

/ / ,

Co₂

Co₂

Co₂

Co₂

: _____

: _____

Co₂

: Co₂ /

: O₂ /

: /

(Thermal polypnea)

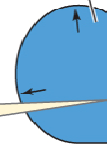
/

: /

(A) Inhalation

The anterior air sacs expand and fill with gas that has passed through the lungs.

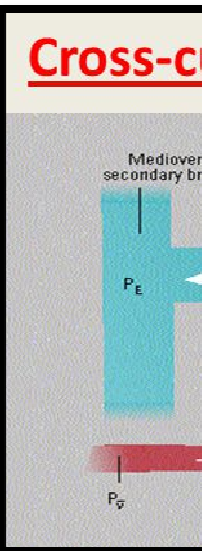
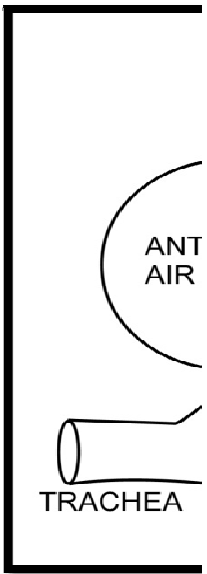
Anterior air :



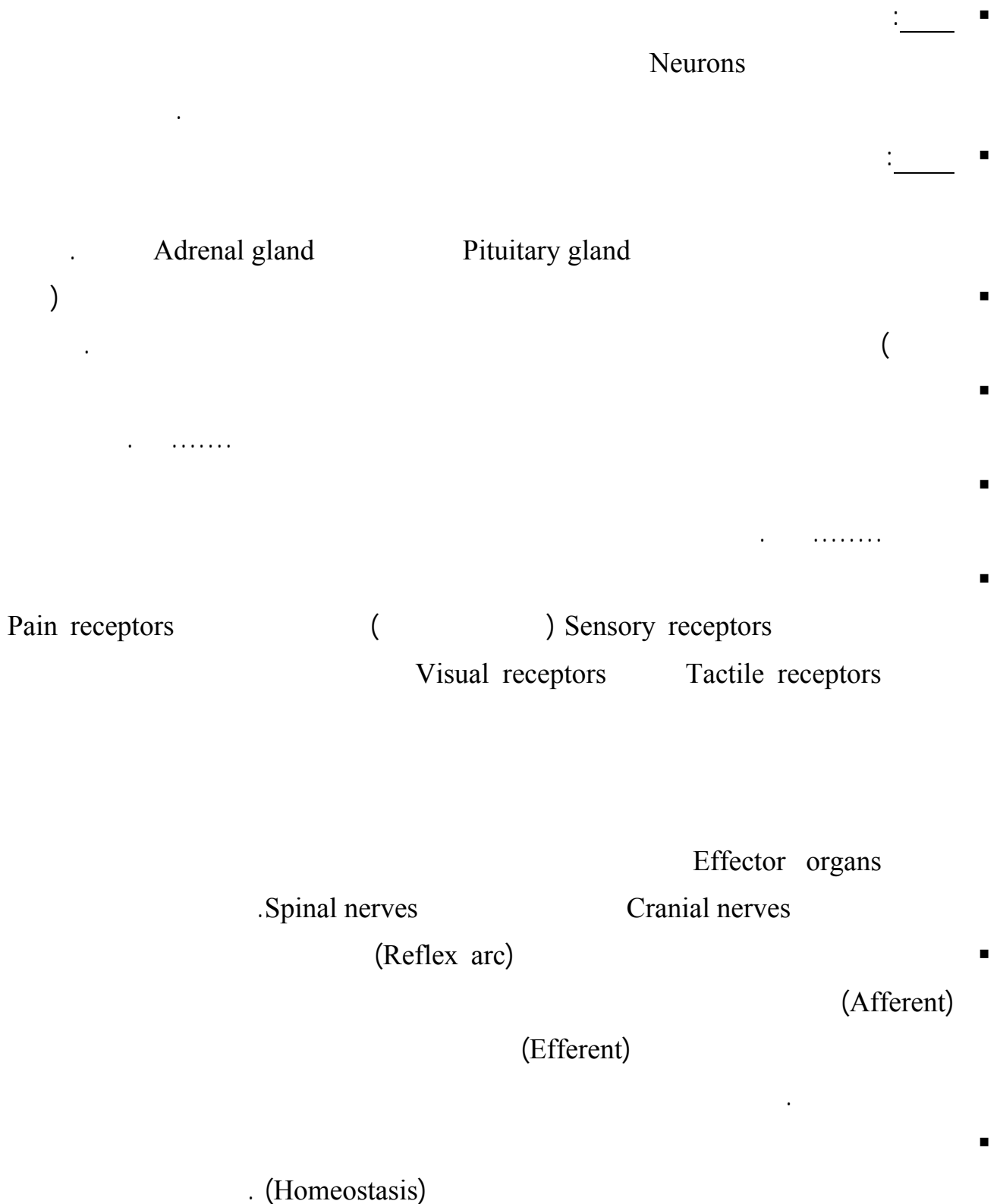
(B) Exhalation

The anterior air sacs are compressed, discharging stale gas stored in them.

- Fresh air
- Stale gas (i.e., in O₂, enriched)



The Nervous System



	:	_____	
	:	//أ	
Central Nervous System (CNS)			-١
Peripheral Nervous System			-٢
	:	//ب	
Somatic Nervous System			-١
() Autonomic Nervous System			-٢
()			
		Sympathetic	-
		Parasympathetic	-
	:	_____ ❖	
Spinal cord	-	Brain	-١
Cerebrospinal fluid (CSF)		Skull	: _____ -
() Meninges			
			:
Duramater	:		-١
Arachnoidea	:		-٢
Piamater	:		-٣
		: _____ ■	
		Cerebrum	-١
		Cerebellum	-٢
		Brain Stem	-٣
Cranial nerves			

:Cerebrum -

Longitudinal Fissure

Frontal lobe	- ١
Parietal lobe	- ٢
Temporal lobe	- ٣
Occipital lobe	- ٤

Cortex

Sulci

.Gyri

: Cerebellum -

Vermis cerebelli

: Brain stem -

Epithalamus - ١

Thalamus - ٢

() Hypothalamus - ٣

Midbrain - ٤

Pons - ٥

Medulla oblongata - ٦

: Spinal Cord -

Vertebral column

Dorsal

.and ventral root

Sensory inputs

. Reflex arc

Reflex

: _____

centers

: _____ ❖

:(Spinal nerves) : _____ -أ

. () ()

()

. ()

() : (Cranial nerves) : _____ -ب

Olfactory

.Acoustic

Optic

.Hypoglossal

Oculomotor

()

