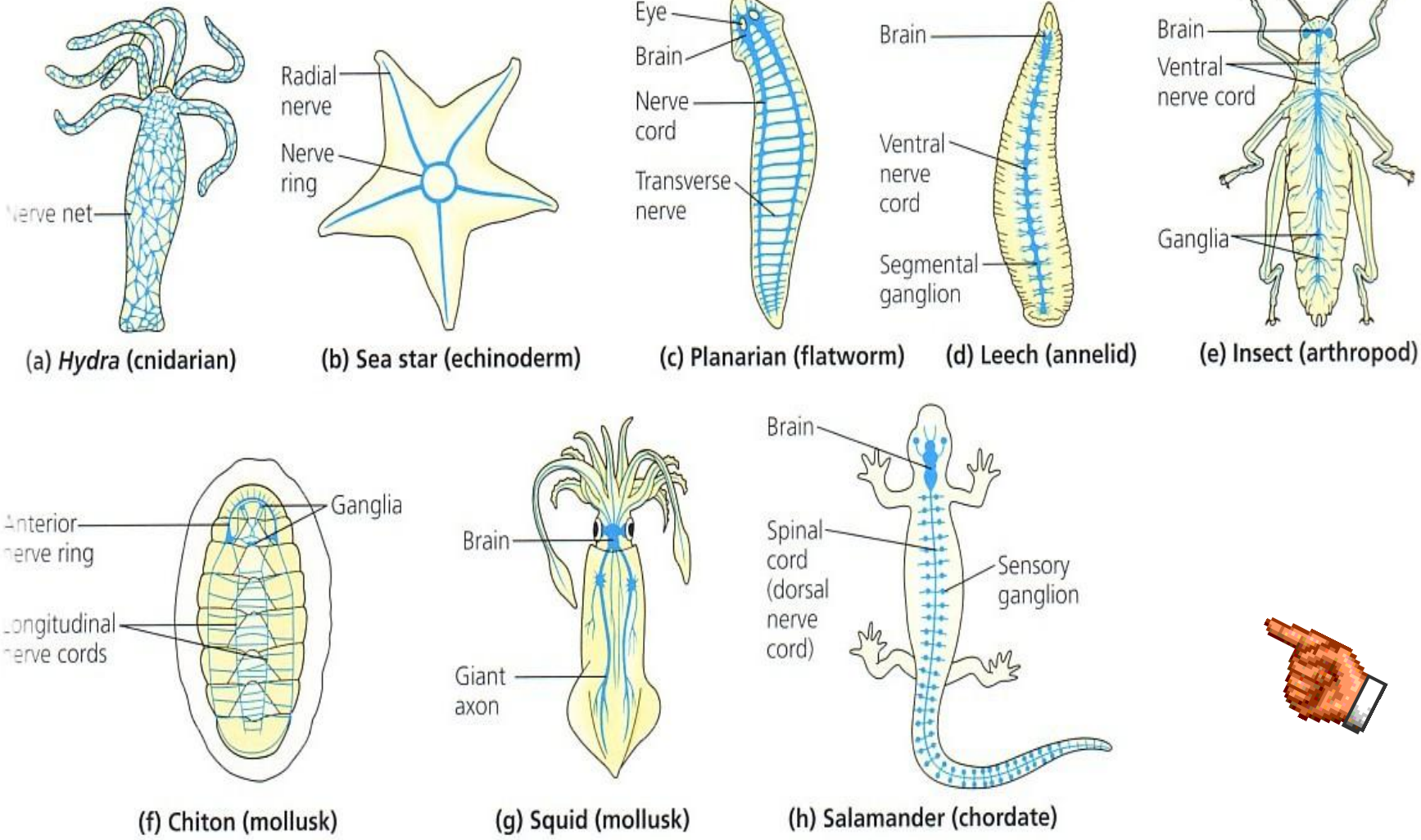
SISTEM SYARAF

VERTEBRATA



SISTEM SYARAF

INVERTEBRATA

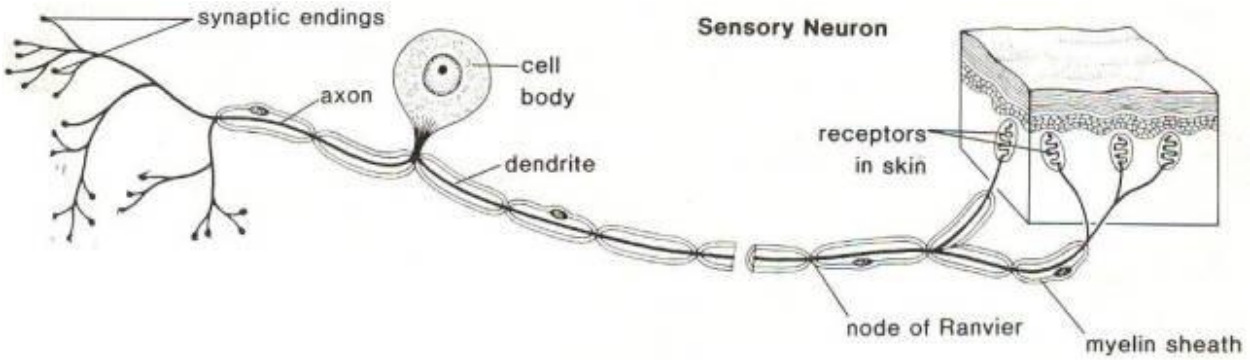


(a) *Hydra* (cnidarian) (b) Sea star (echinoderm) (c) Planarian (flatworm) (d) Leech (annelid) (e) Insect (arthropod)

(f) Chiton (mollusk) (g) Squid (mollusk) (h) Salamander (chordate)

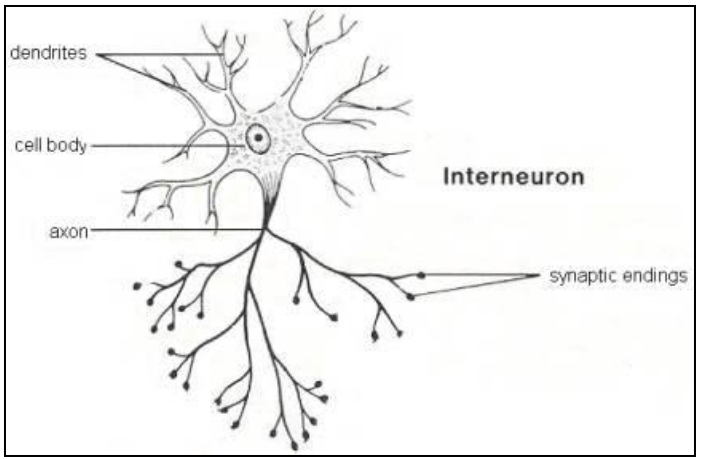
FIGURE 48.15 Diversity in nervous systems.

