RESPIRATORY SYSTEM

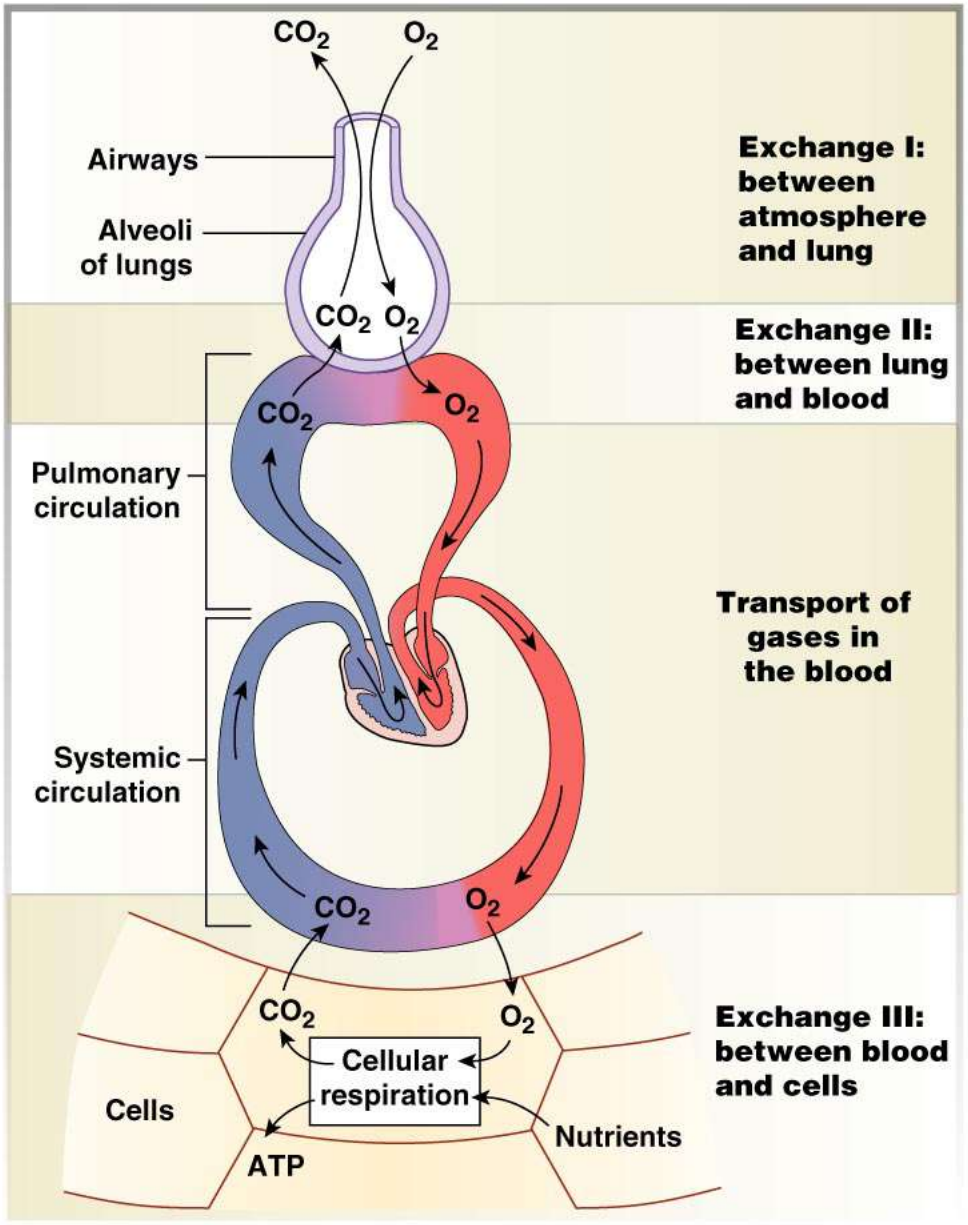


Figure 17-1