Trigeminal

Abducent

Trochlear

Glossopharyngeal

Facial

.Accessory

Vagus

: Reflex arc _____ ■

() Afferent

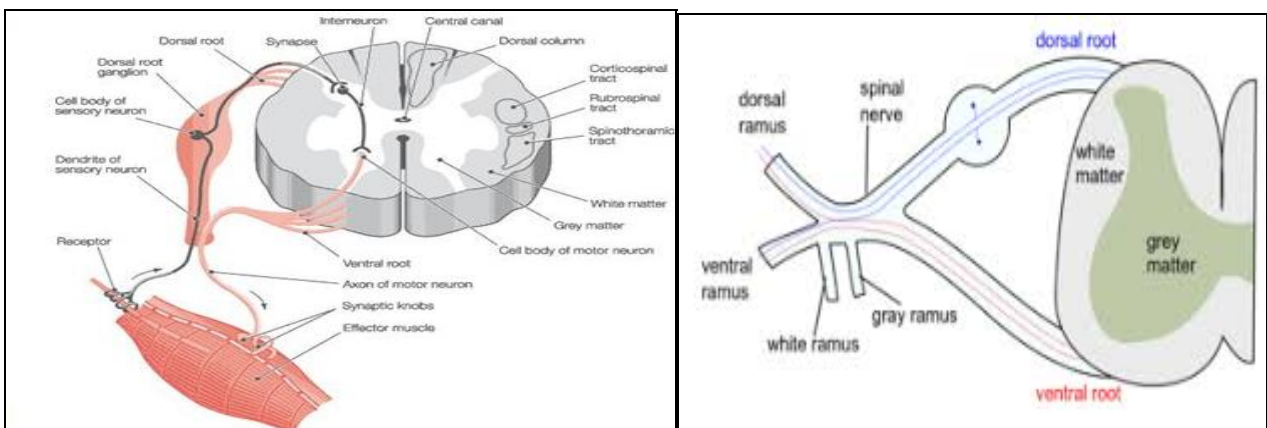
()

()

() Efferent

()

()



Structure of Nervous System

: Nerve Cell (Neuron)

Neurons

Neuroglia

Electric Signals

Synapse

Dendrites

Axon

Nerve

terminals

: _____

Gray mater

Perikaryon - 1)

Nuclei

()

Spinal ganglia

Ganglia

.Parasympathetic ganglia

Sympathetic ganglia

Neuroplasm) :

Nissle bodies

Centrosome

Neurofibrils

.(

(Processes) - 2)

() : _____

Dorsal

) Unipolar

) Bipolar

() (sensory ganglia

Multipolar

() (

.(

Pyramidal

Axon - 3)

Synaptic knob

Vesicles

. Synaptic transmitter

Myelin sheath

(0.4 mm)

Schwann cells

Nodes of Ranvier

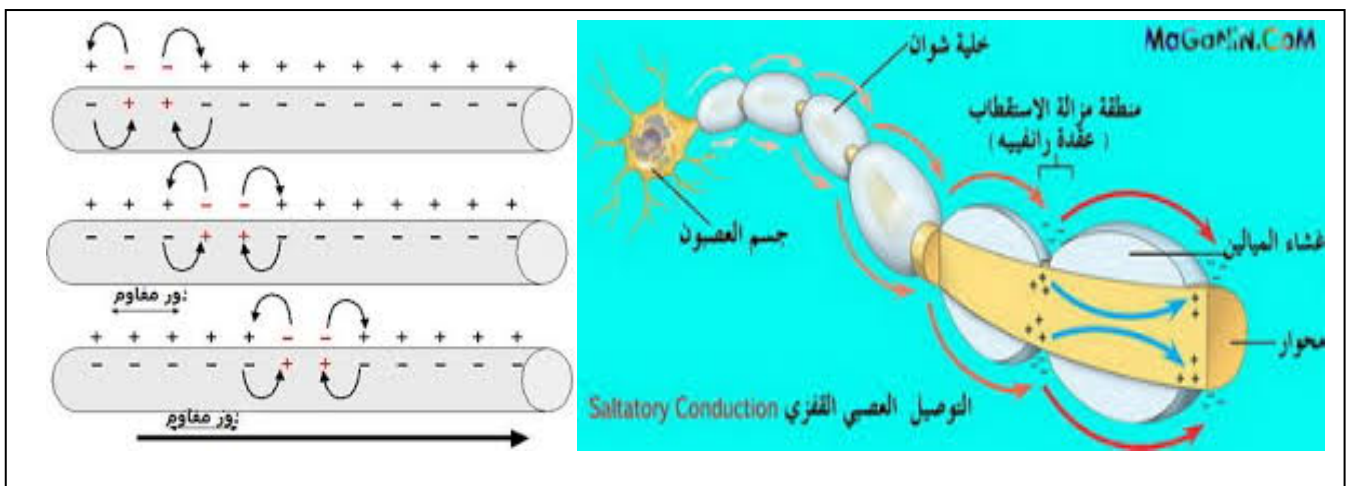
Non-myelinated fibers

Saltatory method

Continuous method

Dendrites

- ٤



: Synapses

Synaptic Cleft

Presynaptic neuron

Postsynaptic neuron

- _____ :
- ١. Axosomatic
- ٢. Axodendritic
- ٣. Axoaxonal
- ٤. Dendrodendritic
- ٥. Axoglial

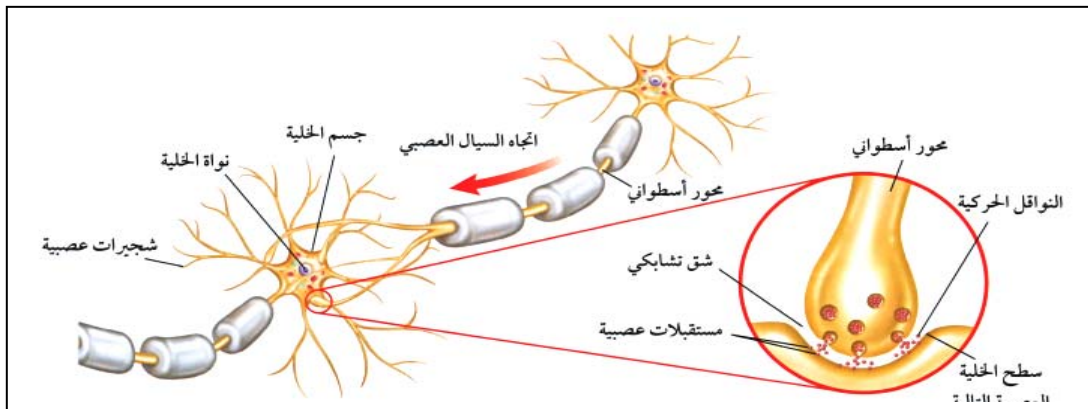
Synaptic

Chemical neurotransmitters

vesicles

Ciliary ganglion

■ Synaptic transmission



: Neurotransmitters ■

Exocytosis

Acetylcholine

(Ach)

: Receptors ■

Peripheral _____

Central _____

- _____ :
- () - ١
 - () - ٢
 - () - ٣
 - () - ٤
 - () - ٥
 - () - ٦
 - () - ٧
 - () - ٨

. (Axonal transport) : _____

Anterograde flow

(orthograde)

Retrograde flow]

)

(/ -

(/ -)

▪ : Resting Potential

-) _____

(mv

()

K⁺

Membrane Potential

K⁺

) Potassium equilibrium Potential

.(

K⁺

=

▪ : Action Potential

()

Bioelectrical Change

(+ -)