NEURON SENSORIK

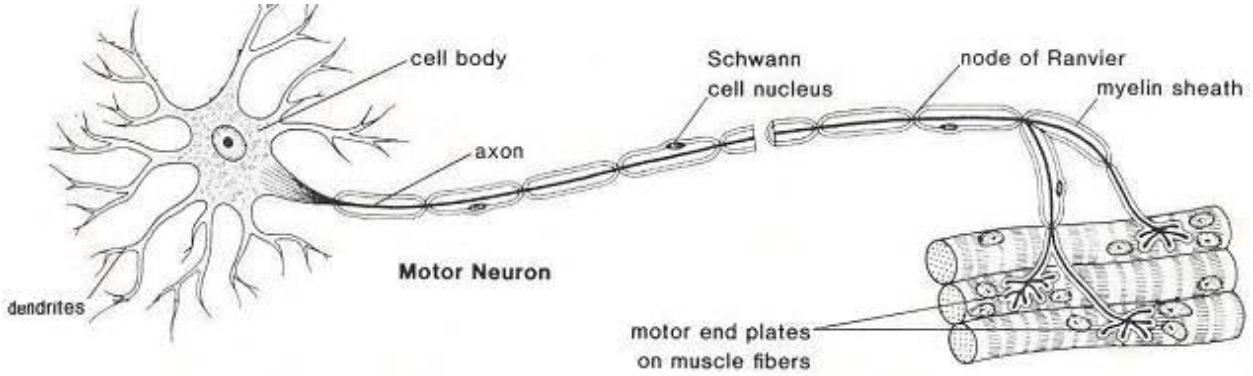


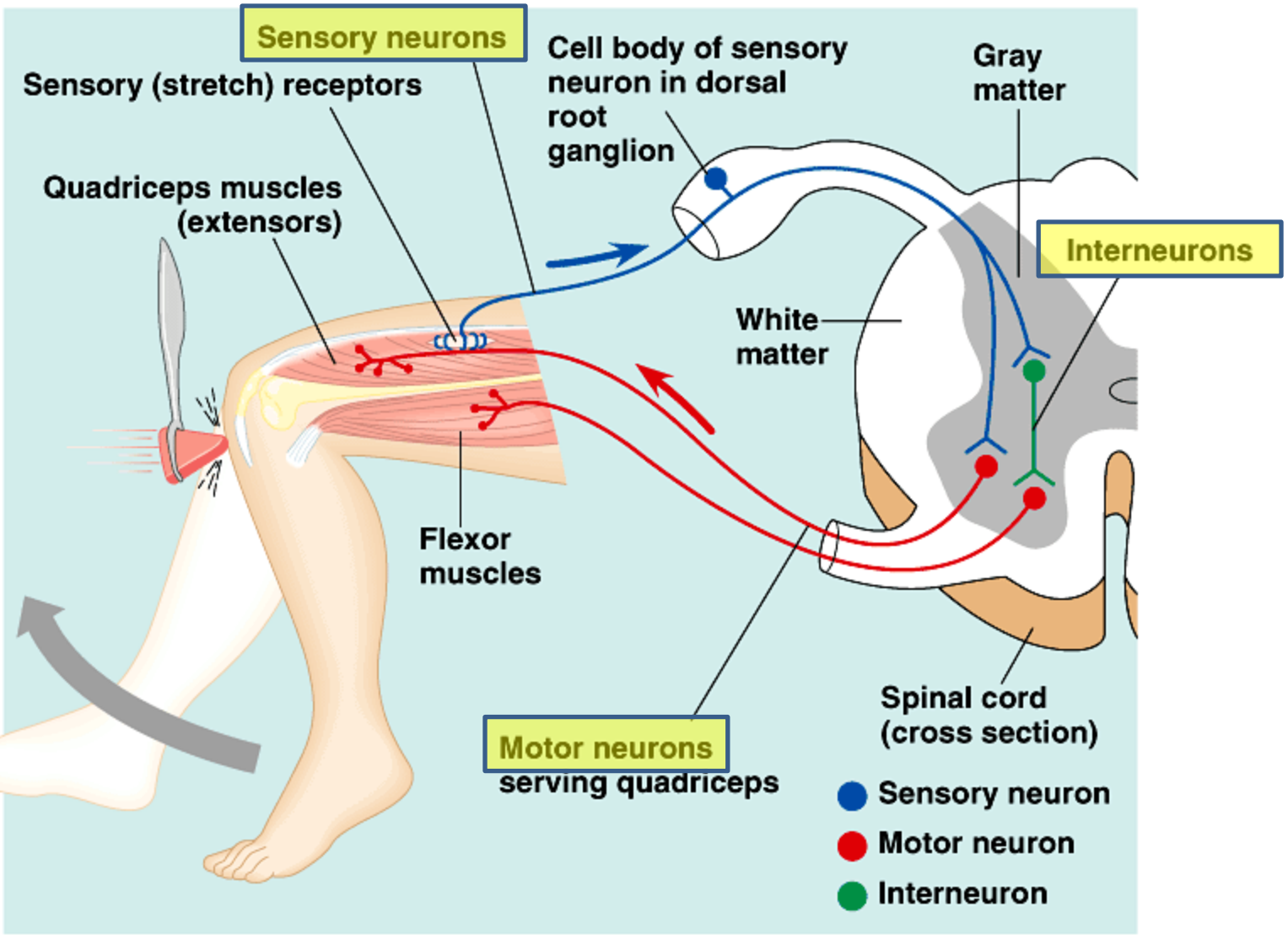
3 TIPE NEURON BERDASARKAN FUNGSINYA

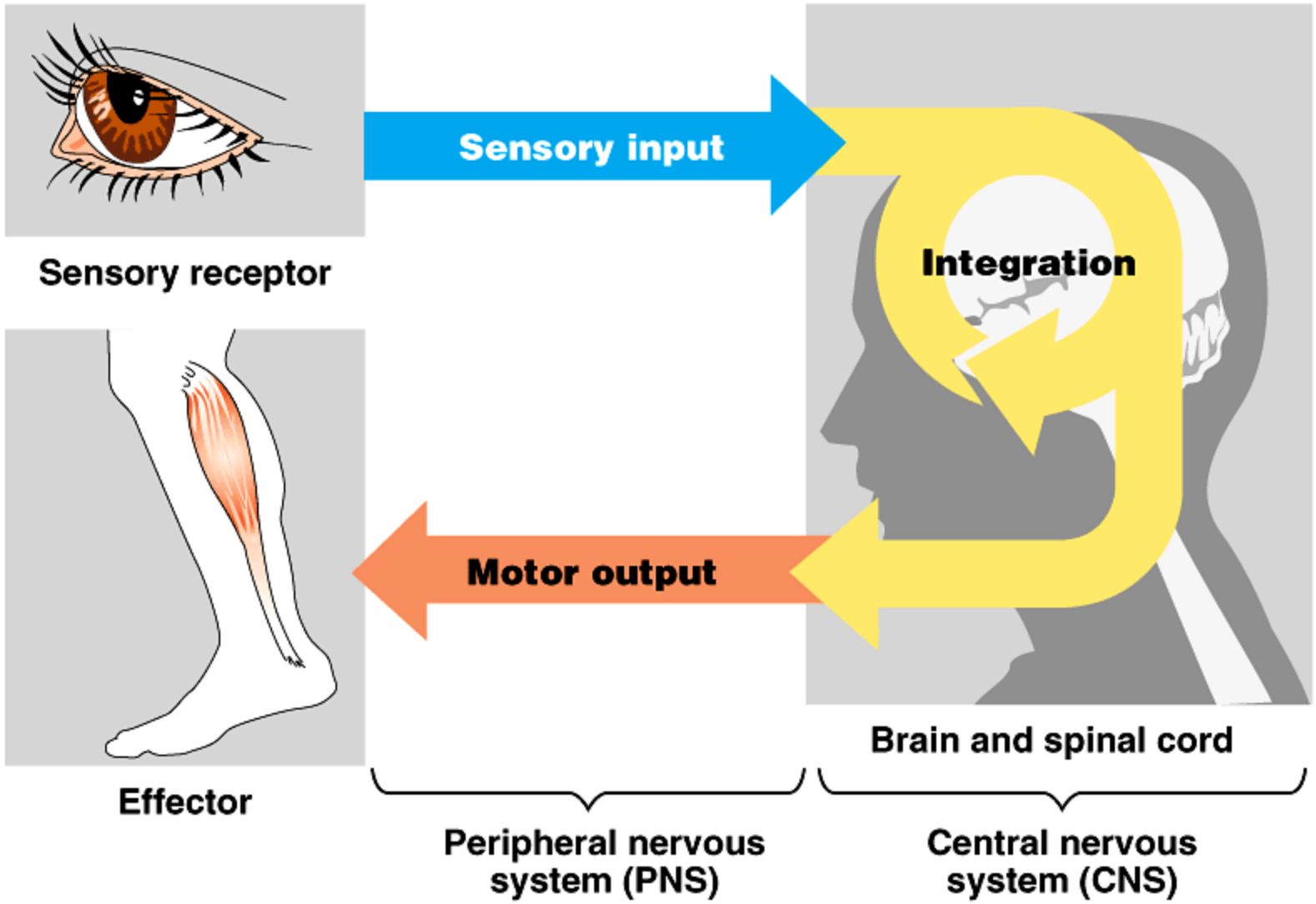
INTERNEURON/
NEURON PENGHUBUNG



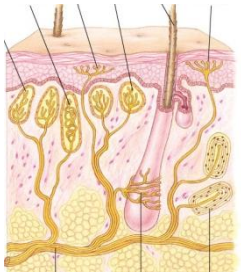
NEURON MOTORIK

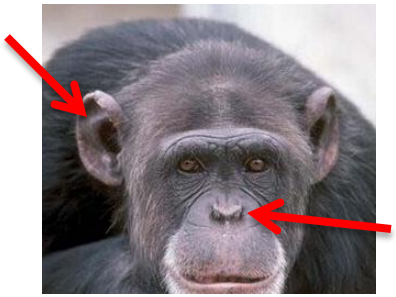




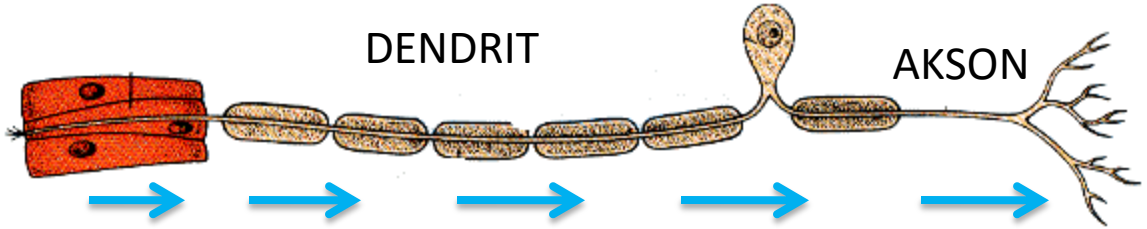


RESEPTOR



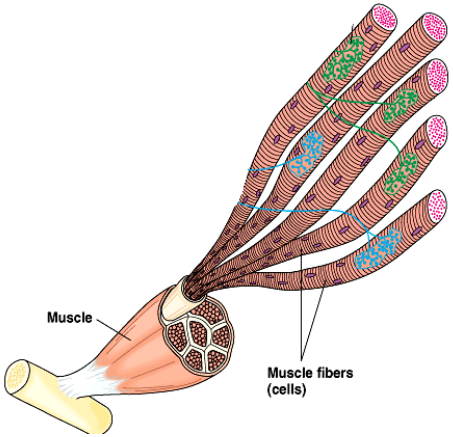


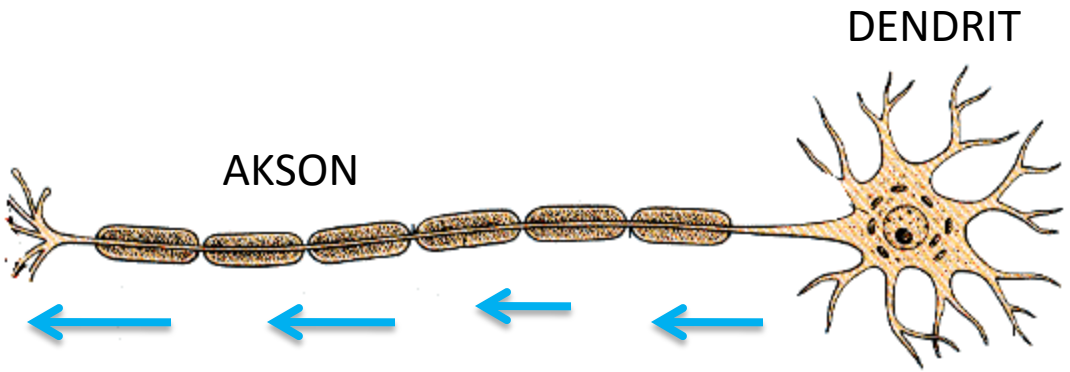
NEURON SENSORIK

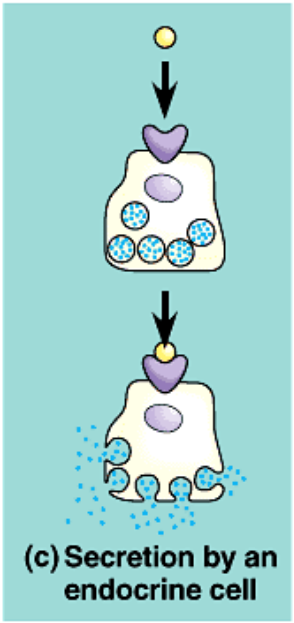


EFEKTOR

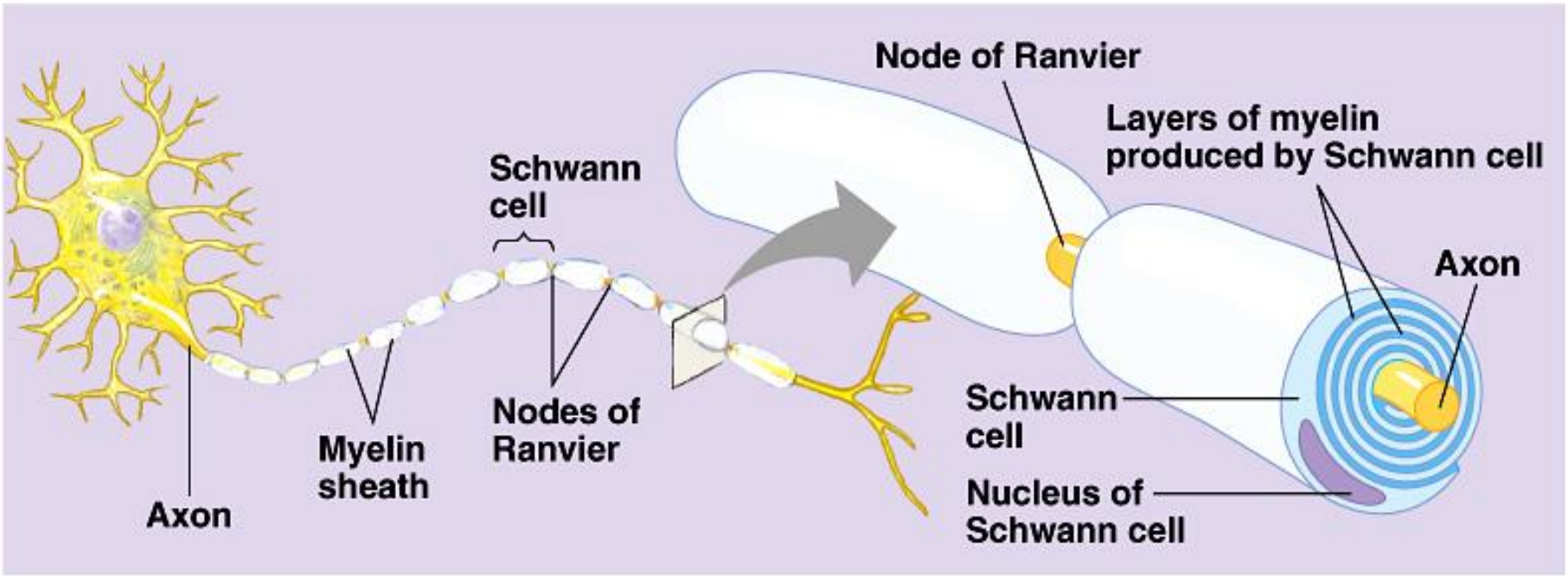
NEURON MOTORIK



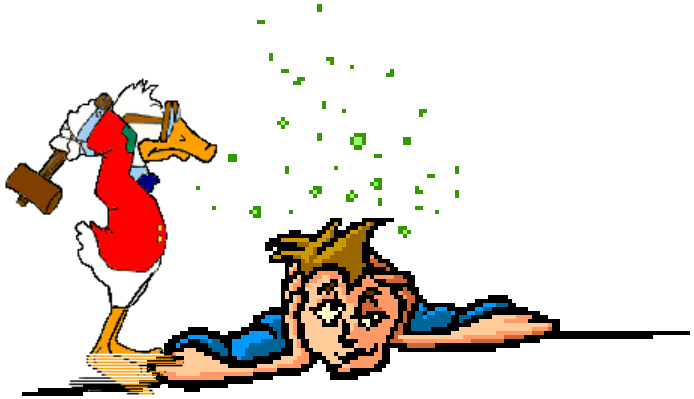


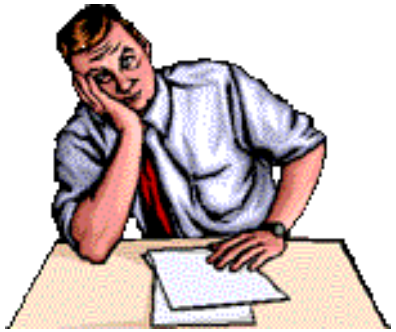


BENTUK UMUM SEBUAH SEL SYARAF (NEURON)



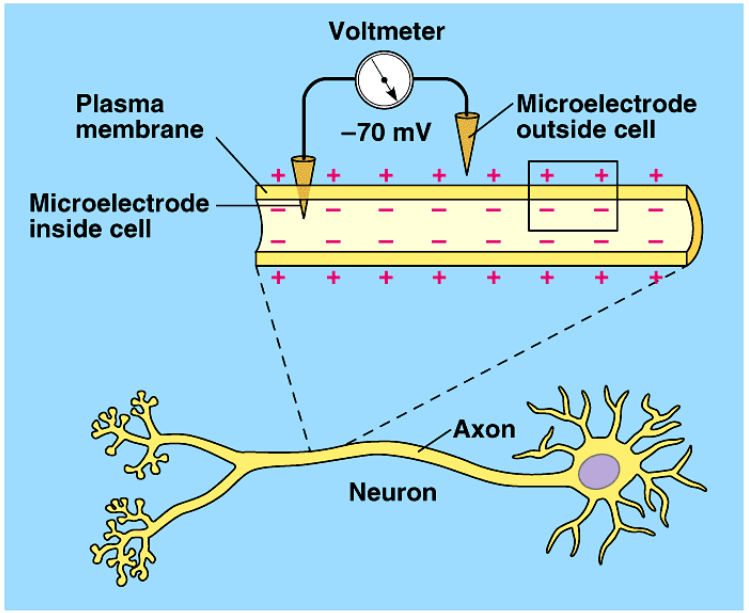
PAUSE

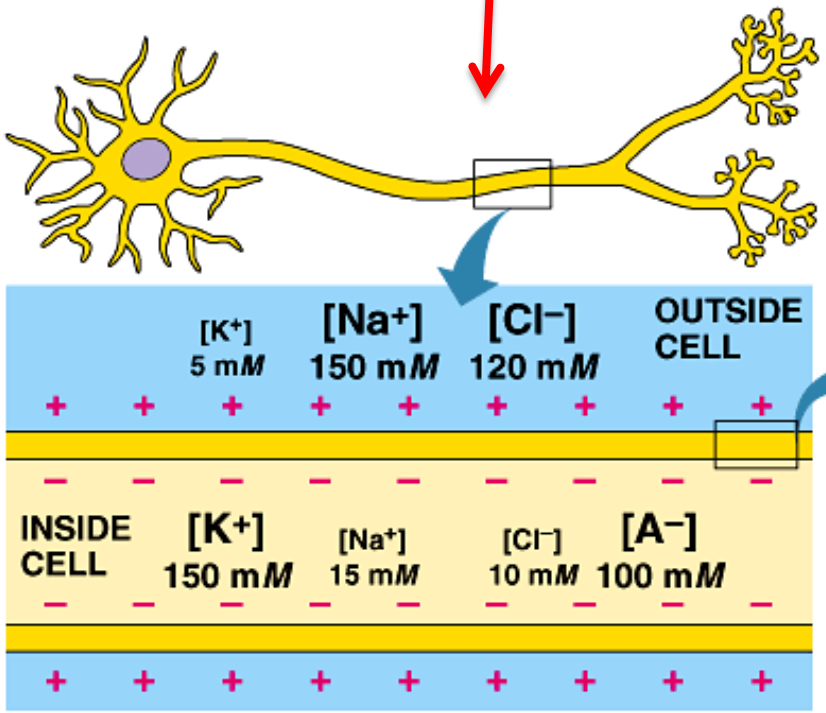




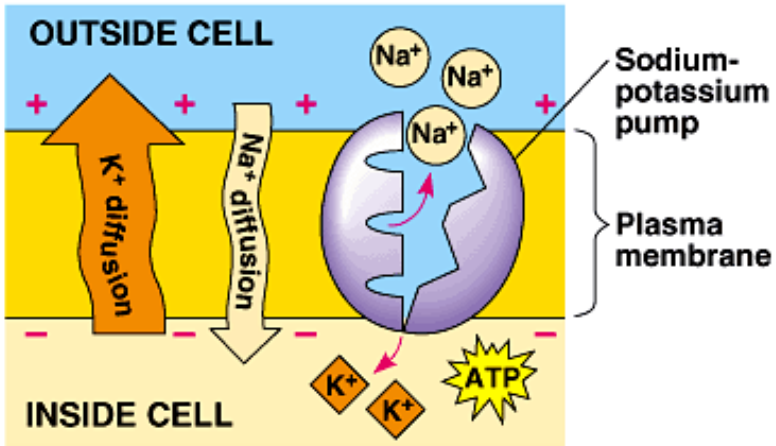
Bagaimanakah informasi dihantarkan oleh sel syaraf?

Sel dalam keadaan istirahat, memiliki potensial membran → adanya perbedaan muatan