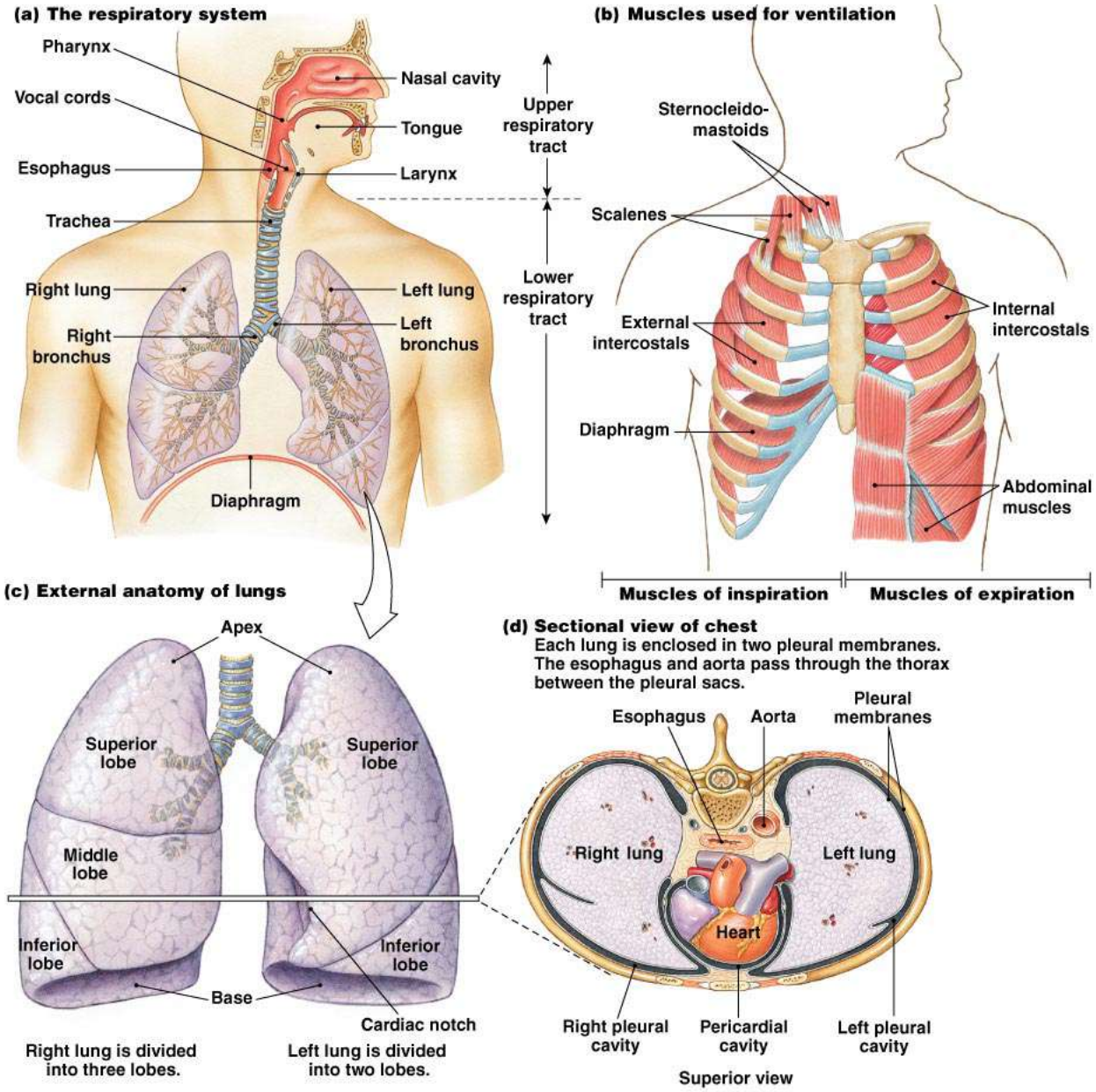


Figure 17-2 – Overview (1 of 2)