Depolarization

Polarization

_____) Na⁺ - K⁺ ATPase

.Spike potential

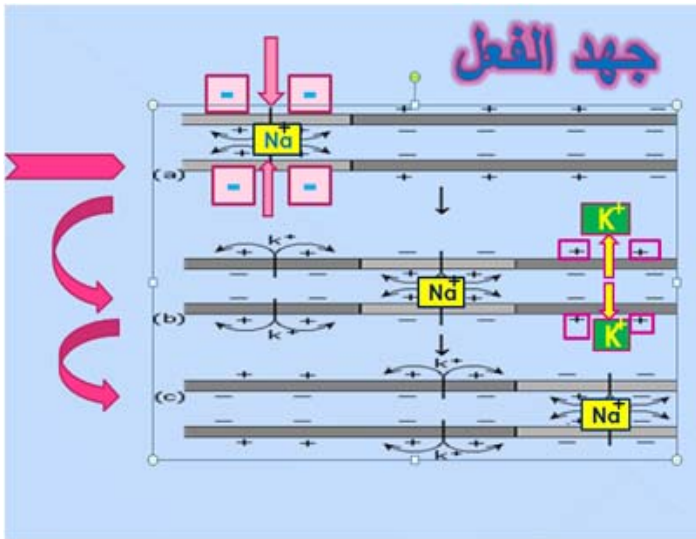
(Sodium pump

Stimulus

()

Local Circuit Current

()



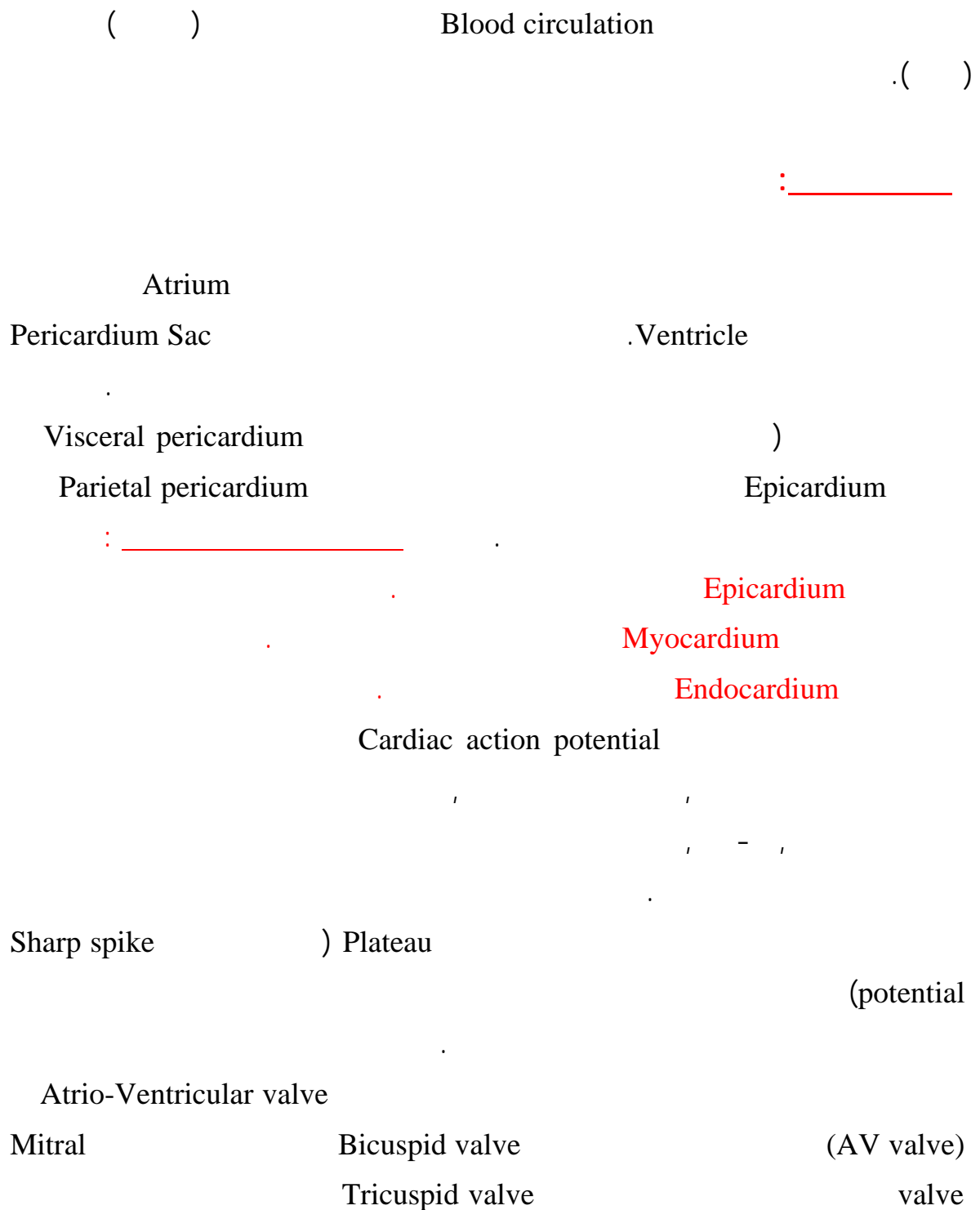
: The nerve impulse ()

()

Na⁺ K⁺



Heart and Blood Circulation



Aortic semilunar valve

Pulmonary

semilunar valve

Oxygenated blood

. Unoxygenated blood

Cranial vena cava

Caudal vena cava

Blood Vessels : _____

Blood

Arterioles

Venules

capillaries

: _____ .