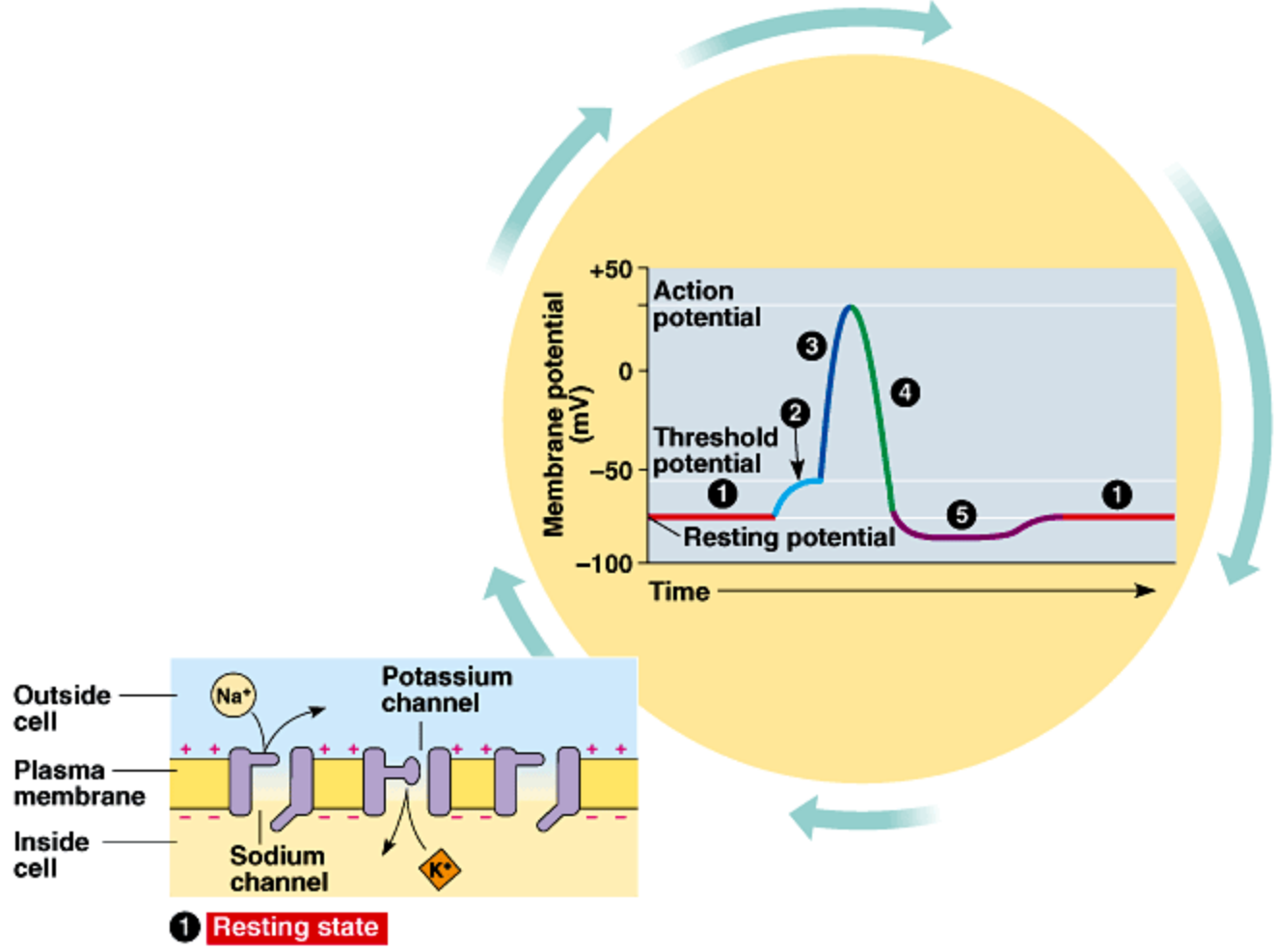


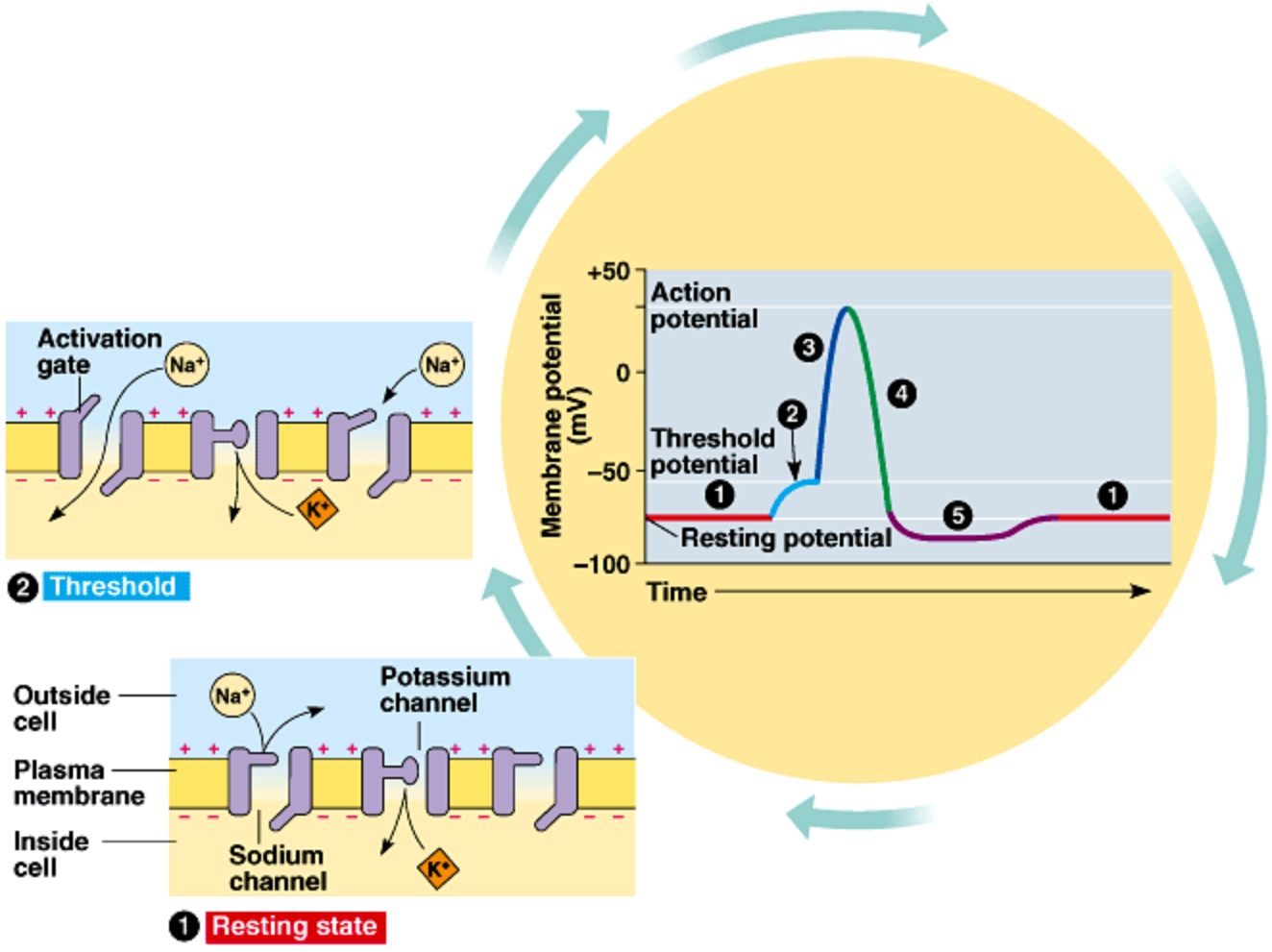


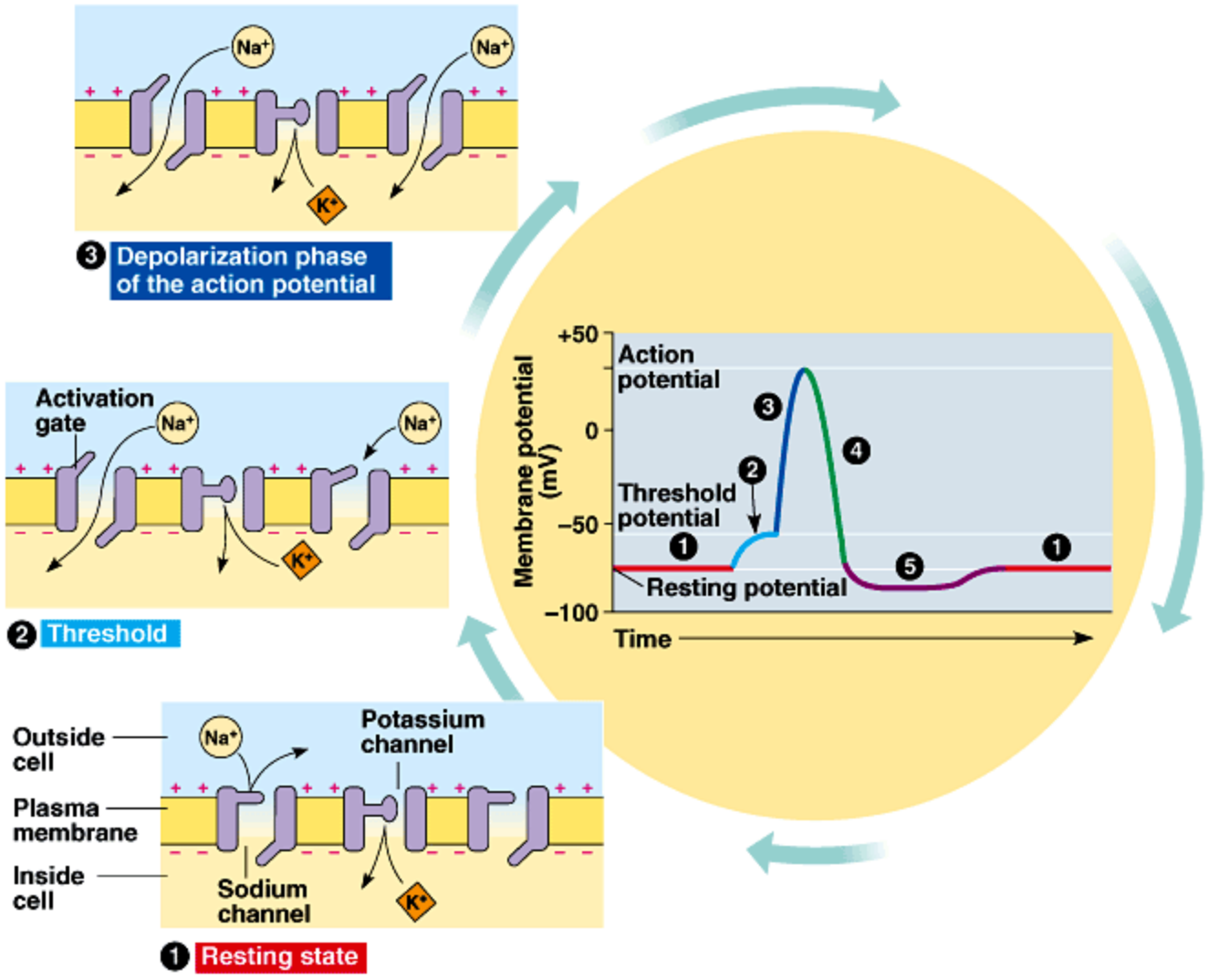
(a)

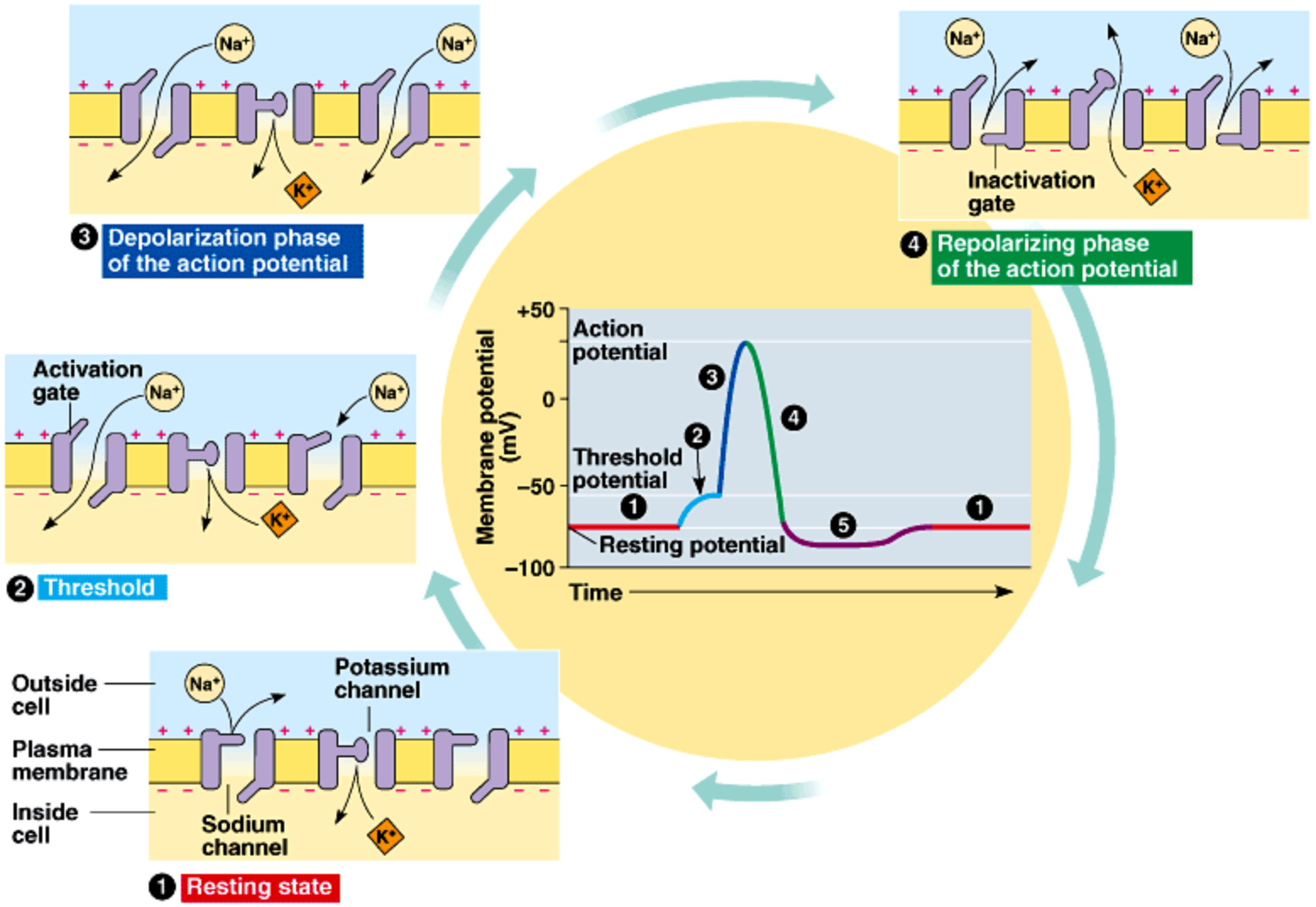


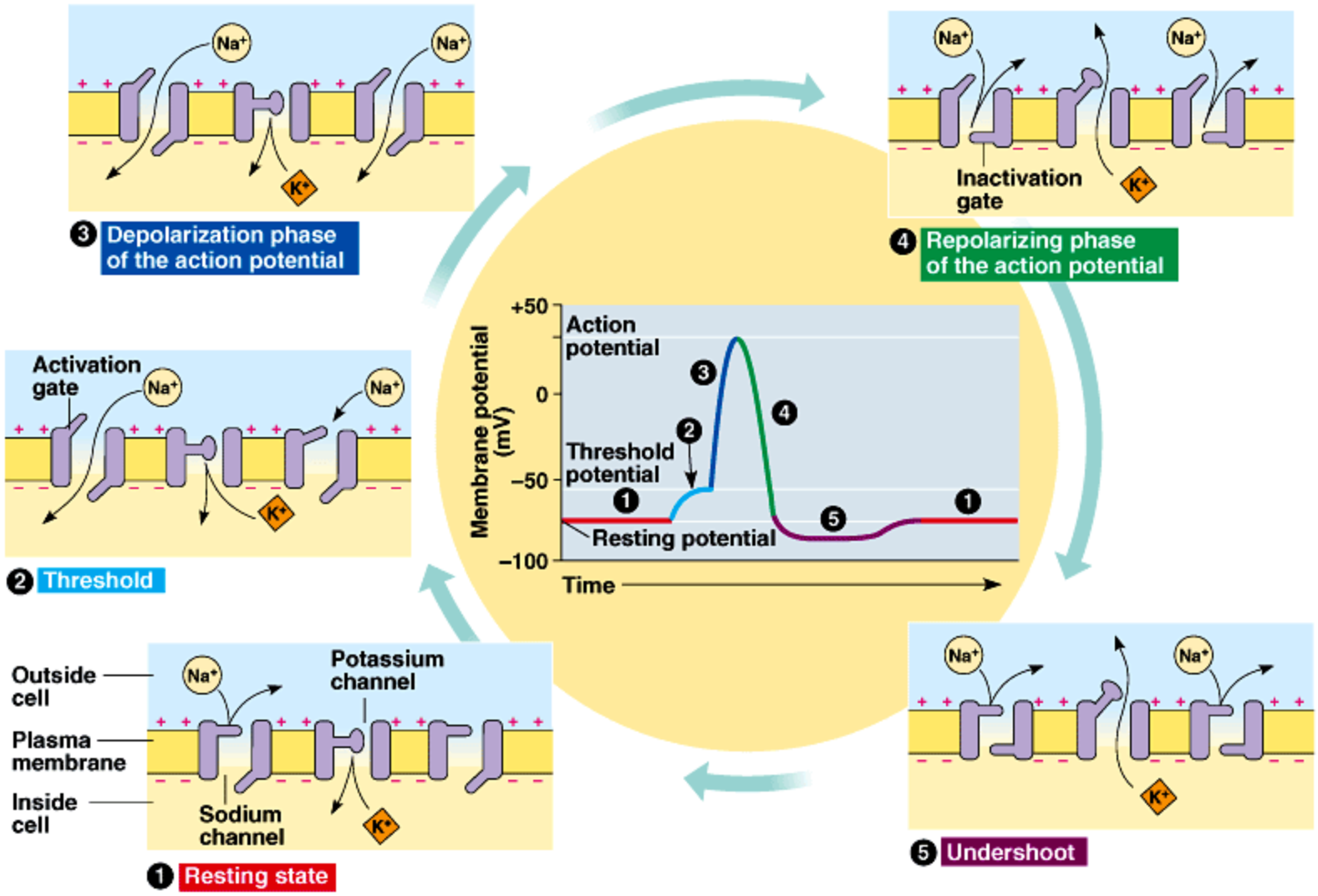
(b)