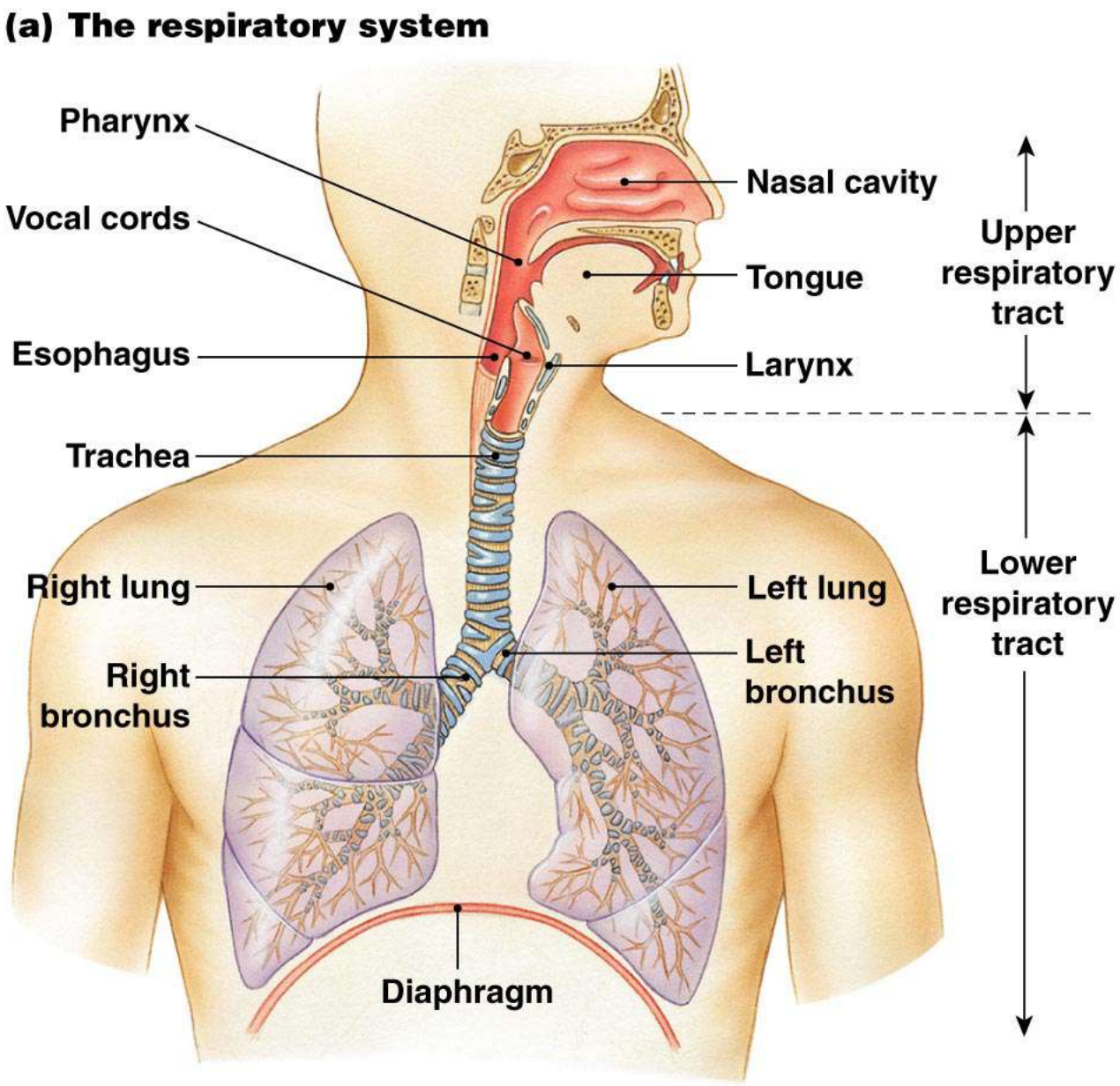
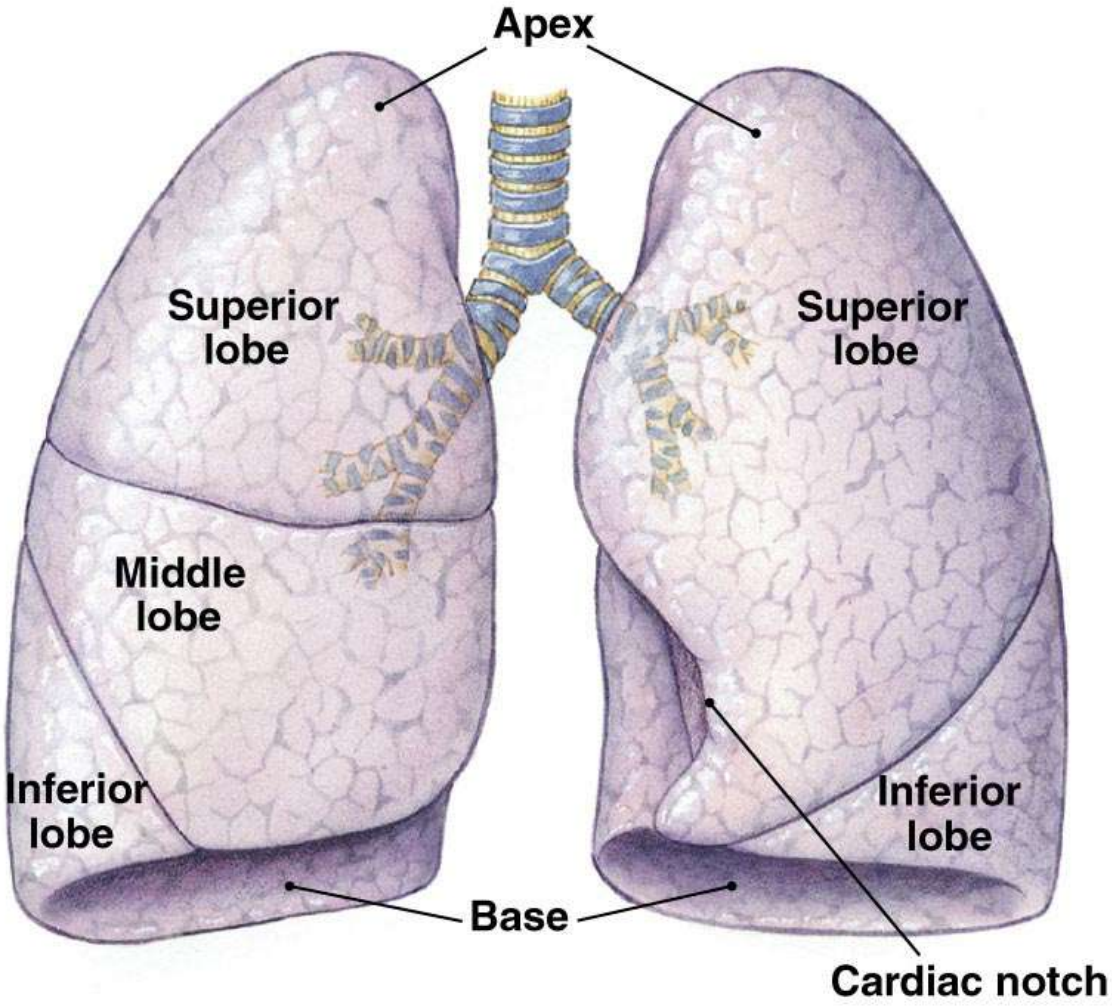