Veins

: Arteries -

) : Blood Capillaries -

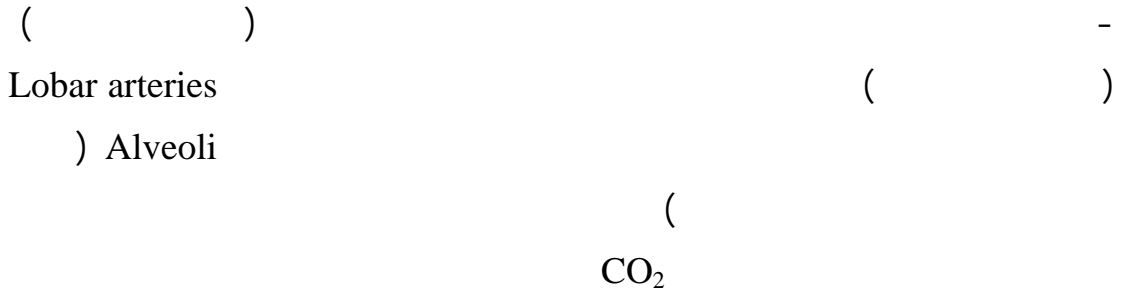
Selective permeable membrane (

: Veins -

Circulatory System

Pulmonary Circulation

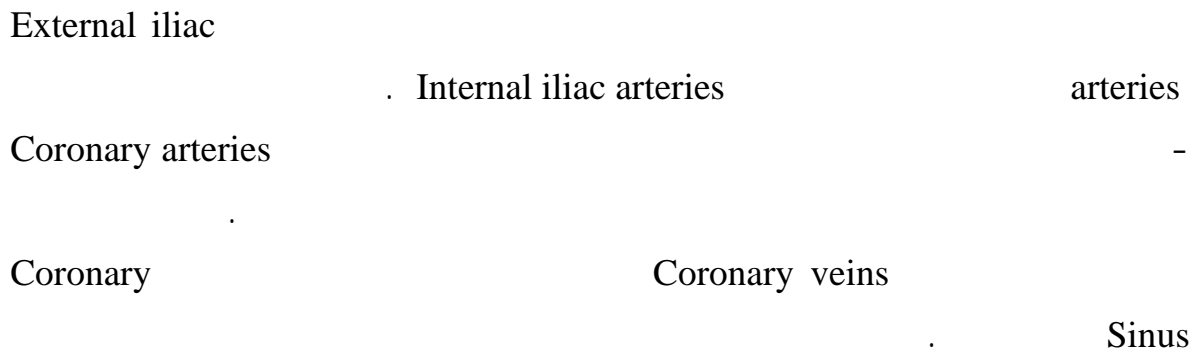
-



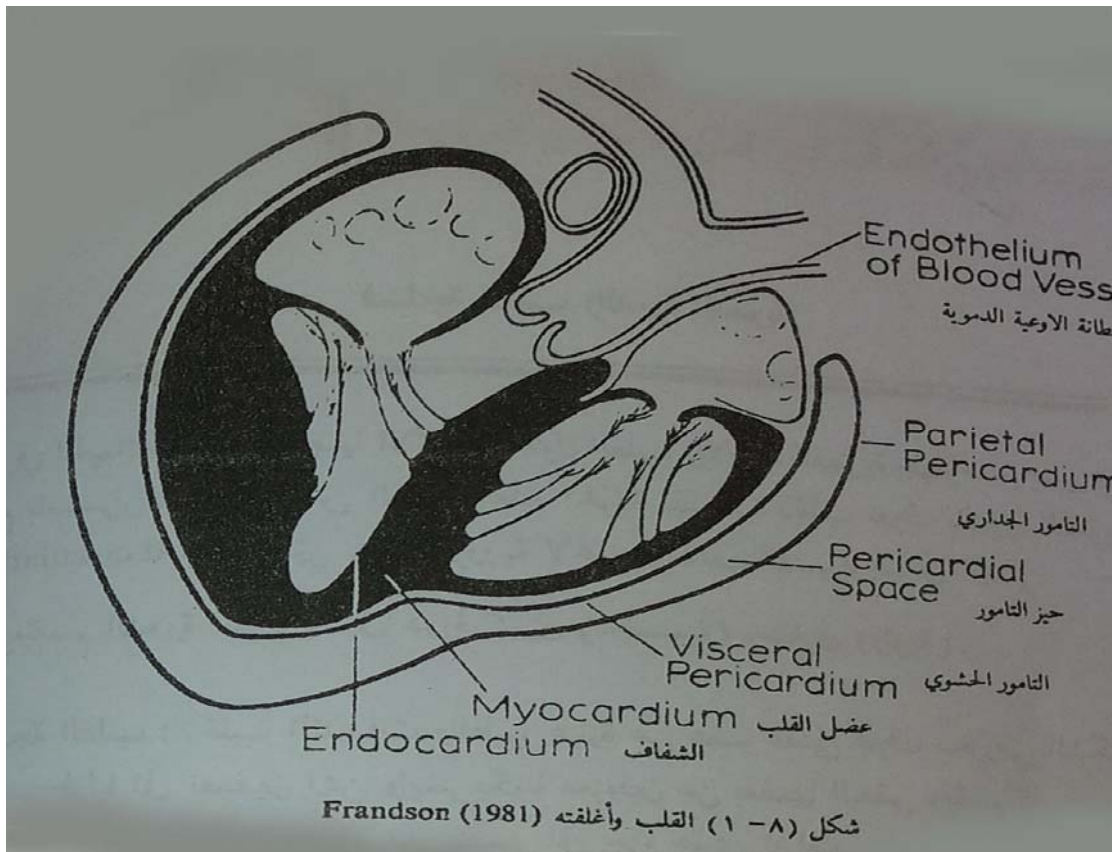
Systemic Circulation

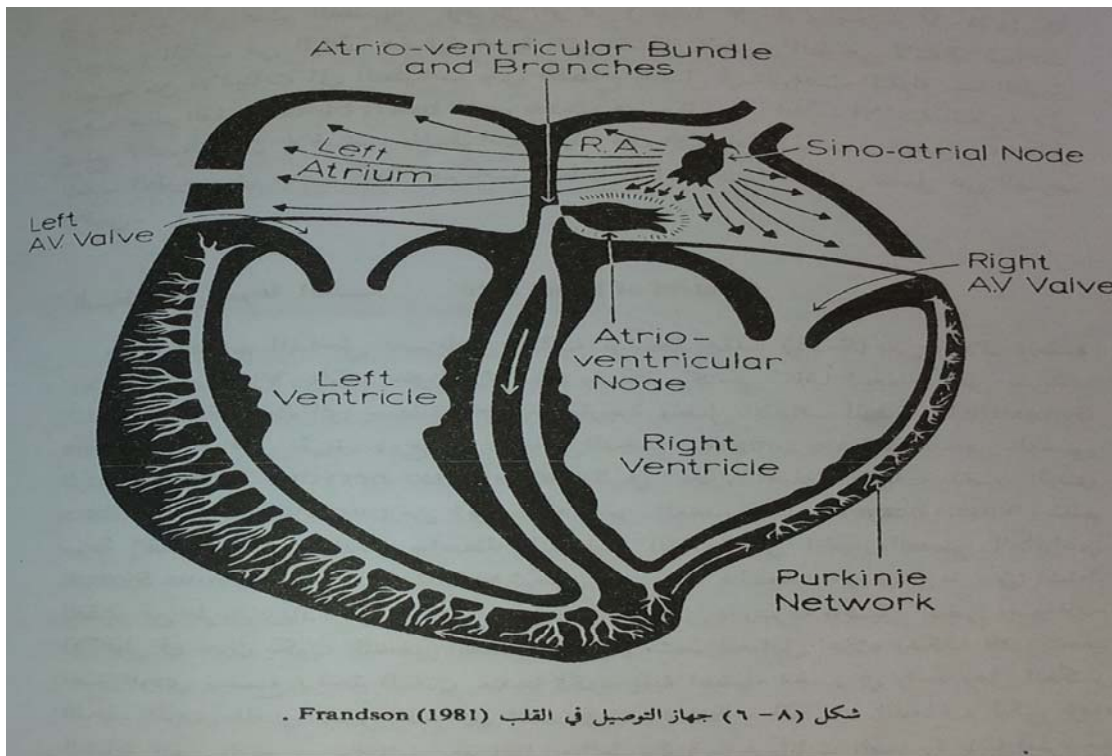
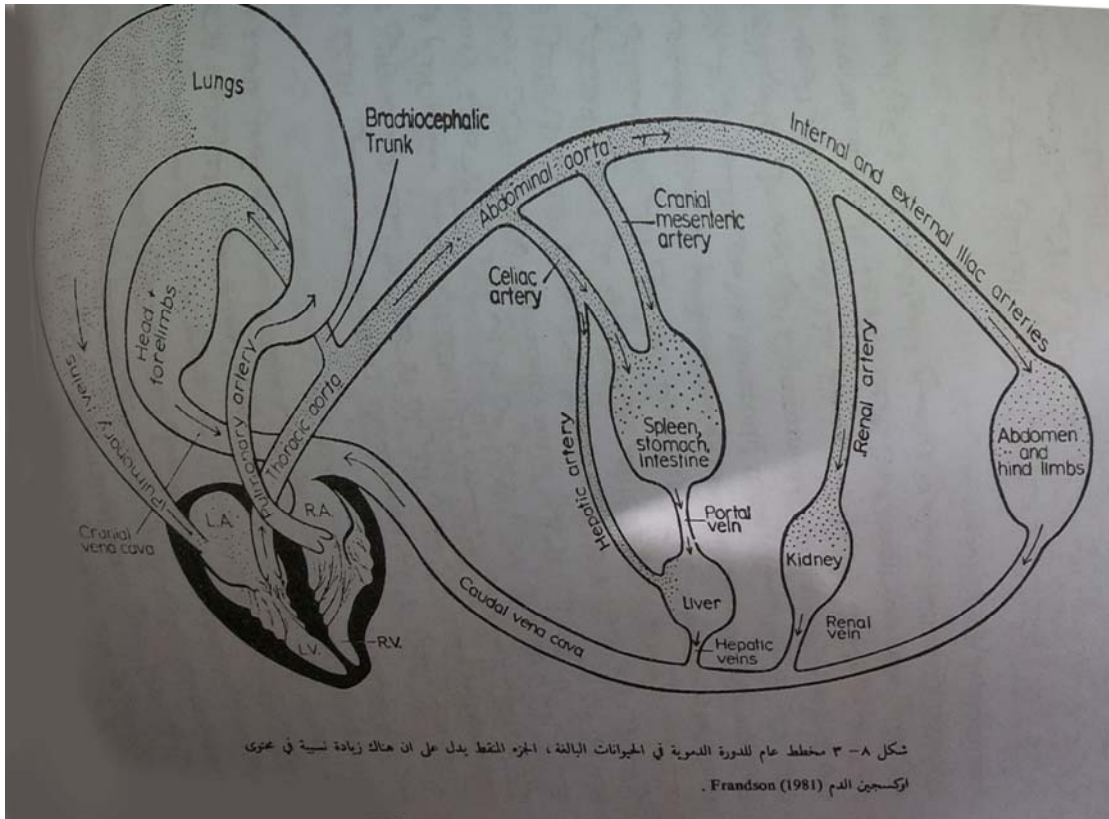
-