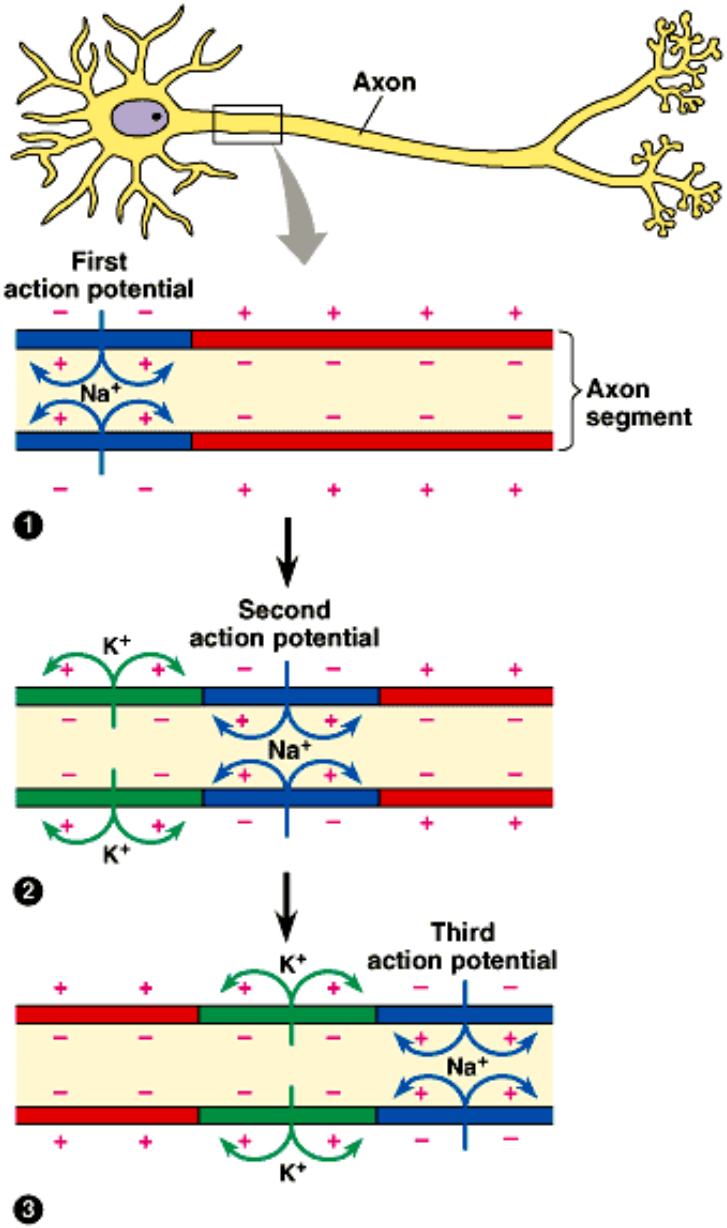


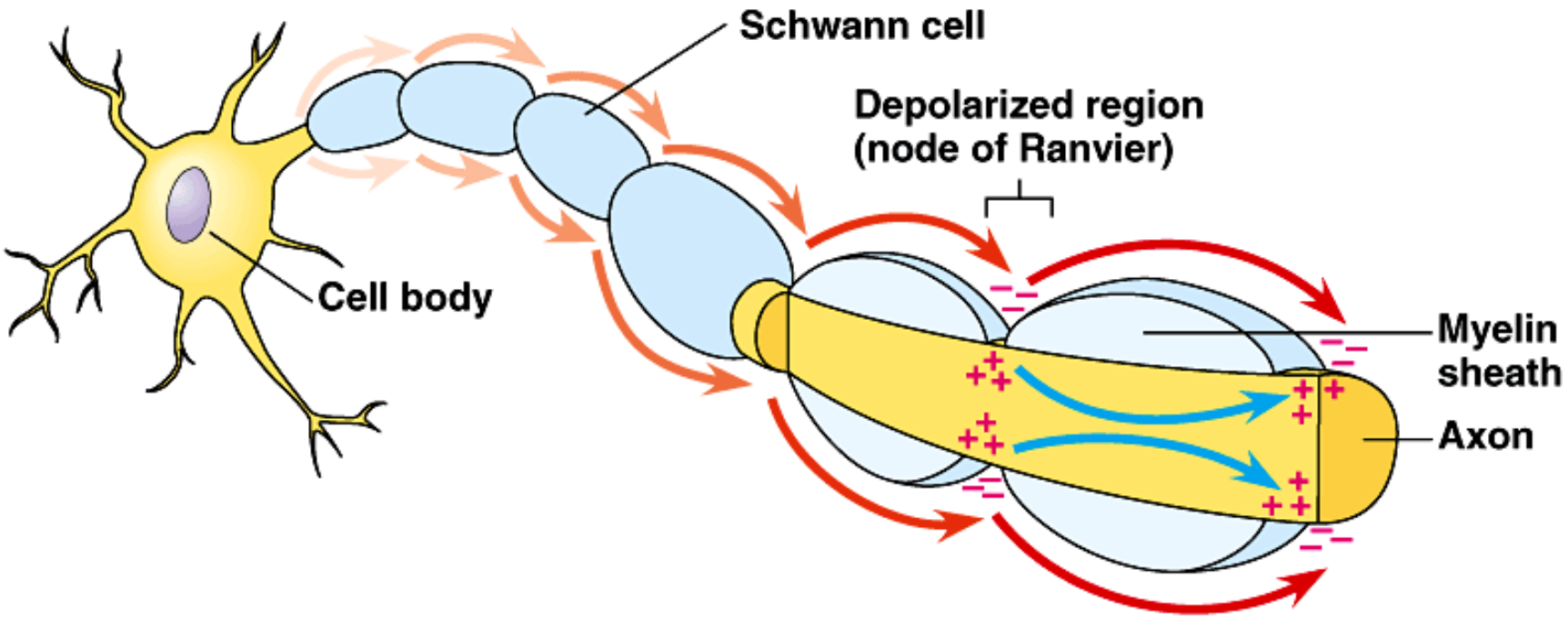


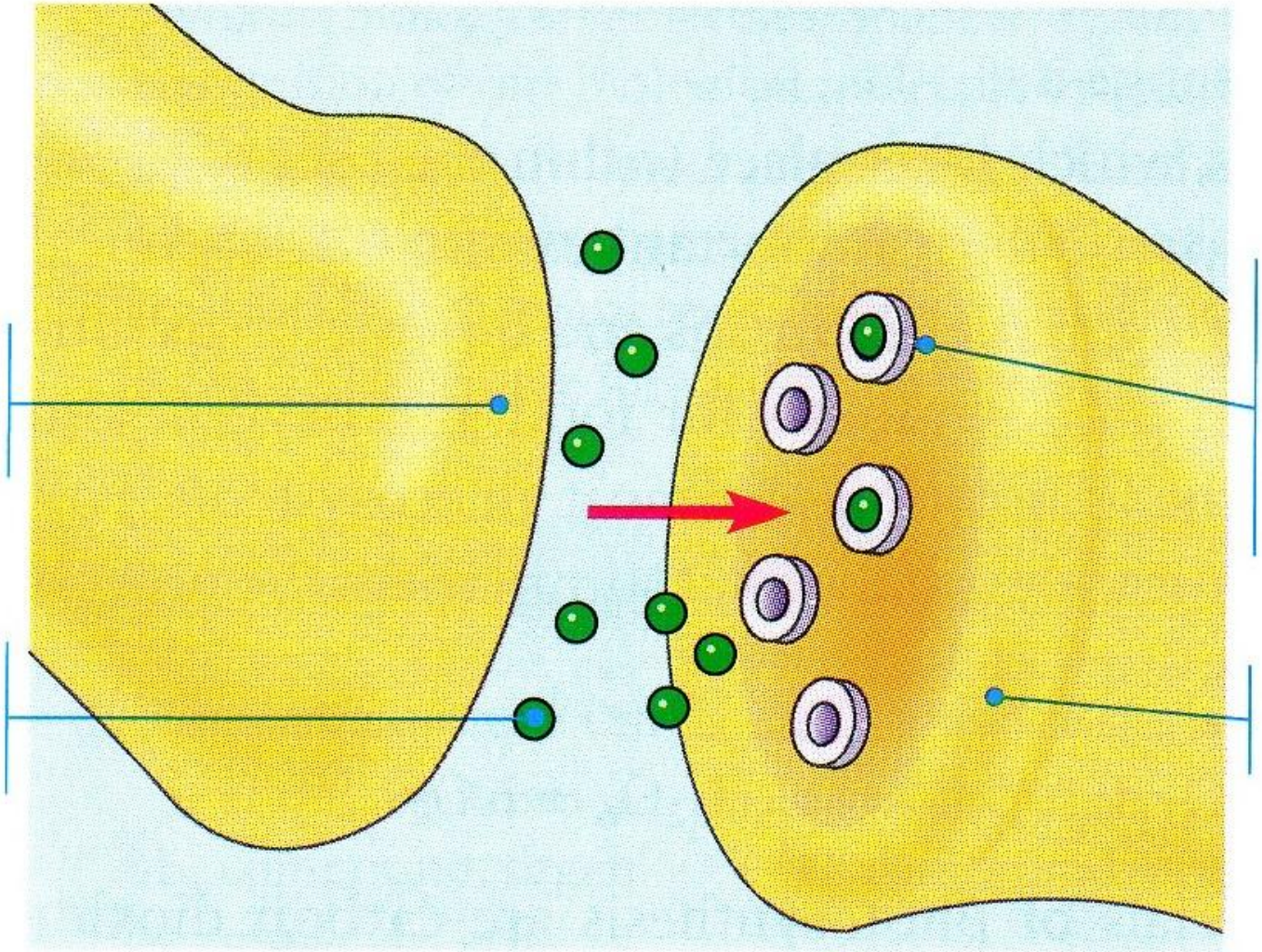


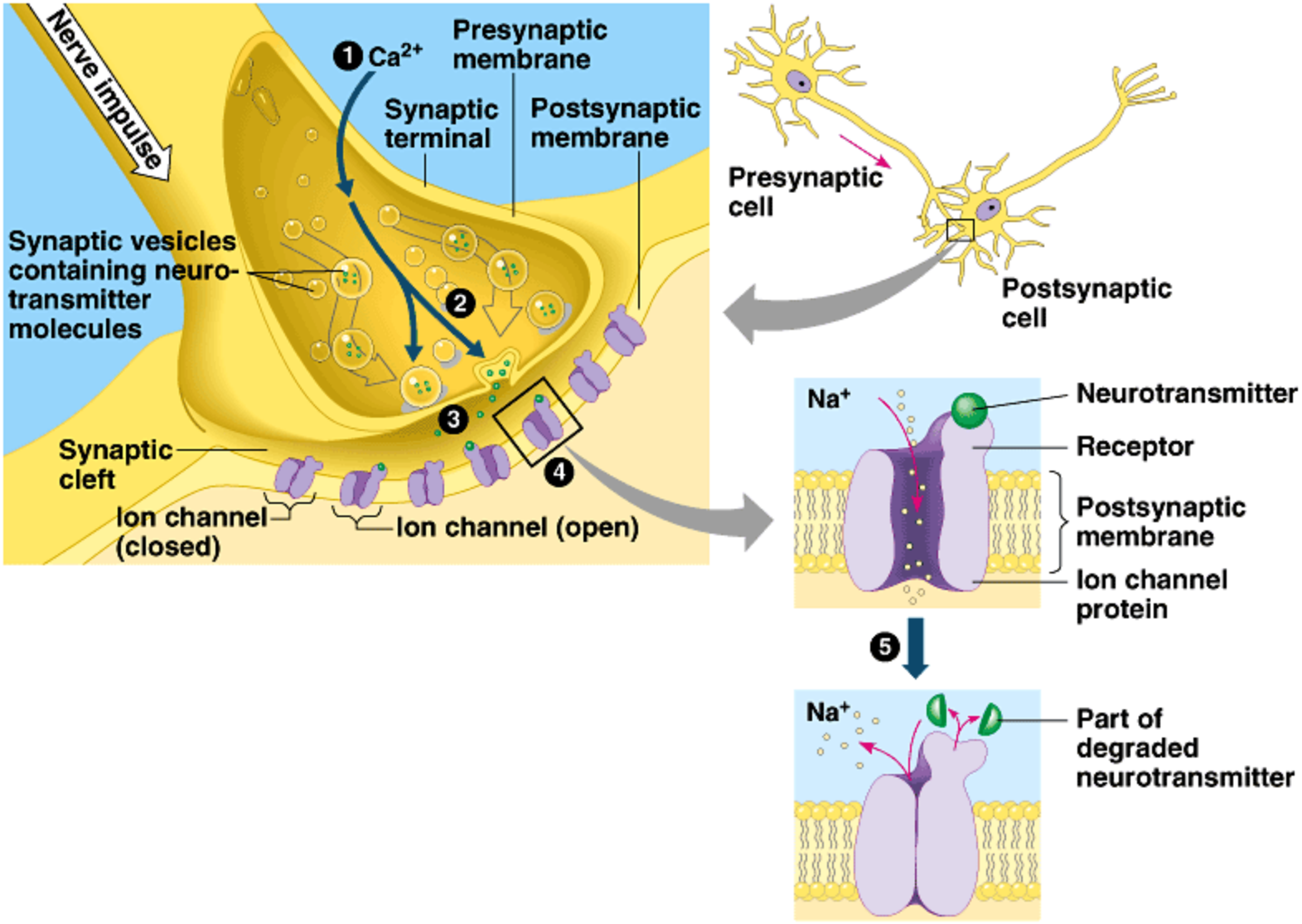












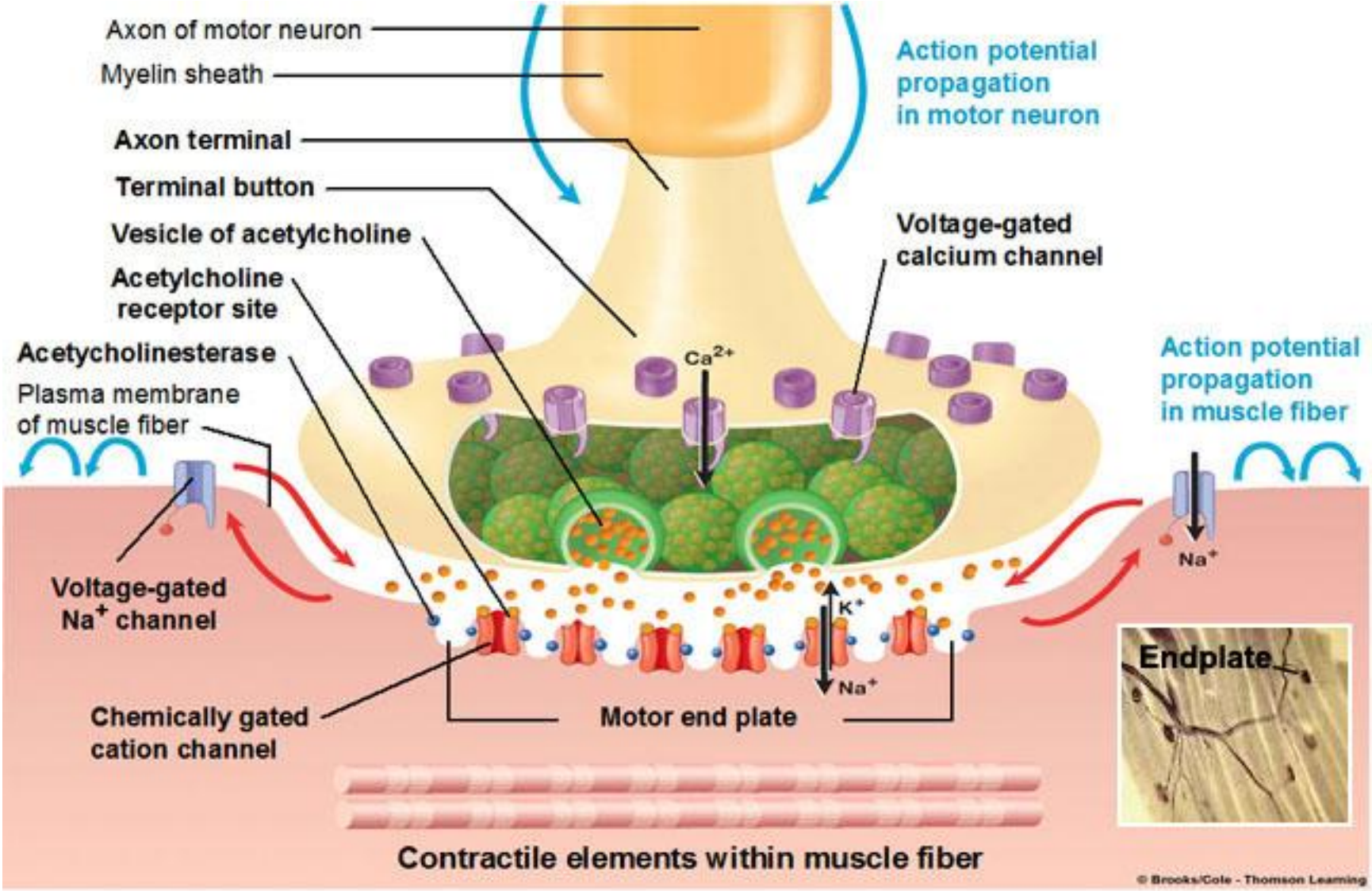

Axon of motor neuron
Myelin sheath
Axon terminal
Terminal button
Vesicle of acetylcholine
Acetylcholine receptor site
Acetycholinesterase
Plasma membrane of muscle fiber
Voltage-gated Na+ channel
Chemically gated cation channel
Action potential propagation in motor neuron
Voltage-gated calcium channel
Ca2+
Action potential propagation in muscle fiber
Na+
K+
Na+
Motor end plate
Endplate
Contractile elements within muscle fiber
© Brooks/Cole - Thomson Learning