Figure 17-2a

(c) External anatomy of lungs

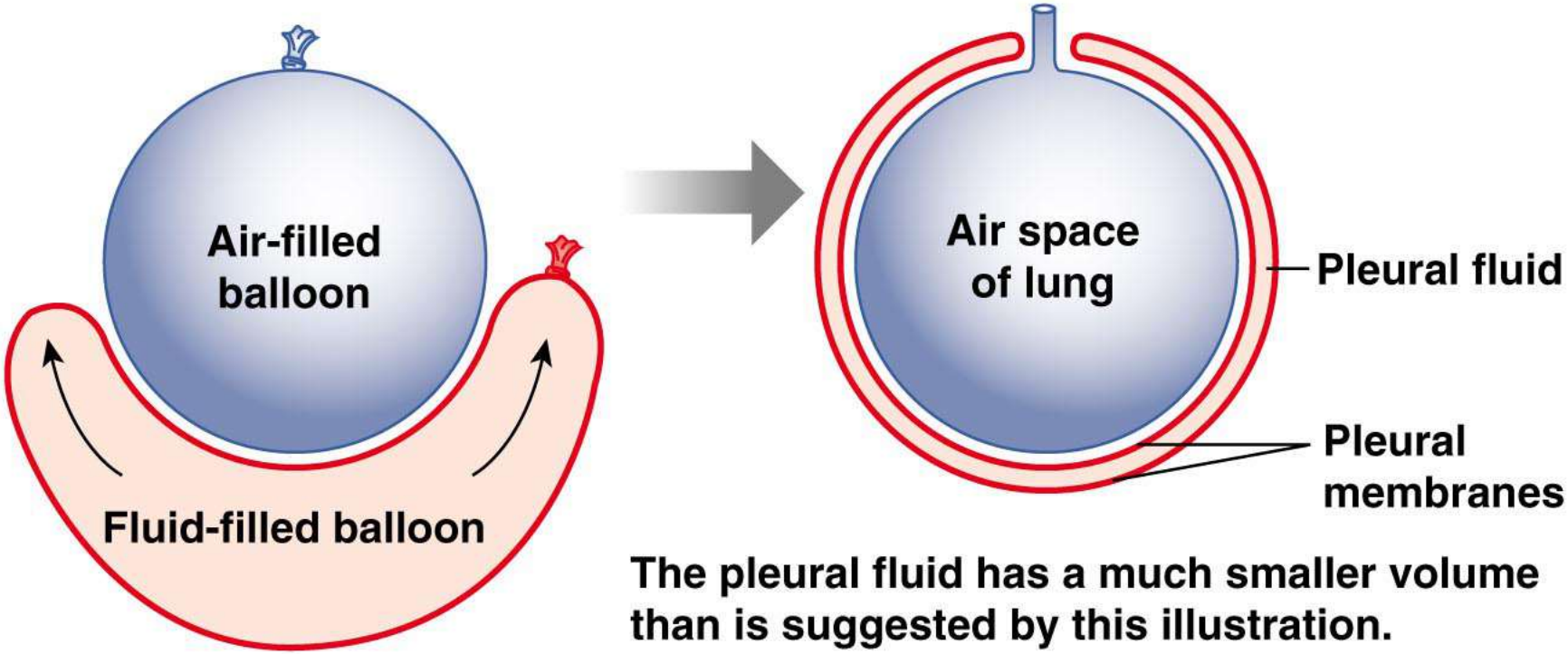


Right lung is divided into three lobes.

Left lung is divided into two lobes.

Figure 17-2c

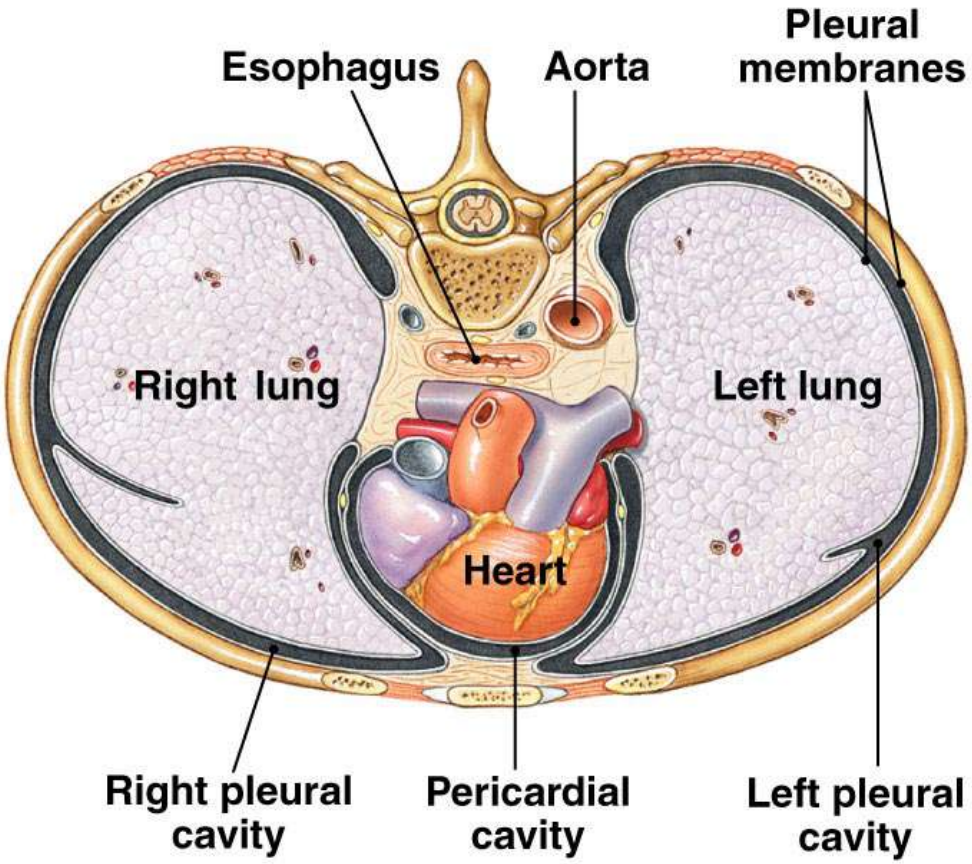
The pleural sac forms a double membrane surrounding the lung, similar to a fluid-filled balloon surrounding an air-filled balloon.