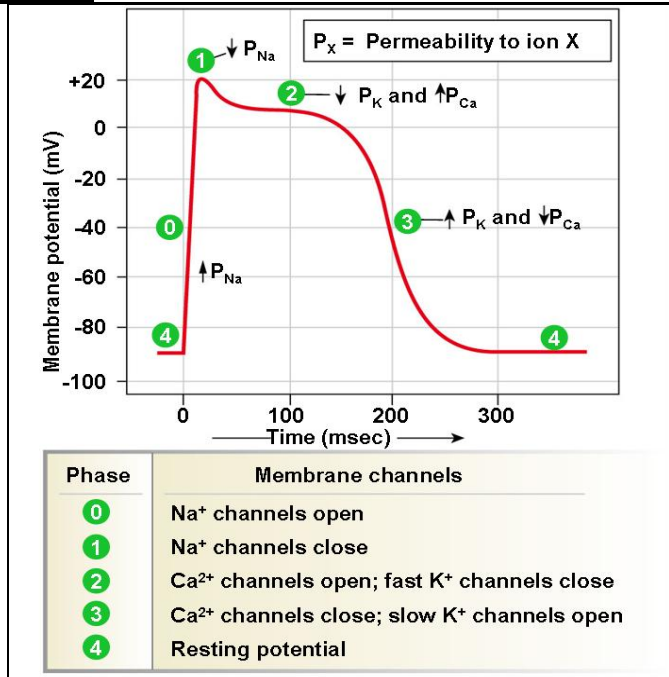
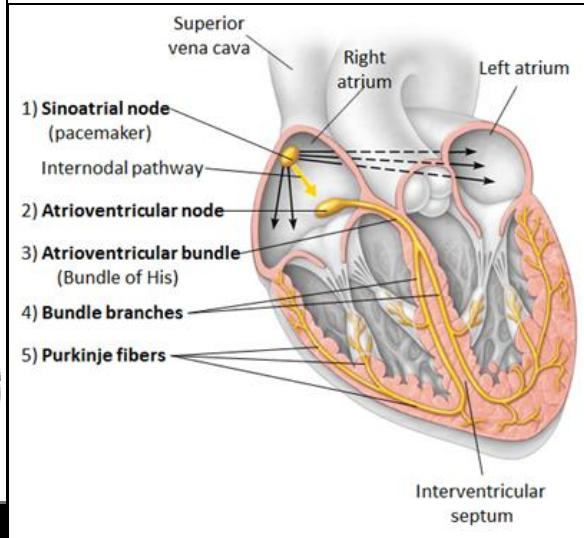
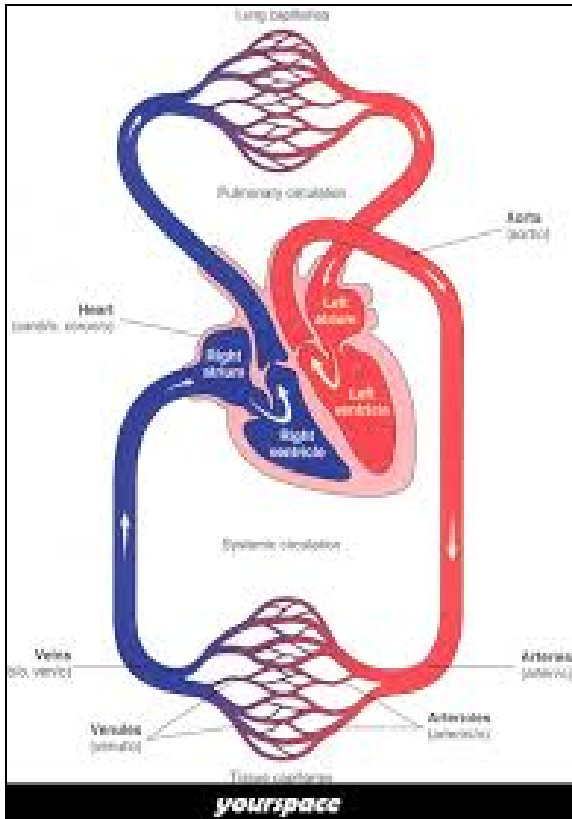
Somatic Circulation

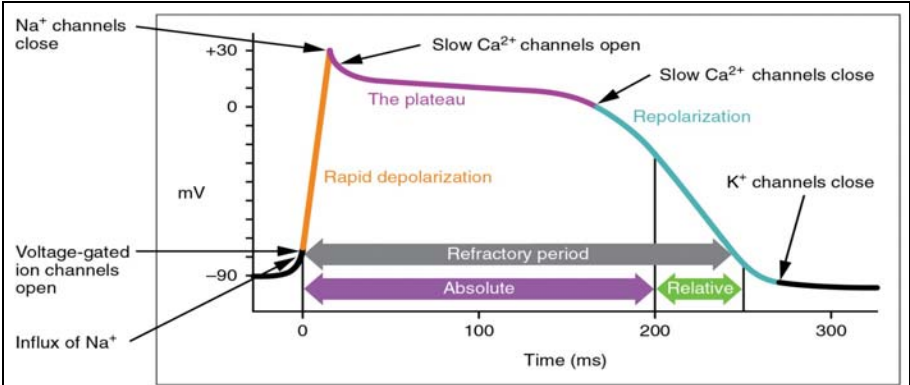


Hepatic Portal System

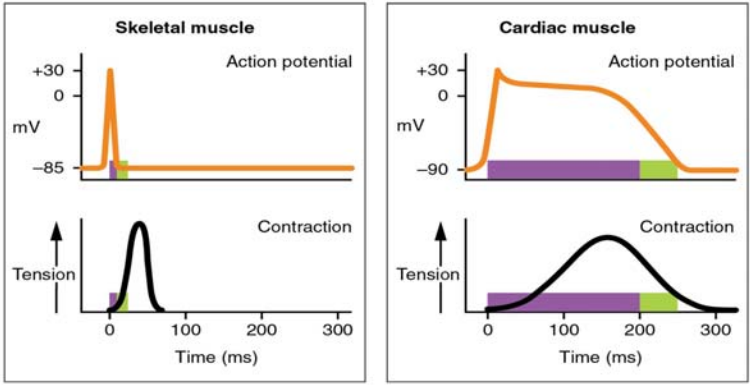








(a)