Fig. 7-6, p. 245

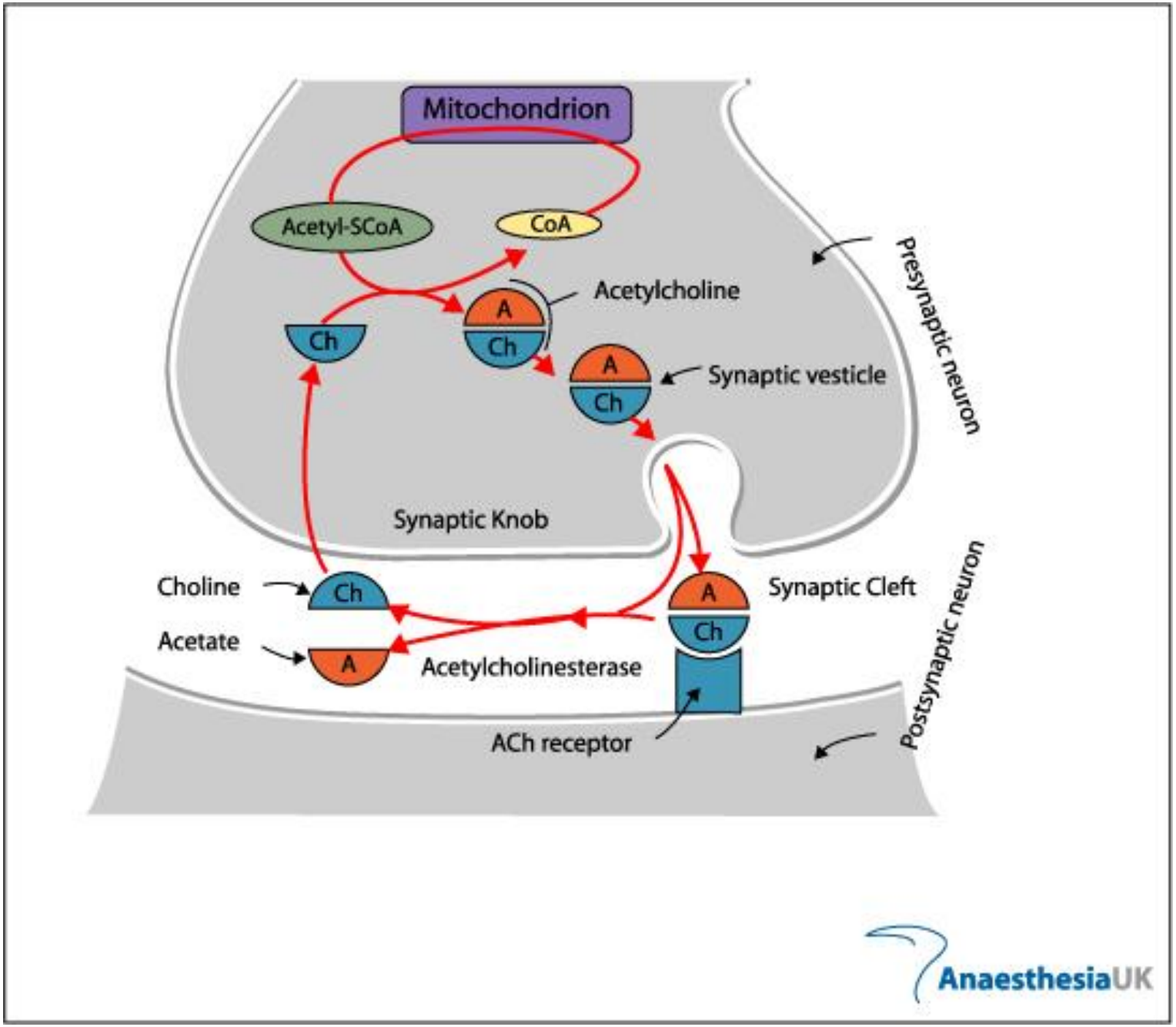
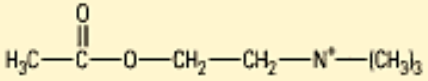
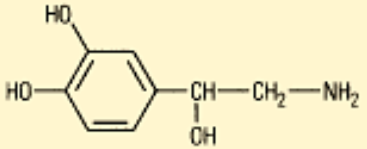
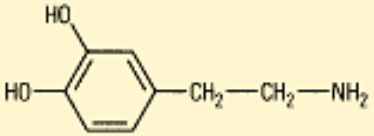
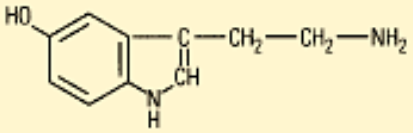
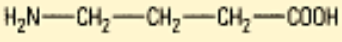
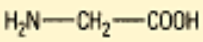
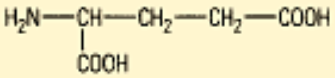
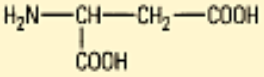
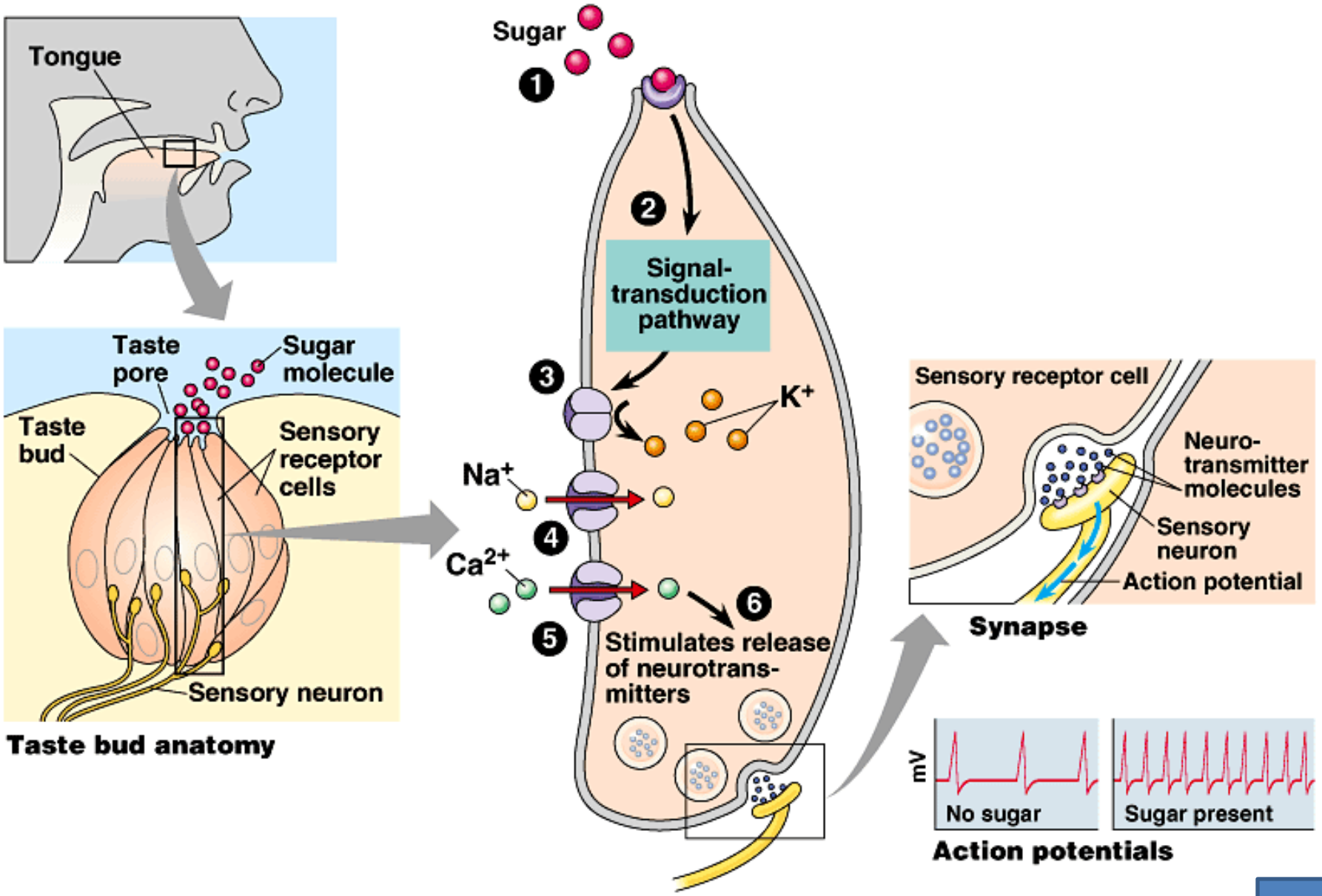

Mitochondrion
Acetyl-SCoA
CoA
Acetylcholine
A
Ch
Ch
A
Ch
Synaptic vesticle
Presynaptic neuron
Synaptic Knob
Choline
Ch
Acetate
A
Acetylcholinesterase
A
Ch
Synaptic Cleft
Postsynaptic neuron
ACh receptor
AnaesthesiaUK

Table 48.1 The Major Known Neurotransmitters

Neurotransmitter	Structure	Functional Class	Secretion Sites
Acetylcholine		Excitatory to vertebrate skeletal muscles; excitatory or inhibitory at other sites	CNS; PNS; vertebrate neuromuscular junction
Biogenic Amines			
Norepinephrine		Excitatory or inhibitory	CNS; PNS
Dopamine		Generally excitatory; may be inhibitory at some sites	CNS; PNS
Serotonin		Generally inhibitory	CNS
Amino Acids			
GABA (gamma aminobutyric acid)		Inhibitory	CNS; invertebrate neuromuscular junction
Glycine		Inhibitory	CNS
Glutamate		Excitatory	CNS; invertebrate neuromuscular junction
Aspartate		Excitatory	CNS
Neuropeptides			
Substance P	Arg—Pro—Lys—Pro—Gln—Gln—Phe—Phe—Gly—Leu—Met	Excitatory	CNS; PNS
Met-enkephalin (an endorphin)	Tyr—Gly—Gly—Phe—Met	Generally inhibitory	CNS

CONTOH KERJA SYARAF



BACK

SISTEM ENDOKRIN

Sekretnya dikeluarkan tidak punya saluran khusus

↓

Umumnya disalurkan via peredaran darah

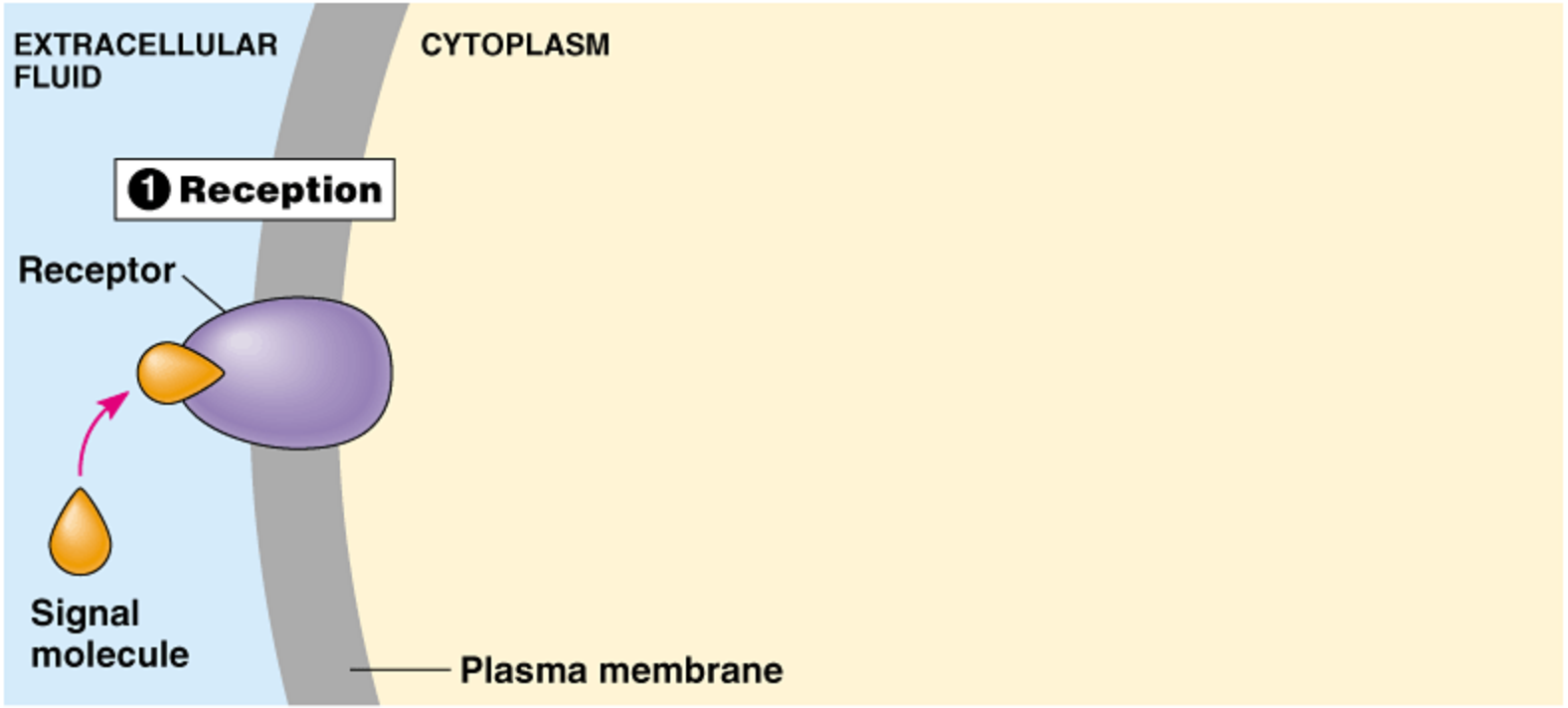
EKSOKRIN ???

Sekretnya dikeluarkan pada saluran yang sudah tersedia

↓

Misalnya pankreas yang punya saluran ke duodenum

CARA KERJA HORMON



SISTEM ENDOKRIN

Sekretnya dikeluarkan tidak punya saluran khusus

↓

Umumnya disalurkan via peredaran darah

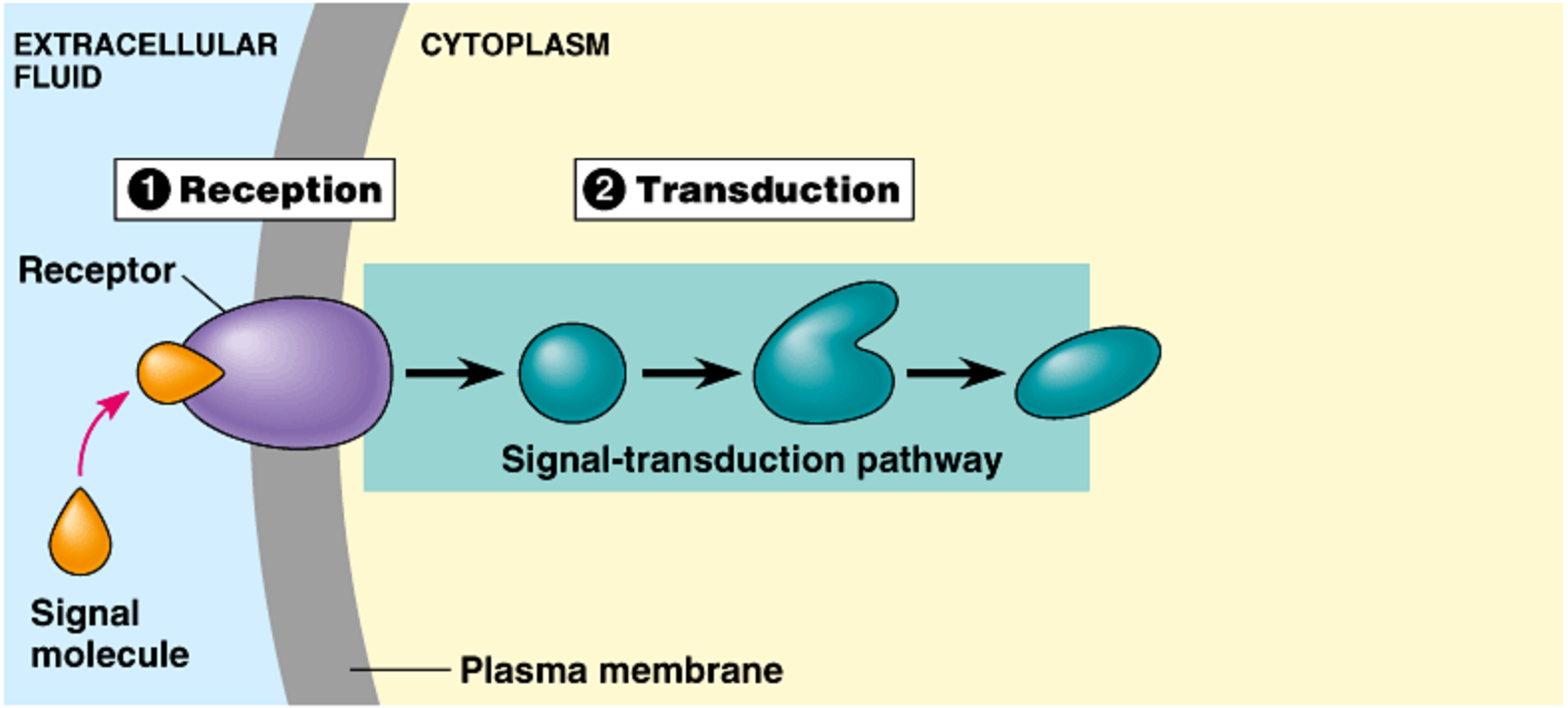
EKSOKRIN ???

Sekretnya dikeluarkan pada saluran yang sudah tersedia

↓

Misalnya pankreas yang punya saluran ke duodenum

CARA KERJA HORMON



SISTEM ENDOKRIN

Sekretnya dikeluarkan tidak punya saluran khusus

↓

Umumnya disalurkan via peredaran darah

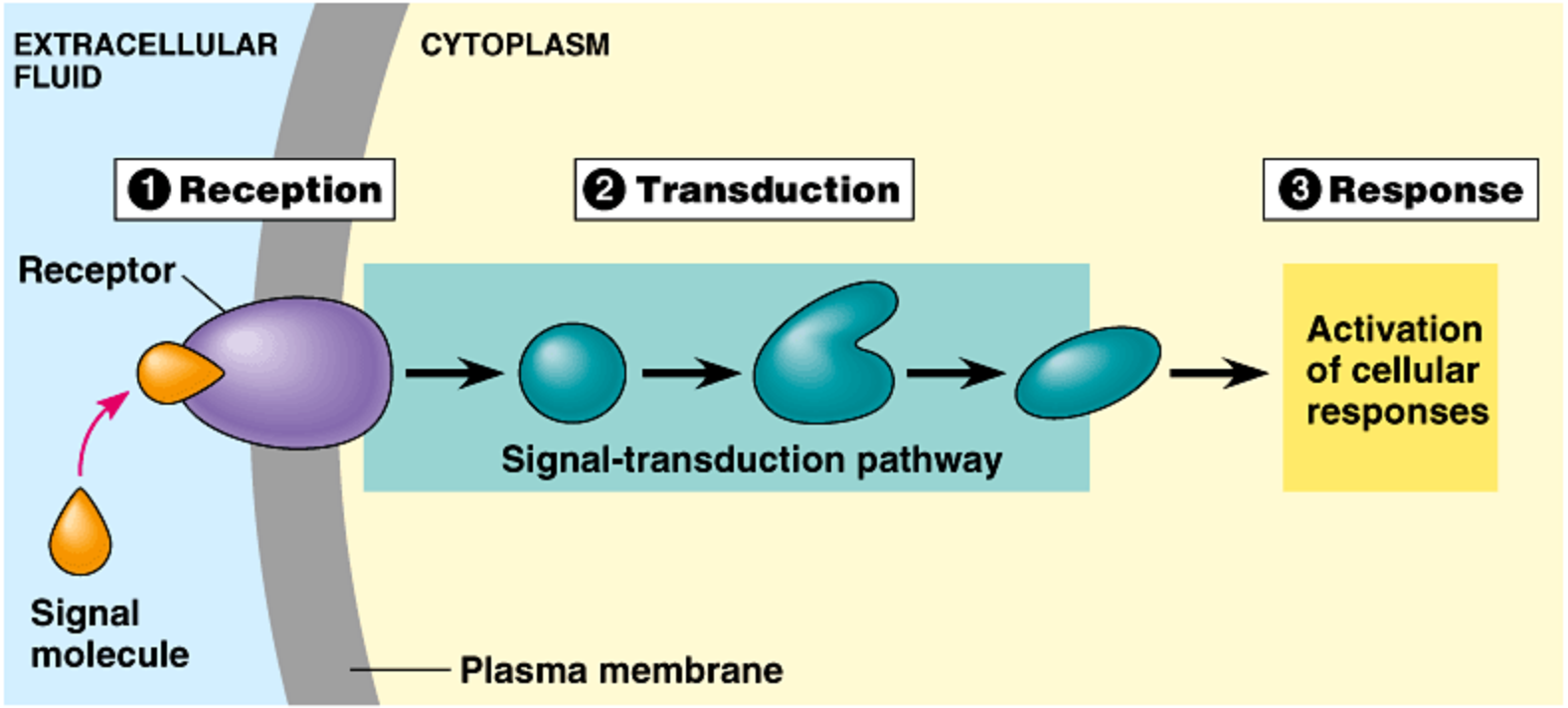
EKSOKRIN ???