The pleural fluid has a much smaller volume than is suggested by this illustration.

Figure 17-3

(d) Sectional view of chest
Each lung is enclosed in two pleural membranes. The esophagus and aorta pass through the thorax between the pleural sacs.



Superior view

Figure 17-2d

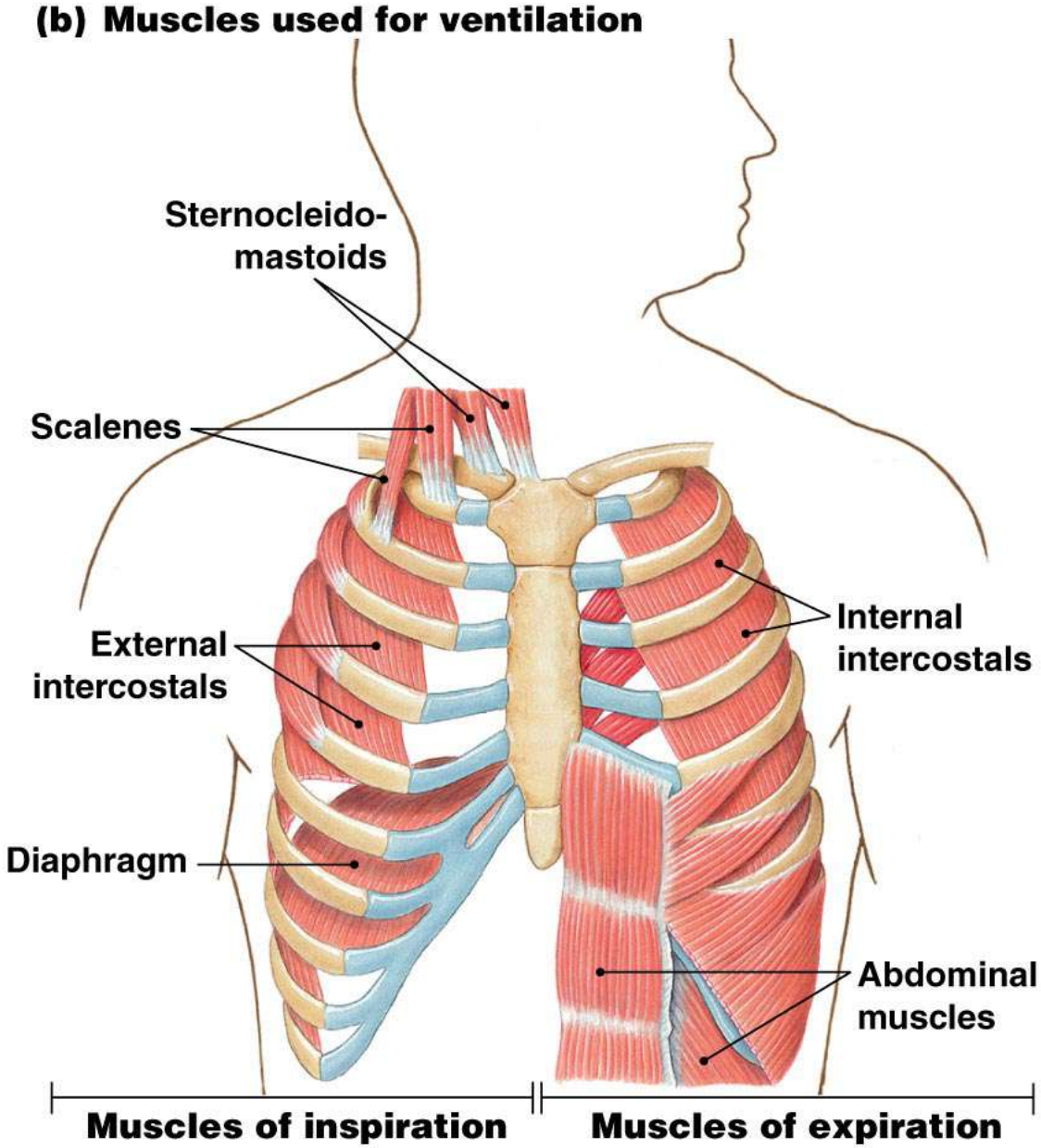


Figure 17-2b

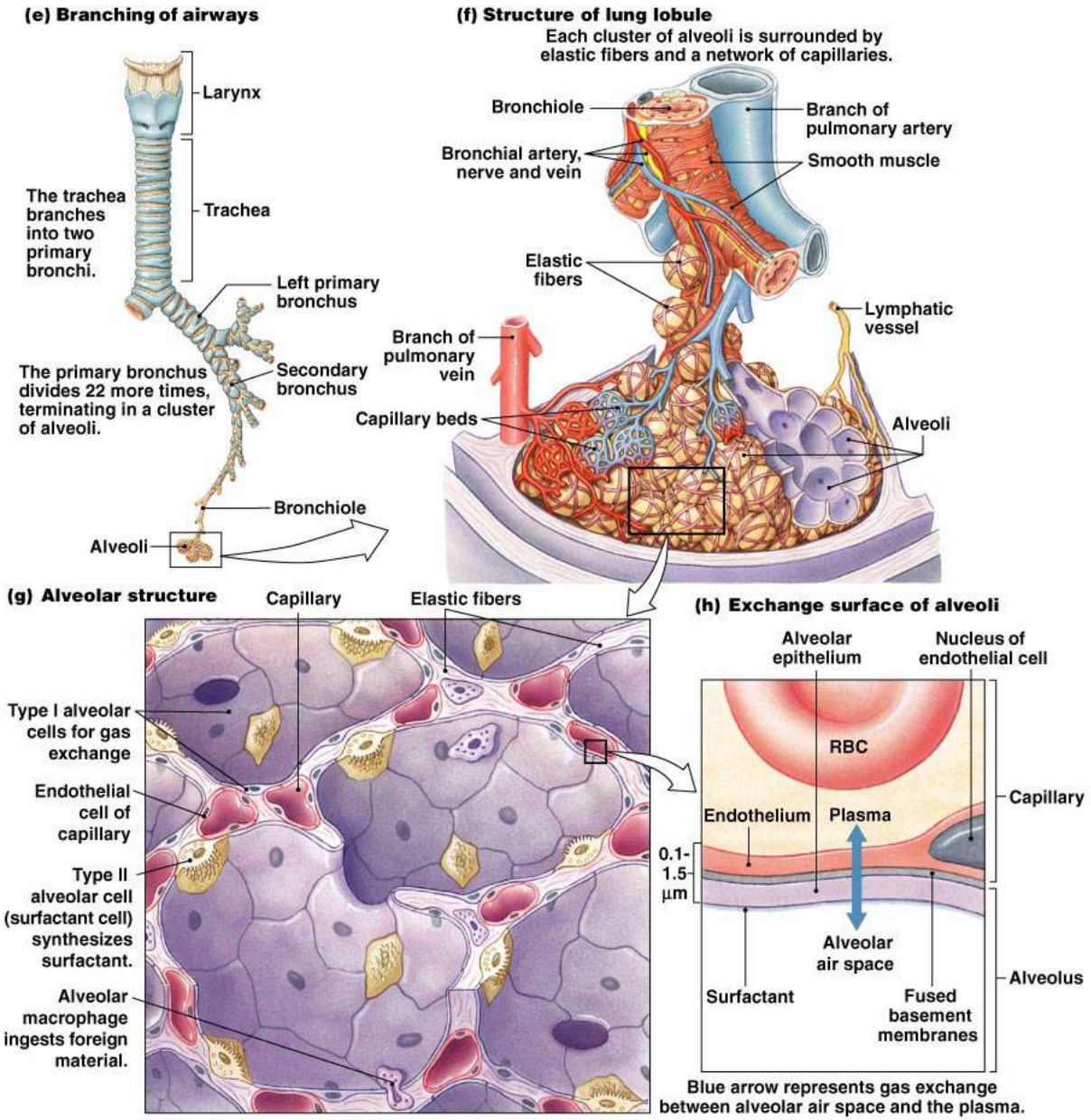


Figure 17-2 – Overview (2 of 2)