(b)

Physiology of circulation

: Cardiac Cycle

Heart beat

:Diastole -

:Systole -

AV valves
(Atrial systole)

Ventricle) -
Lup AV valves (Systole

Isovolumetric Isometric Contraction

Rapid ejection phase

Reduced ejection

Dup
AV valves

Isovolumetric

relaxtion phase

Dup () LUP

pause

()

()

murmur

Conduction system in the heart

Sino – Atrial node (SA node)

Pacemaker

A-V

Bundle of His

bundle

Purkinje cell

. S-A node → A-V node → Purkinje cell

. Heart block

Control of heart rate

bundle)

A-V node S-A node

(A-V

()

-
-

Blood pressure

-
-

()

()

-
-

-
-
-
-

x = :

Poiseuille's Law

.Reynold's formula

$$\frac{\pi r^4 \Delta P}{8 \eta L} = Q$$

Control of the heart and Circulation _____

Heart rate

Cardiac out put

Stroke volume

() Input

.Medulla

.Endocrine Secretion ()

Feedback sensors

Sensory elements

Noradrenalin

Acetyl choline ()

. Pacemaker

Medulla

Baroreceptors	Pressure receptors	-
	Aortic arch	
	Carotid sinuses	
Receptor		
)	Hering's nerve	
	Glossopharyngeal nerve (
	.Medulla	
	Chemo receptors	-
	CO ₂ O ₂	
Vasomotor centers		-
	Vasoconstrictor nerve	:
		.Vasodilator nerve
		-
		-
Brady kinin	Kinins ()	-
	Angiotensin	
	Vasopressin	-
	Prostaglandins	
		-
		-
	Bradykinin ← Kinins	-
	Angiotensin	-
	Vasopressin	-
	Prostaglandin	-

: Resting Potential -

-)

(mv -

K+

()

Membrane

Potential

Potassium equilibrium

=

K+) Potential

.(

K+

: Action Potential -

()

Bioelectrical Change

(

+

-)

Polarization

Depolarization

Spike

Sodium pump

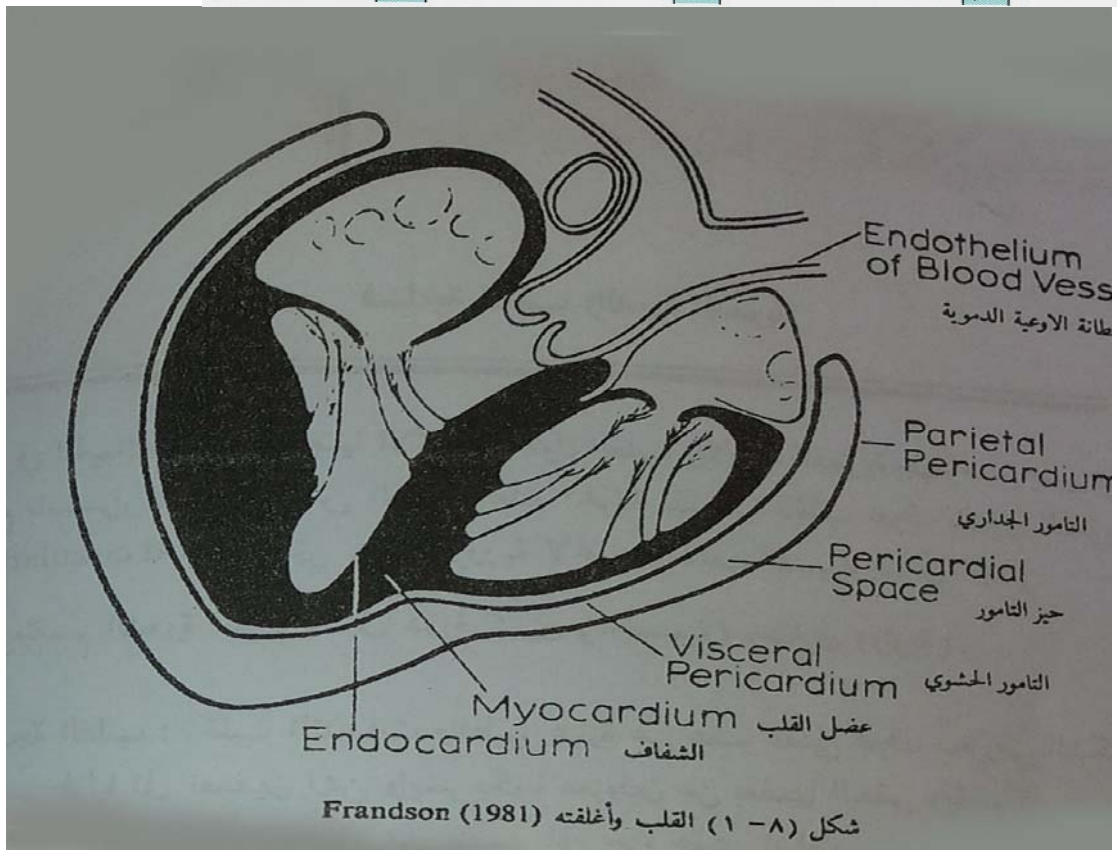
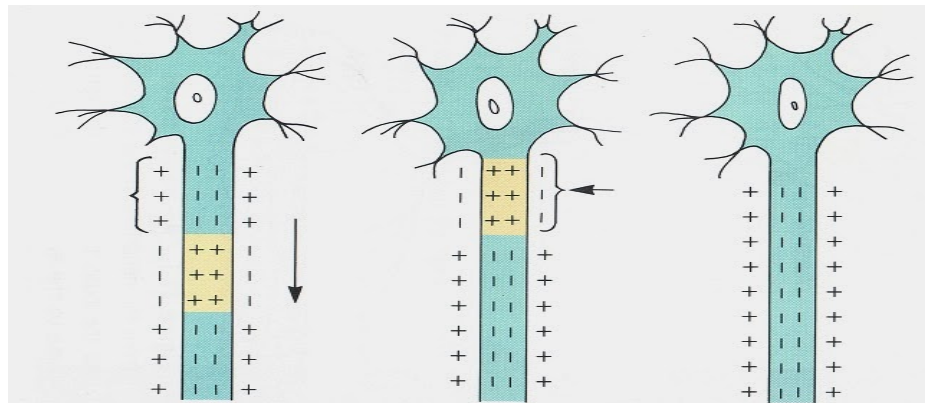
.potential