Sekretnya dikeluarkan pada saluran yang sudah tersedia

↓

Misalnya pankreas yang punya saluran ke duodenum

CARA KERJA HORMON



PERAN HORMON

1. Pertumbuhan
2. Perkembangan
3. Reproduksi
4. Energi metabolisme
5. Homeostasis

SIFAT KERJA HORMON

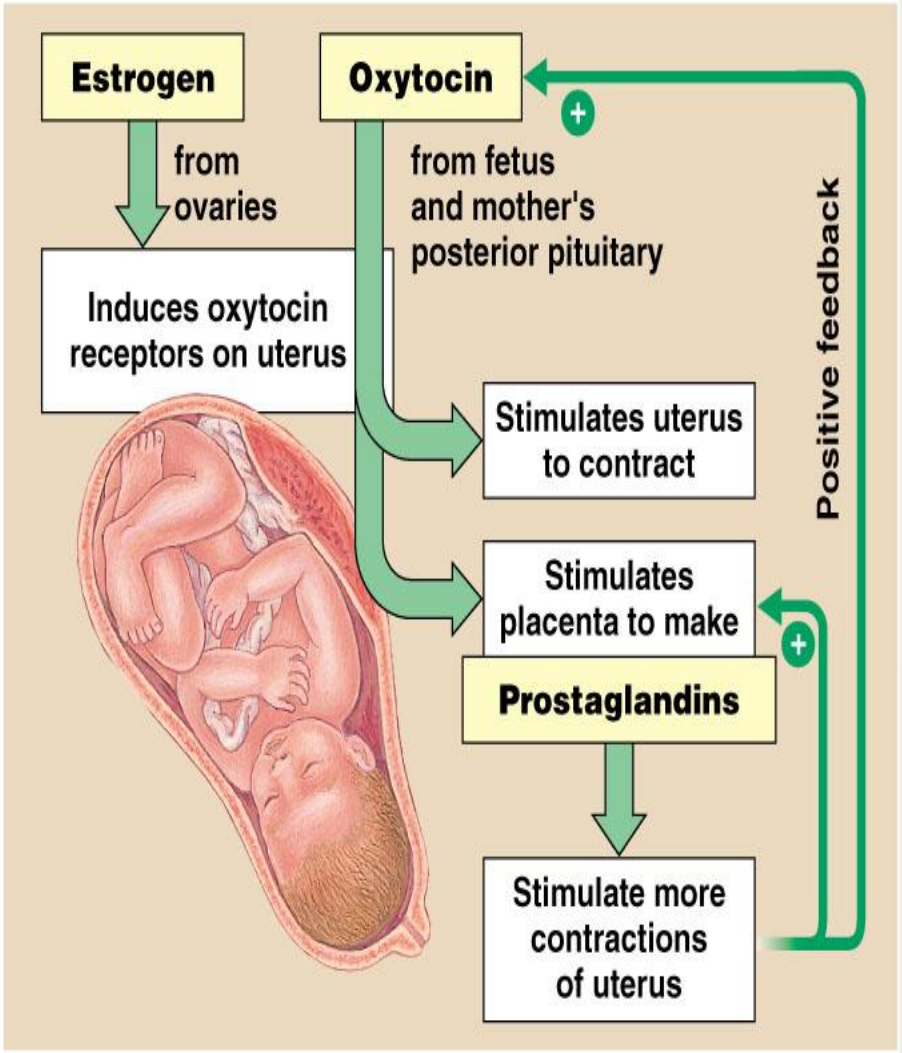
1. Satu hormon untuk banyak fungsi → Hormon leptin → memulai pubertas dan pengaturan energi

2. Satu hormon untuk fungsi yang spesifik → Hormon ACTH → memicu kerja kelenjar adrenal

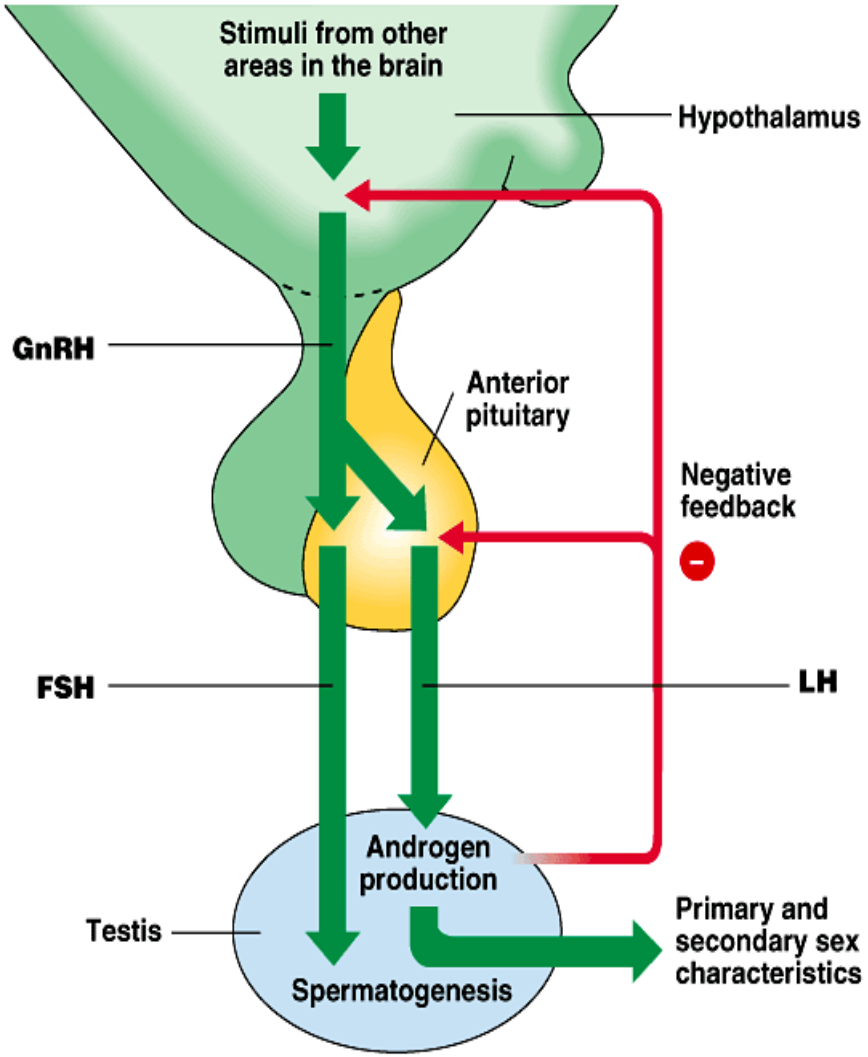
3. Banyak hormon untuk satu fungsi → Hormon leptin, glucocorticoid, thyroid, steroid → Berperan dalam mengontrol pertumbuhan

KONTROL KERJA HORMON

Umpan balik POSITIF



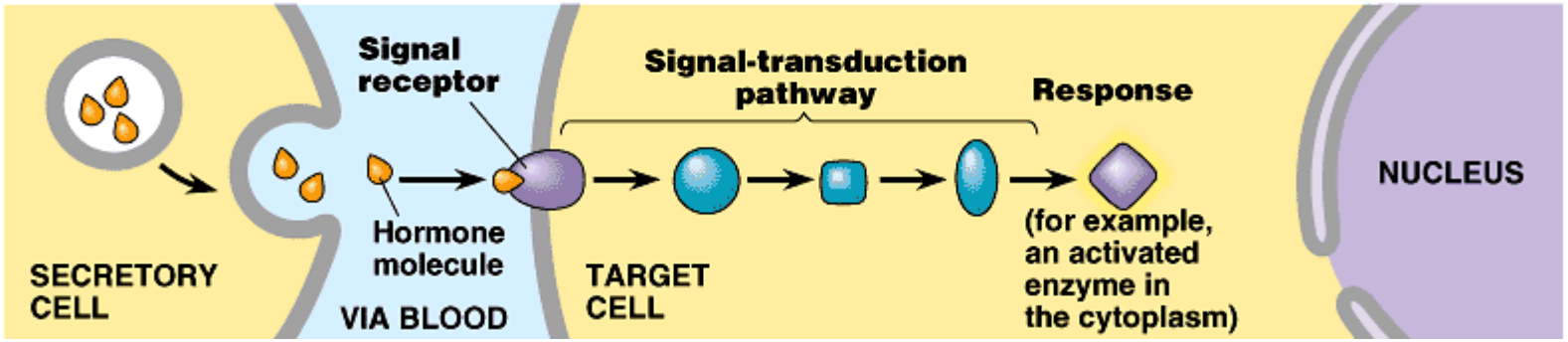
Umpan balik NEGATIF



JENIS HORMON BERDASARKAN KOMPONEN UTAMA

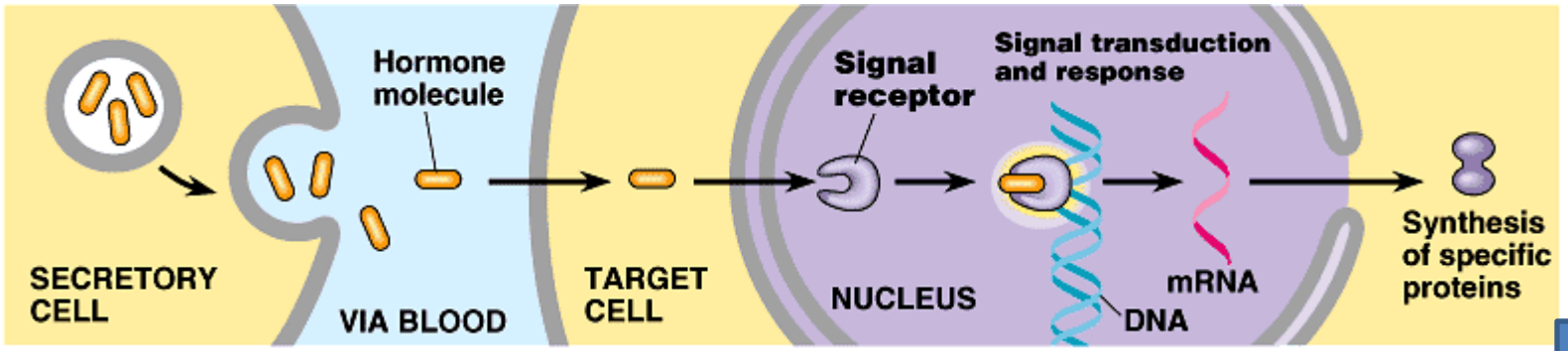
1. Hormon PEPTIDA

- Memiliki bahan dasar asam amino/protein
- Reseptor sel target terletak pada membran sel
- Contoh : thyroxin, adrenalin, ACTH, LH

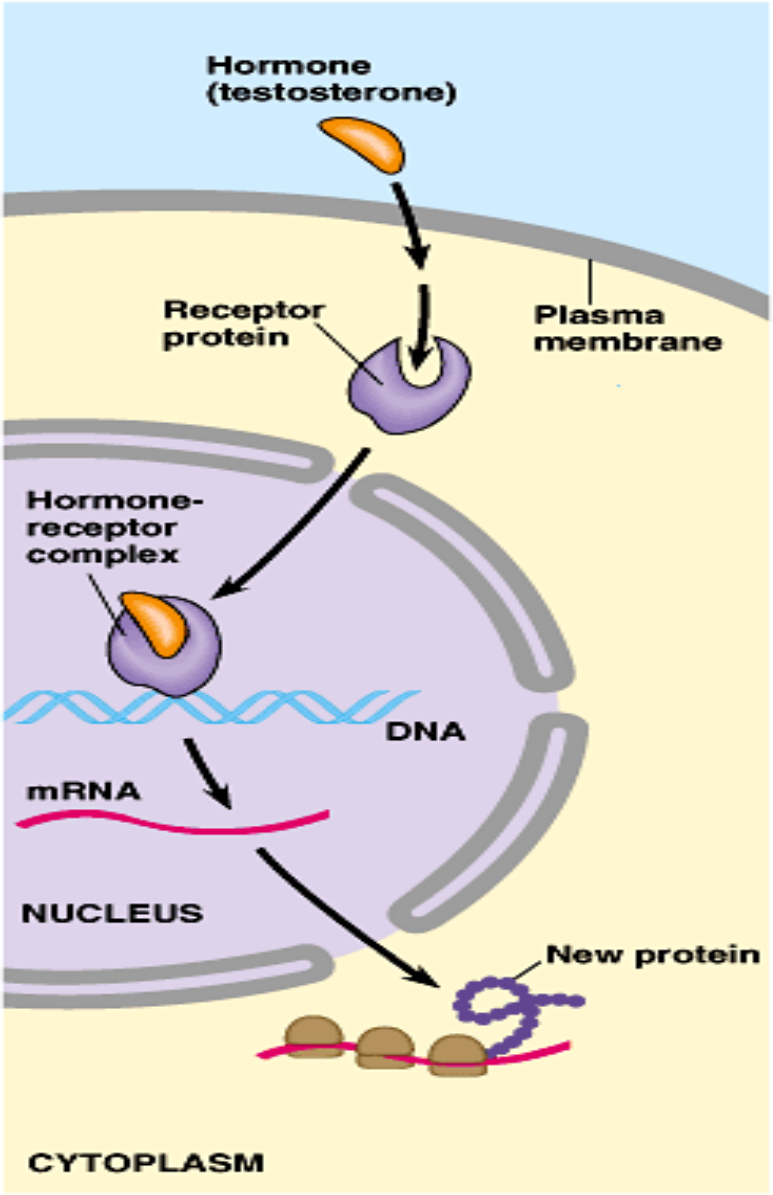


2. Hormon STEROID

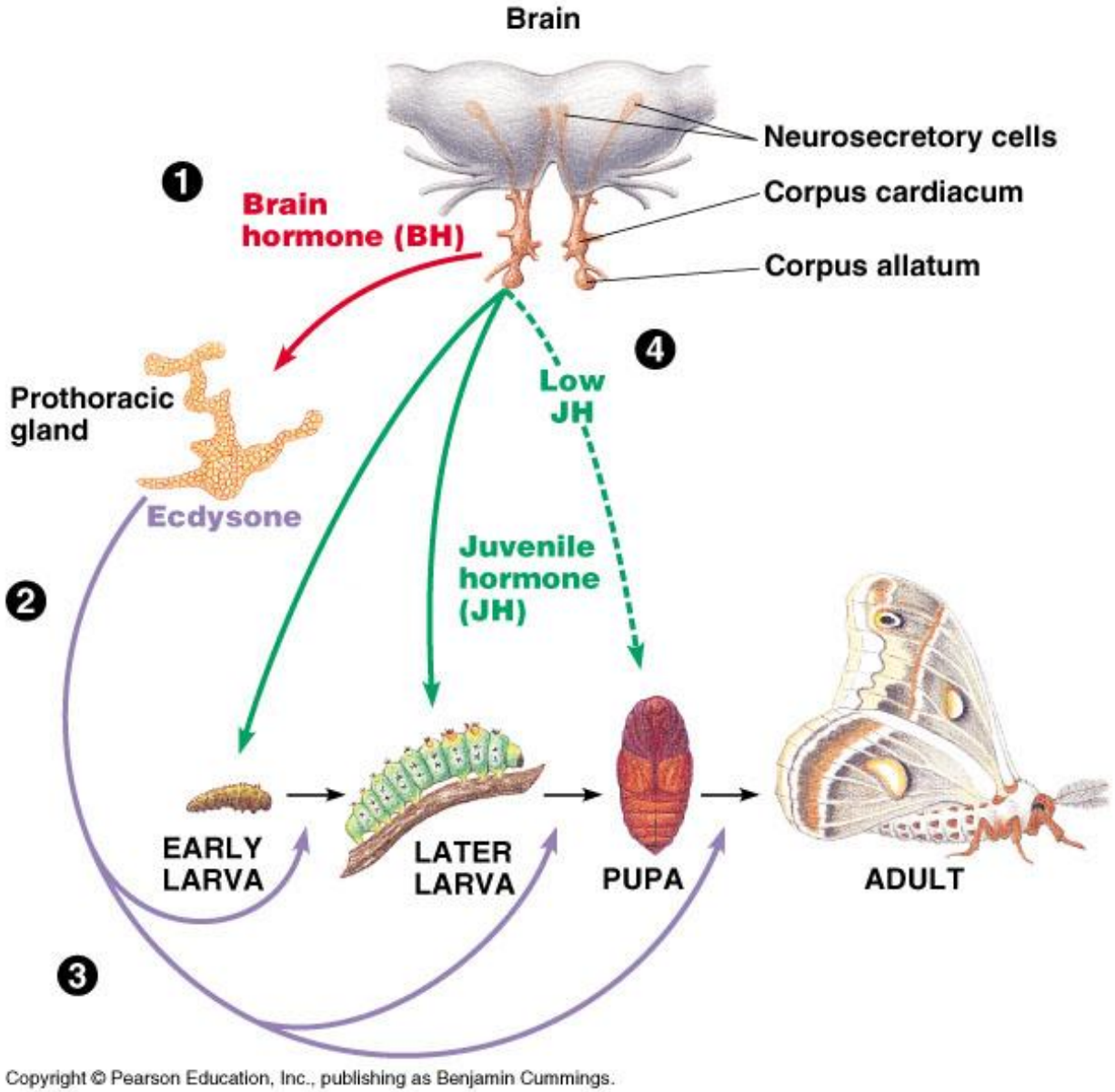
- Memiliki bahan dasar kolesterol
- Reseptor terletak di dalam sel target
- Contoh : glucocorticoid, testosteron, estrogen



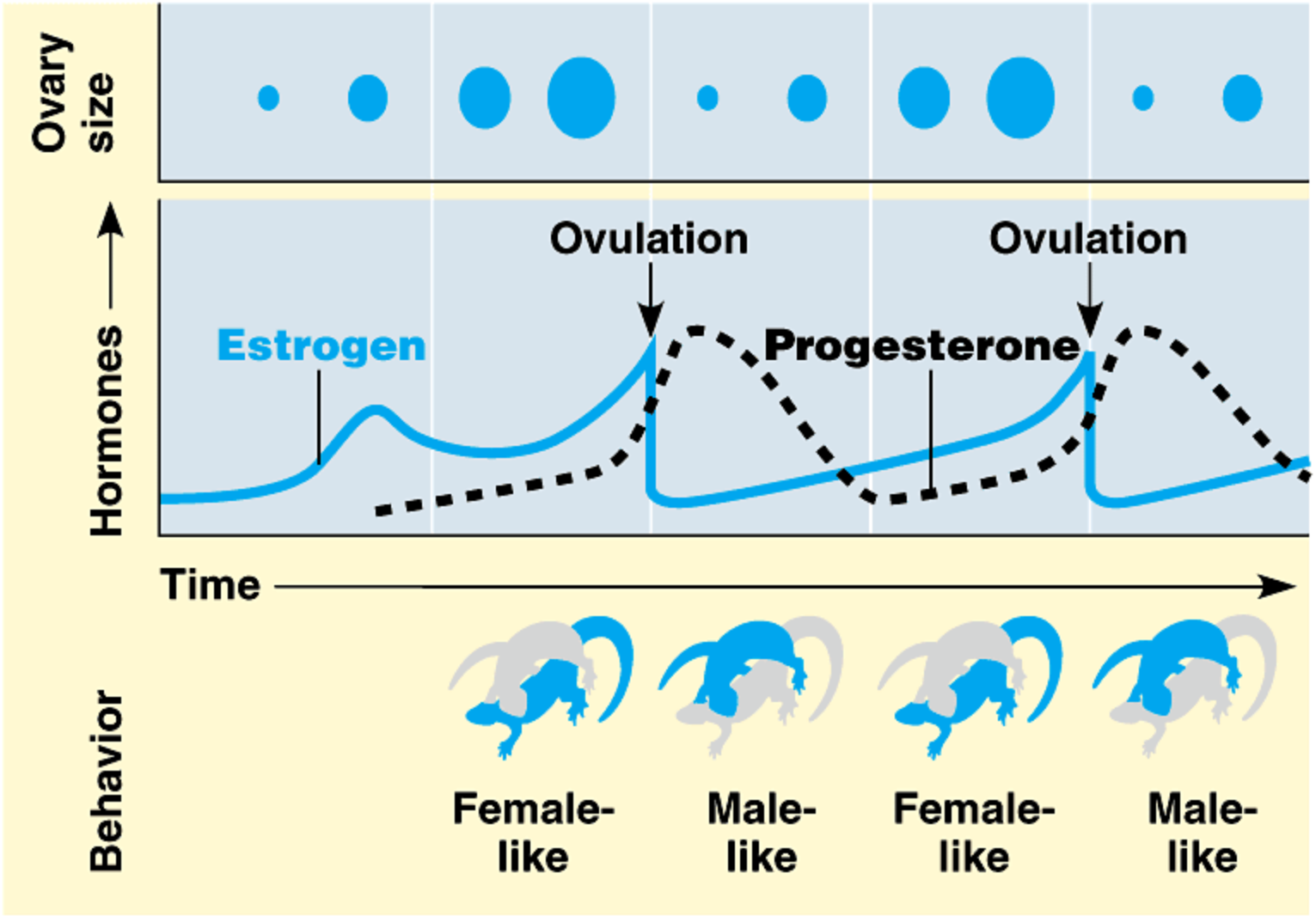
CONTOH MEKANISME KERJA TESTOSTERON



CONTOH KERJA HORMON PADA INVERTEBRATA

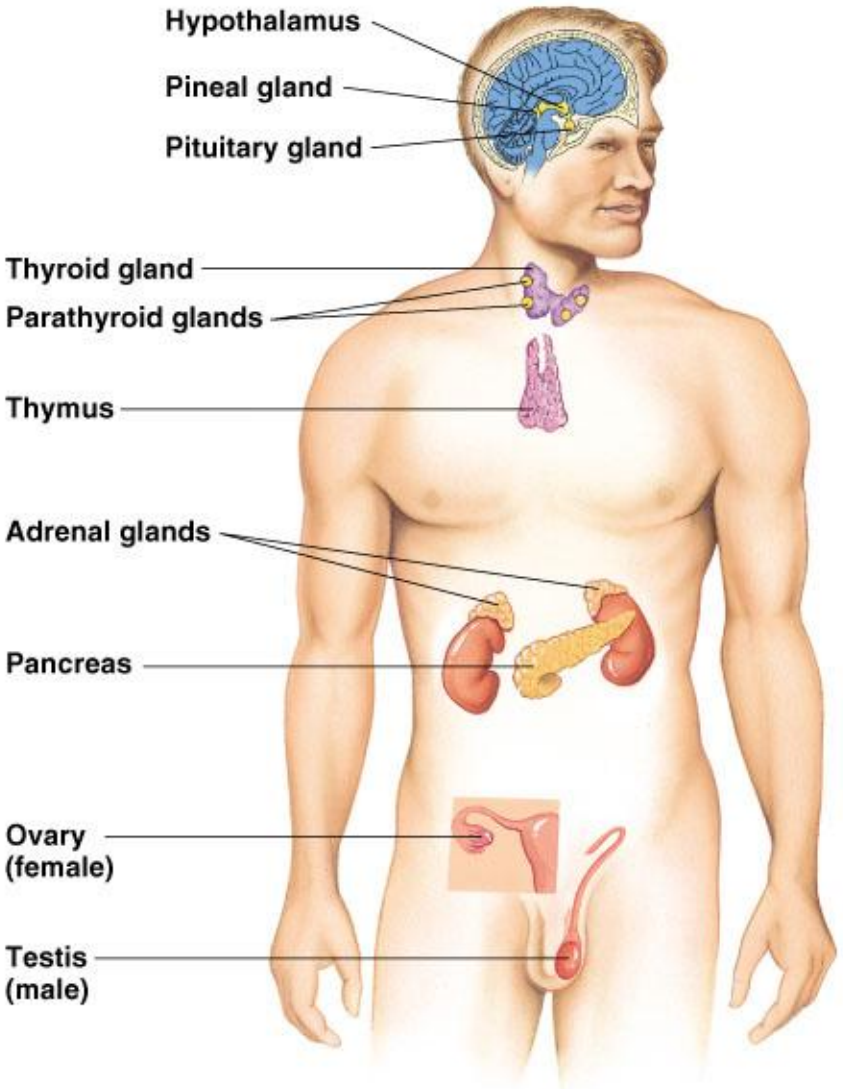


CONTOH KERJA HORMON PADA VERTEBRATA

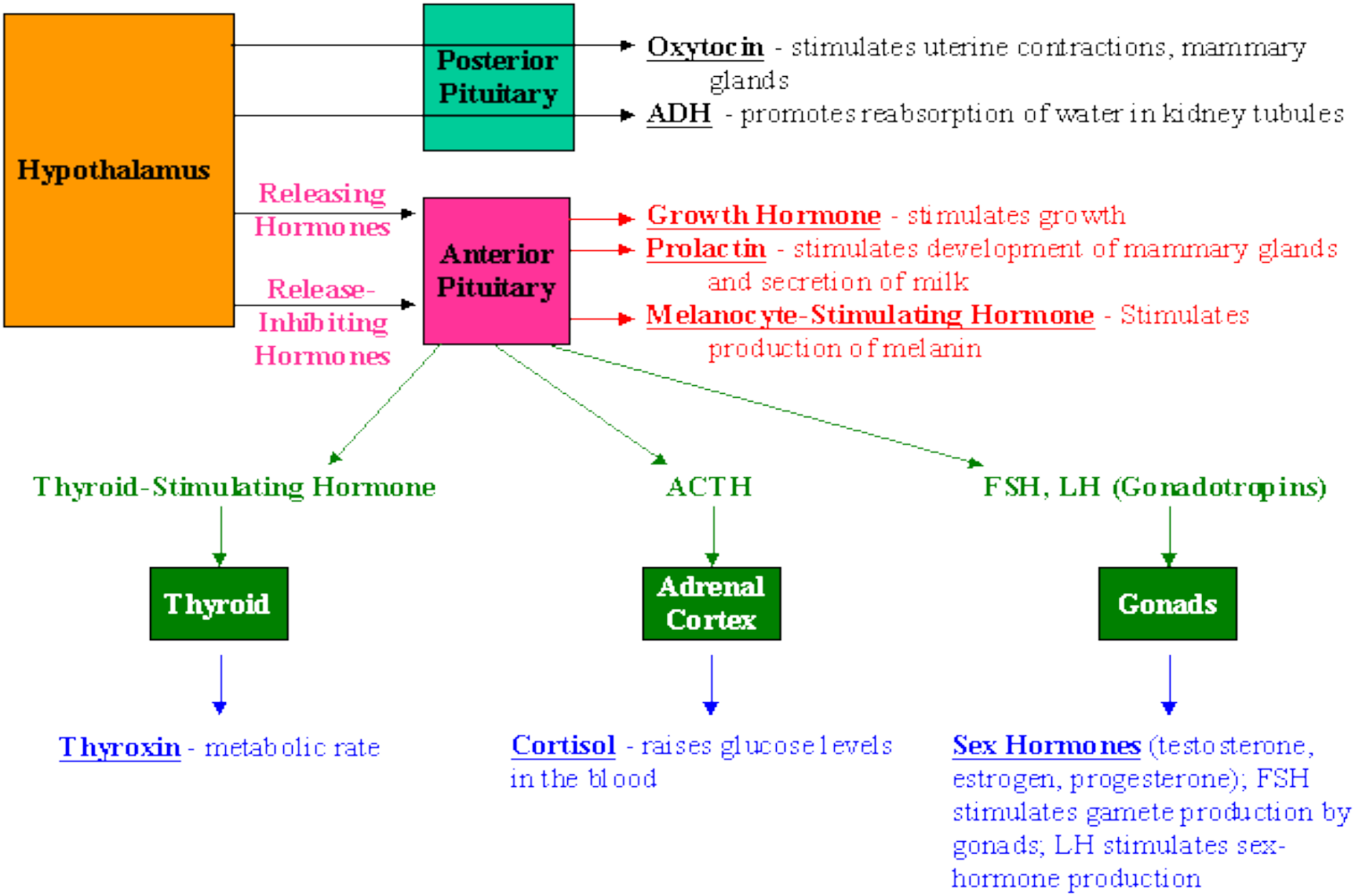


(b)