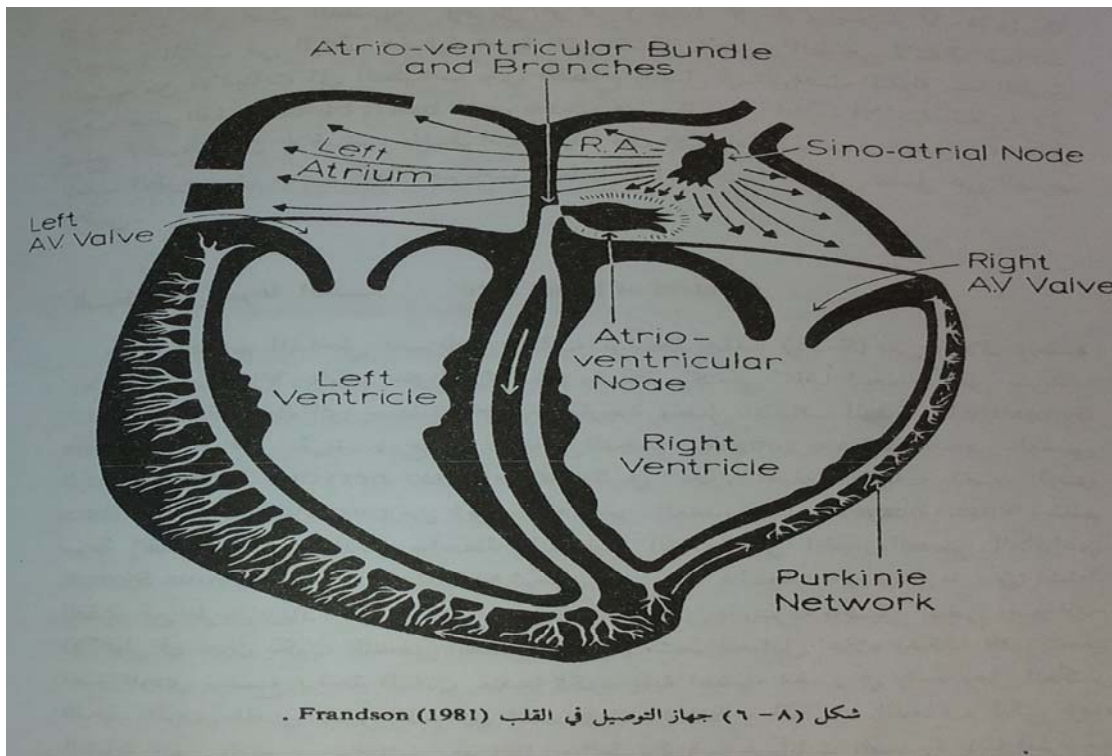
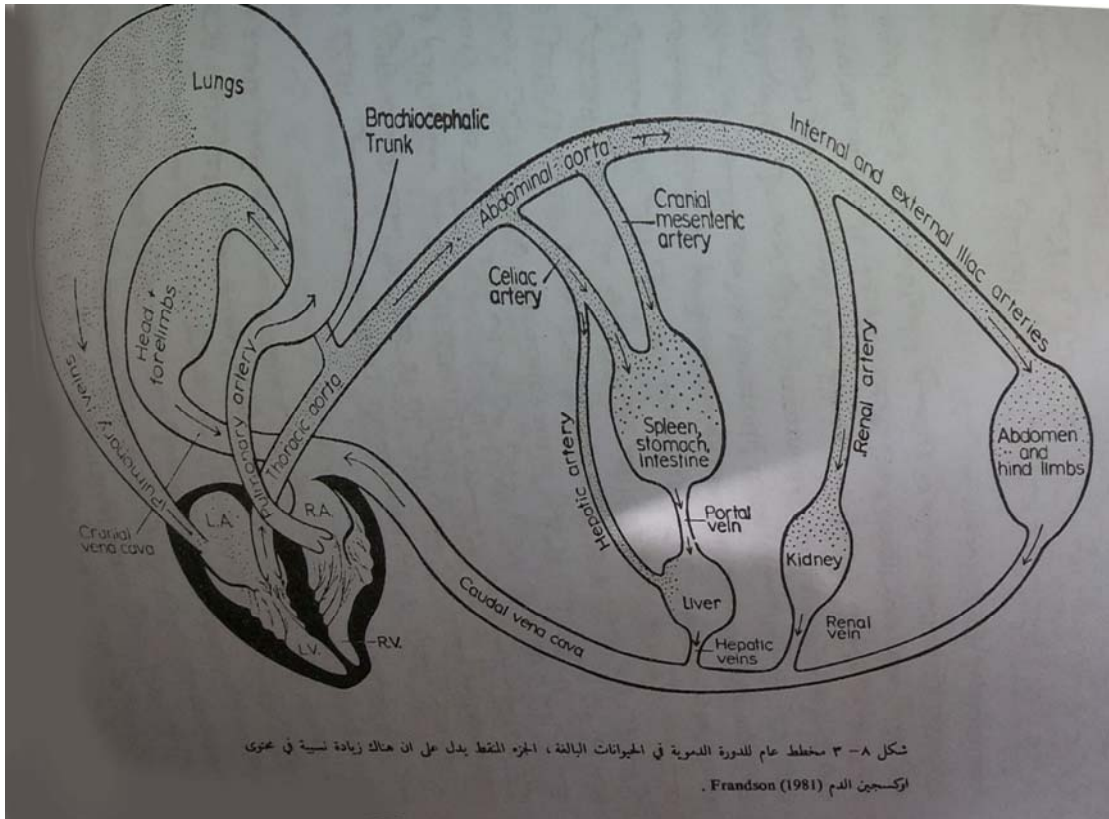
Stimulus