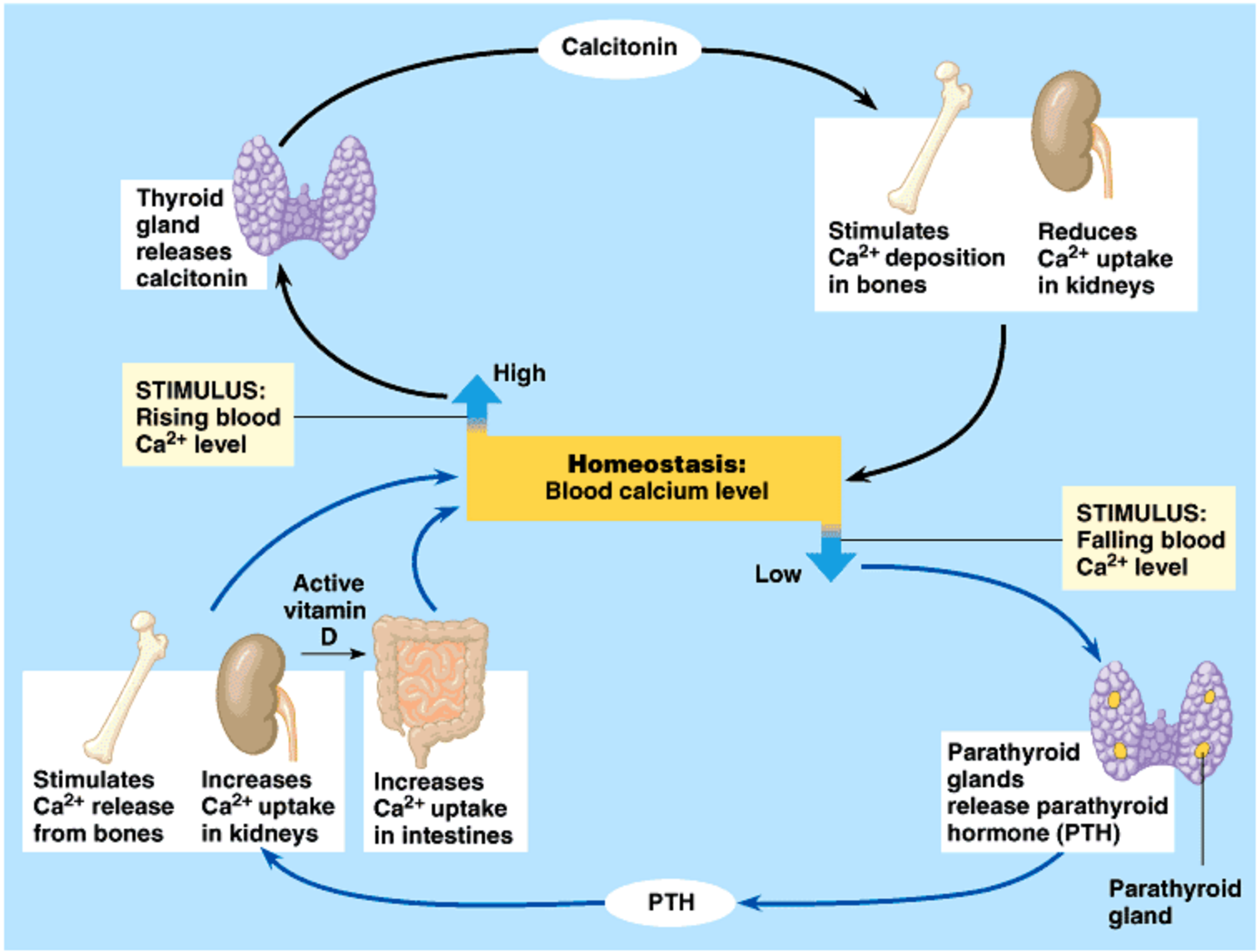
LETAK KELENJAR PADA MANUSIA DAN MAMALIA UMUMNYA



MEKANISME UMUM KERJA HORMON YANG DISTIMULUS OLEH HYPOTHALAMUS



- MEKANISME KERJA HORMON YANG DIRANGSANG OLEH KONDISI DARAH
- PERAN HORMON DALAM MENJAGA HOMEOSTASIS



- MEKANISME KERJA HORMON YANG DIRANGSANG OLEH KONDISI DARAH
- PERAN HORMON DALAM MENJAGA HOMEOSTASIS

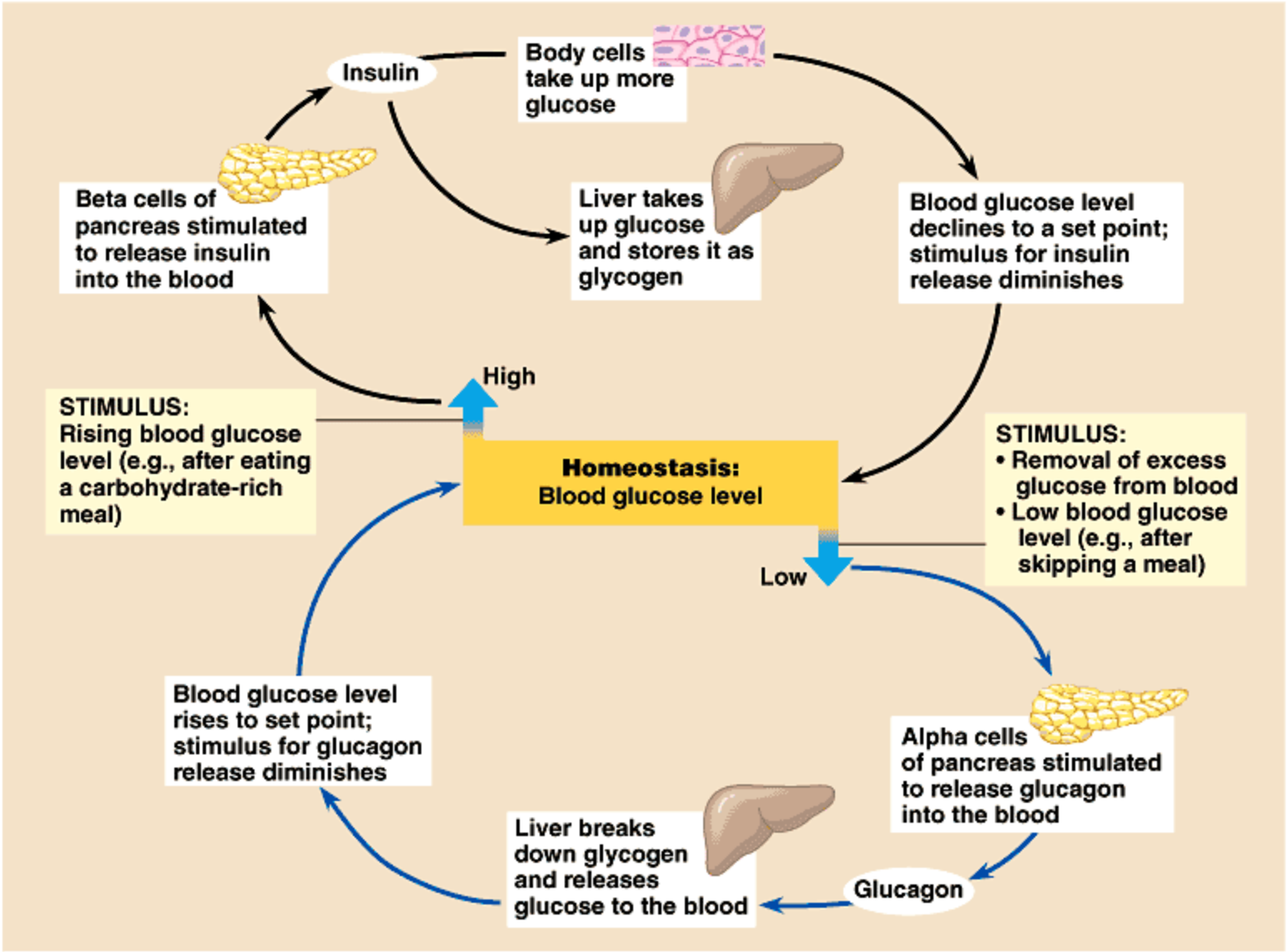


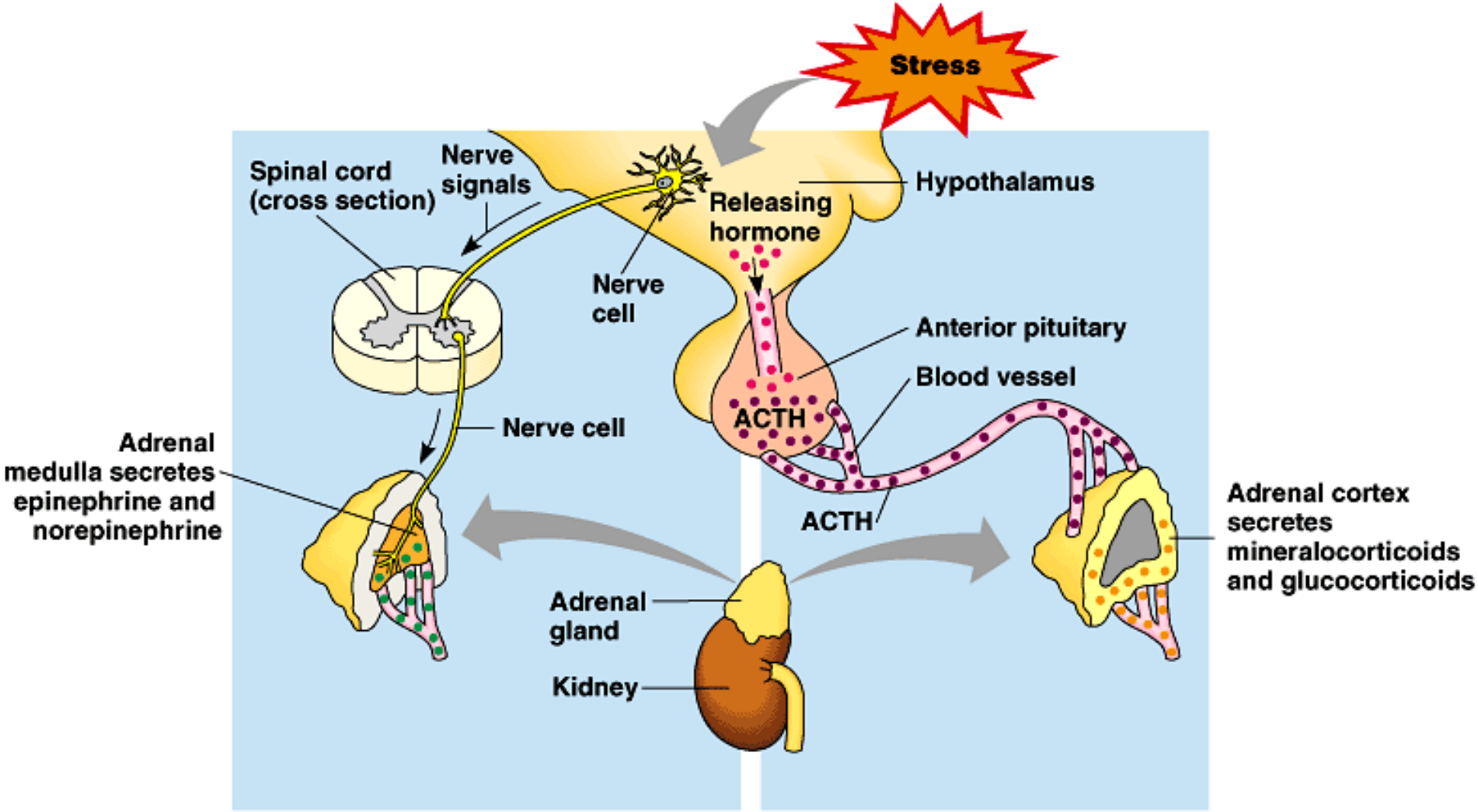
Table 45.1 Major Vertebrate Endocrine Glands and Some of Their Hormones (Hypothalamus – Parathyroid glands)

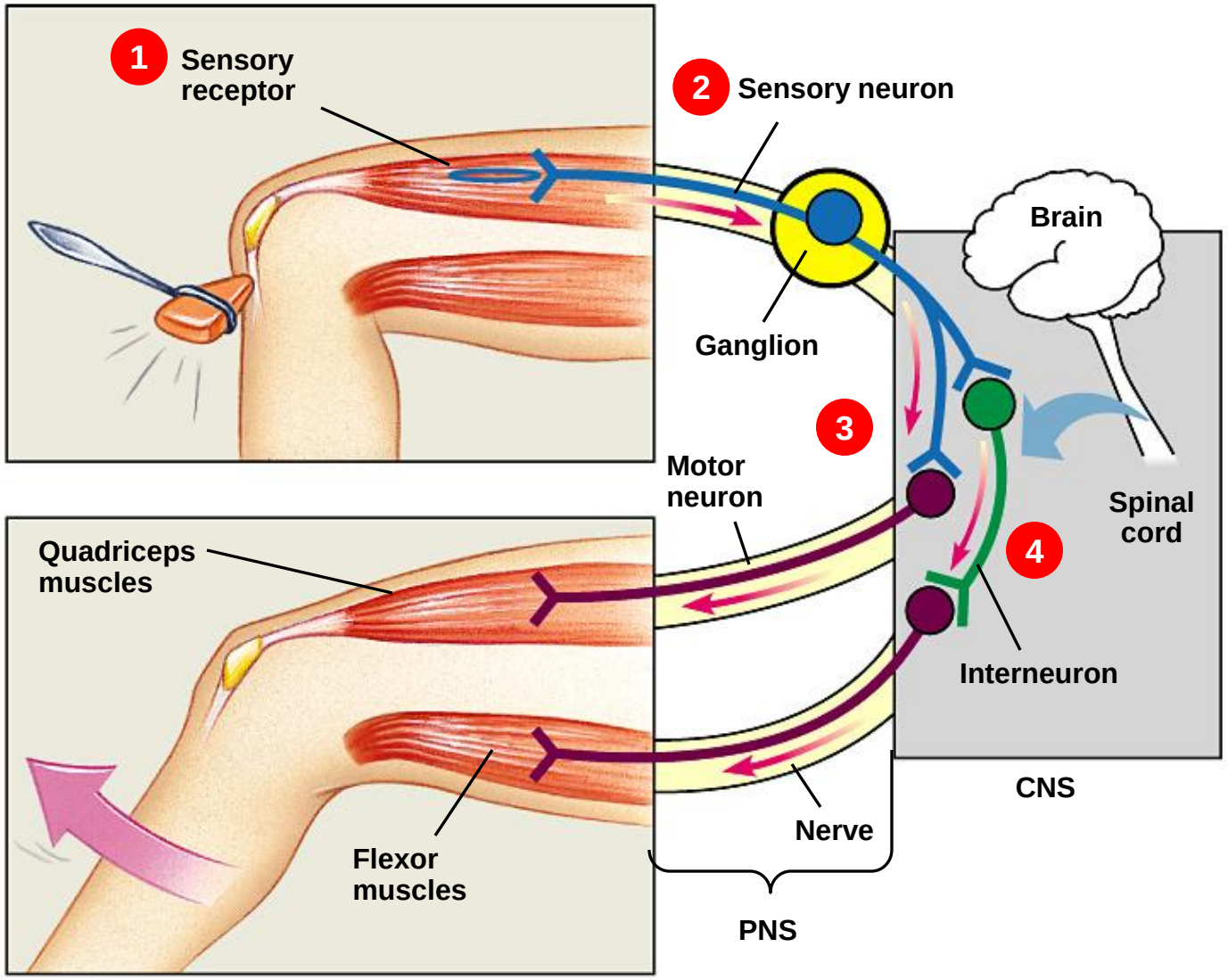
Gland		Hormone	Chemical Class	Representative Actions	Regulated By
Hypothalamus		Hormones released by the posterior pituitary and hormones that regulate the anterior pituitary (see below)			
Pituitary gland Posterior pituitary (releases hormones made by hypothalamus)		Oxytocin	Peptide	Stimulates contraction of uterus and mammary gland cells	Nervous system
		Antidiuretic hormone (ADH)	Peptide	Promotes retention of water by kidneys	Water/salt balance
Anterior pituitary		Growth hormone (GH)	Protein	Stimulates growth (especially bones) and metabolic functions	Hypothalamic hormones
		Prolactin (PRL)	Protein	Stimulates milk production and secretion	Hypothalamic hormones
		Follicle-stimulating hormone (FSH)	Glycoprotein	Stimulates production of ova and sperm	Hypothalamic hormones
		Luteinizing hormone (LH)	Glycoprotein	Stimulates ovaries and testes	Hypothalamic hormones
		Thyroid-stimulating hormone (TSH)	Glycoprotein	Stimulates thyroid gland	Thyroxine in blood; hypothalamic hormones
		Adrenocorticotropic hormone (ACTH)	Peptide	Stimulates adrenal cortex to secrete glucocorticoids	Glucocorticoids; hypothalamic hormones
Thyroid gland		Triiodothyronine (T_3) and thyroxine (T_4)	Amine	Stimulate and maintain metabolic processes	TSH
		Calcitonin	Peptide	Lowers blood calcium level	Calcium in blood
Parathyroid glands		Parathyroid hormone (PTH)	Peptide	Raises blood calcium level	Calcium in blood

Table 45.1 Major Vertebrate Endocrine Glands and Some of Their Hormones (Pancreas – Thymus)

Gland		Hormone	Chemical Class	Representative Actions	Regulated By
Pancreas		Insulin	Protein	Lowers blood glucose level	Glucose in blood
		Glucagon	Protein	Raises blood glucose level	Glucose in blood
Adrenal glands Adrenal medulla		Epinephrine and norepinephrine	Amine	Raise blood glucose level; increase metabolic activities; constrict certain blood vessels	Nervous system
Adrenal cortex		Glucocorticoids	Steroid	Raise blood glucose level	ACTH
		Mineralocorticoids	Steroid	Promote reabsorption of Na^+ and excretion of K^+ in kidneys	K^+ in blood
Gonads Testes		Androgens	Steroid	Support sperm formation; promote development and maintenance of male secondary sex characteristics	FSH and LH
Ovaries		Estrogens	Steroid	Stimulate uterine lining growth; promote development and maintenance of female secondary sex characteristics	FSH and LH
		Progesterone	Steroid	Promotes uterine lining growth	FSH and LH
Pineal gland		Melatonin	Amine	Involved in biological rhythms	Light/dark cycles
Thymus		Thymosin	Peptide	Stimulates T lymphocytes	Not known

BACK




1
Sensory receptor
2
Sensory neuron
Brain
Ganglion
3
Motor neuron
Spinal cord
4
Quadriceps muscles
Interneuron
CNS
Nerve
Flexor muscles
PNS

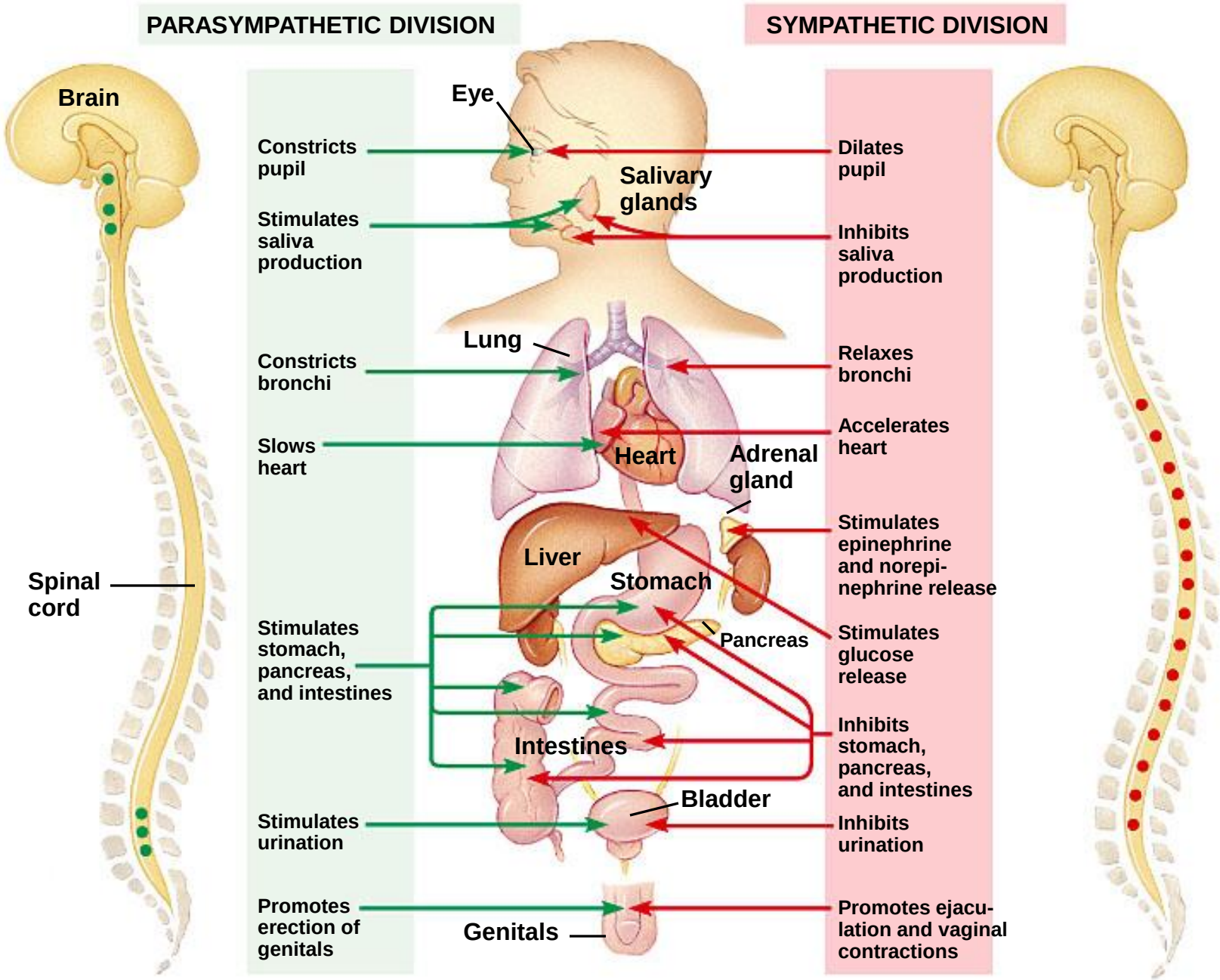

PARASYMPATHETIC DIVISION
SYMPATHETIC DIVISION
Brain
Spinal cord
Eye
Constricts pupil
Dilates pupil
Salivary glands
Stimulates saliva production
Inhibits saliva production
Lung
Constricts bronchi
Relaxes bronchi
Slows heart
Heart
Accelerates heart
Adrenal gland
Stimulates epinephrine and norepi-nephrine release
Liver
Stomach
Pancreas
Stimulates stomach, pancreas, and intestines
Stimulates glucose release
Intestines
Inhibits stomach, pancreas, and intestines
Bladder
Stimulates urination
Inhibits urination
Promotes erection of genitals
Genitals
Promotes ejacu-lation and vaginal contractions

Figure 28.13