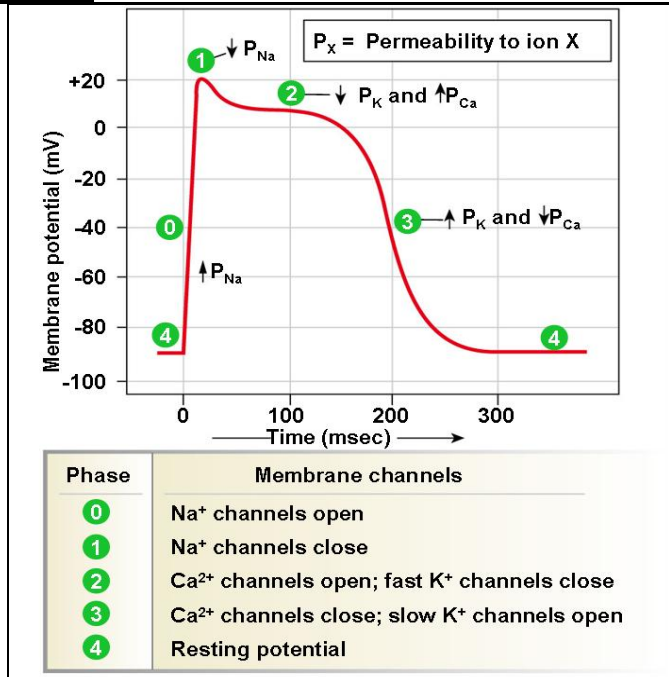
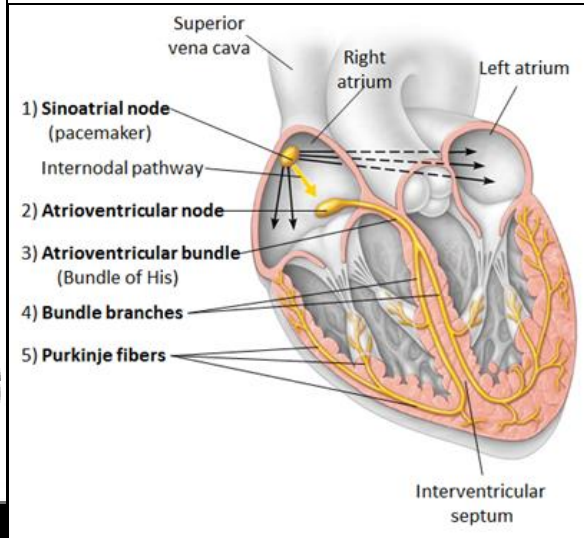
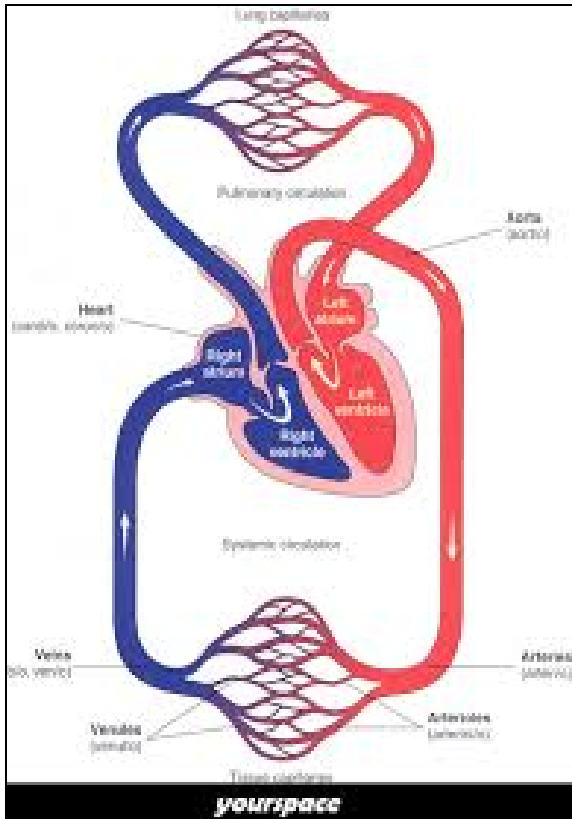
()

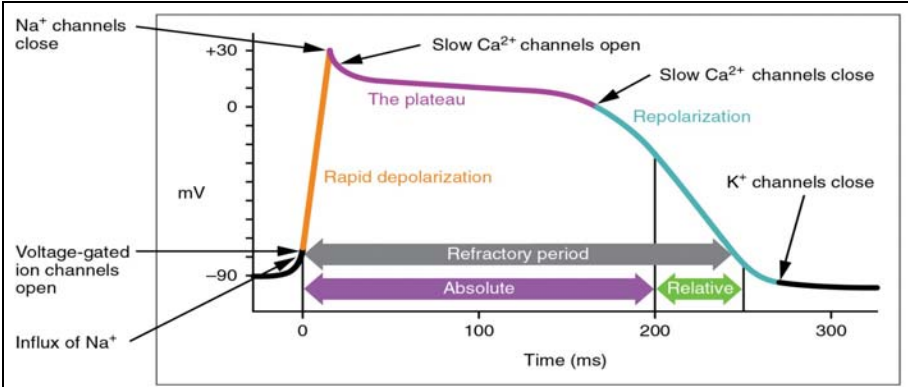
Local Circuit Current

()

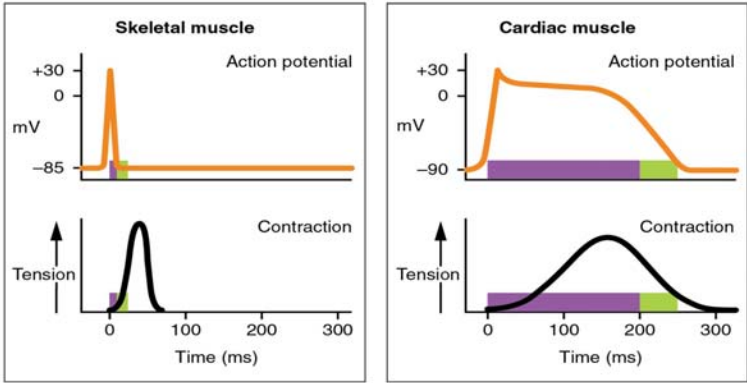








(a)



(b)

Reproduction in males

Mesorchium

%

Seminiferous tubules

Spermatogenesis

Leydig cells

.Sertoli cells

.Testosterone

Steroidogenesis

-:

:

. Vasa efferentia /

.Epididymis /

.Ductus deferens /

.Phallus Ejaculatory groove /

.Testes /

Seminal

(Cowper's Gland

) Bulbourethral gland

vesicles

: () _____

)

.(LH

FSH

LH

FSH

: _____

.(_____) /

: _____ /

: **Spermatogenesis**

Spermatogonia

(_____)

Primary Spermatocytes

()

Spermatids

: _____

-

/ -
/

_____ /

_____ /

()

-

:(_____) /

Interstitial cell-

LH

FSH

-

(ICSH) stimulating hormone

()

Indian Finches

-

.

: /

-

-

.

: /

% -

.

: /

)

(

.

Artificial insemination

-

-

-

(

)

-

.

: _____
/ .
/ .
/ .
/ .

: Fertilization

()

: _____

(LH FSH)

LH
LH

/

/

/

/

,

)

/

,

:

-

LH

./ / ,
/

.

:()

Acrosome

%

DNA

./
()
)

.(
ergothionine

-

PH

.

()

/ ,

/ ,

/ ,

/

/ ,

.

/

() :

.
.

:

.

.

-

.

Reproduction in Females

Ovoviviparity

_____ Yolk

Oocyst plasma membrane. /

Perivitelline membrane . /

Granulosa cells . /

Basal lamina. /

Theca interna layer. /

Theca externa. /

:

- , : /

: /

- : /

-

%

%

:Sperm Storage glands

Left mullerian duct

-

- :

:Infundibulum /

:Magnum() /

Ovomucoid (Conalbumin) Ovotransferrin
(Avidin)

-)

(

:Isthmus /

()
() -

()

:Shell gland (Uterus) () /

()

()

()

Plumping

Vagina: /

()

)

()
()

)

(

%

%

()

- :

/

/

/

-

/

/

:Oviposition

Stretch receptors

PGF₂α

()

:Sperm Host glands

-
:

-

/

/

:(_____)

:(Clutch)(_____)

% -

%

-

%

.Molt

:Molt ()

:

:Nesting Behavior (Broodiness) :

:

. () /

. /

. /

:Parthenogenesis

: _____ /

-

(LH)

: _____

-

PGS

:LH _____

LH

(LH

(-)

LH

: _____

LH

LH

: _____

-

LH

. LH

: _____

LH

LH

LH

LH

LH

FSH

LH

-:

() .Albumin :Unionized / (Vitellogenin)

:Ionized /

(%)

LH