(e) Branching of airways

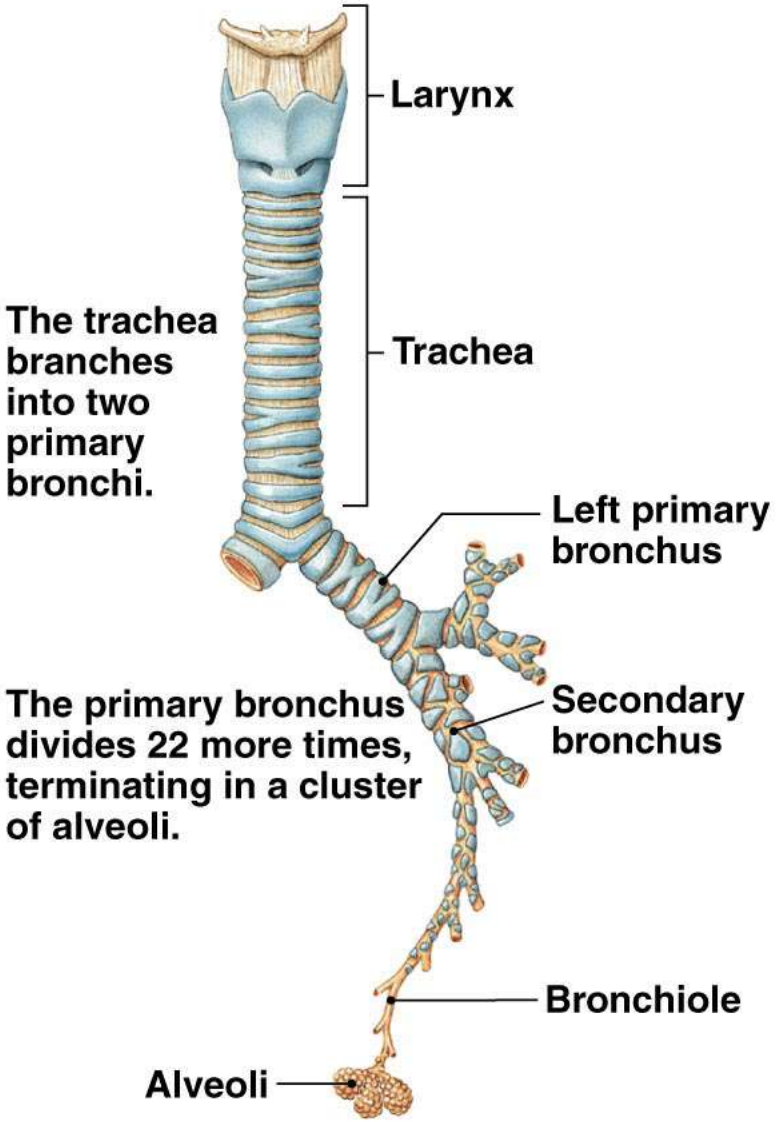


Figure 17-2e

Trachea

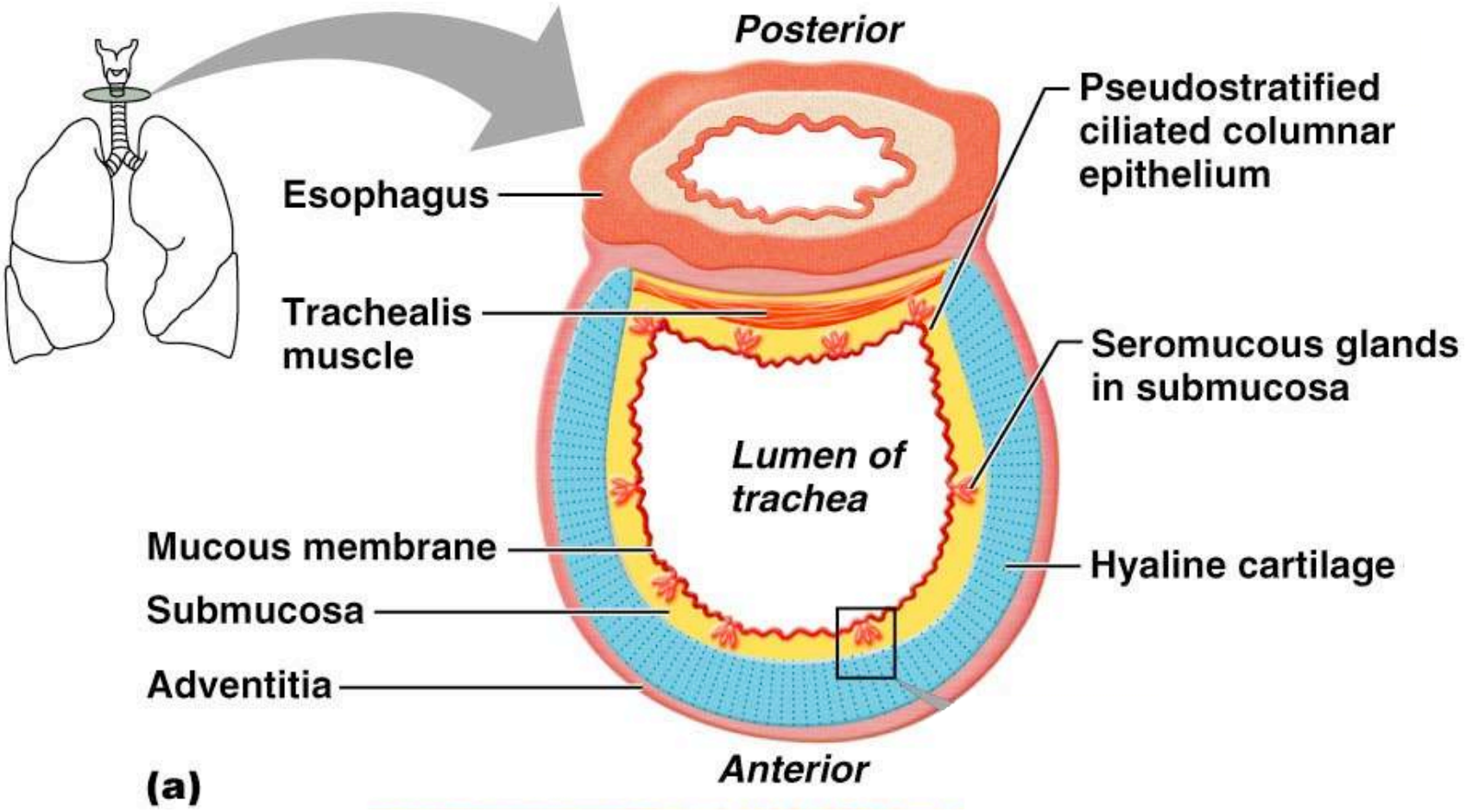
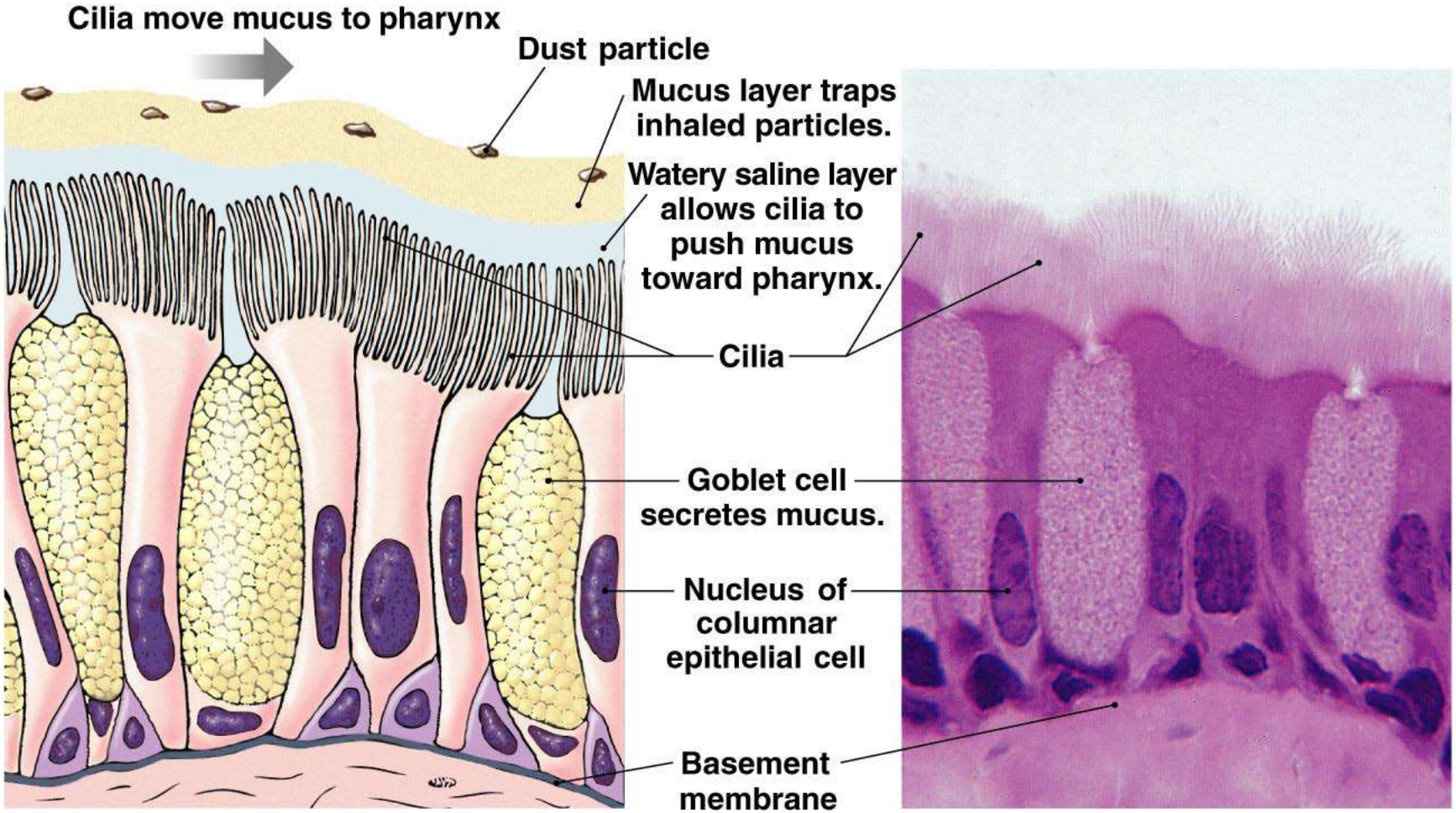


Figure 22.6a



Ciliated epithelium of the trachea

(f) Structure of lung lobule

Each cluster of alveoli is surrounded by elastic fibers and a network of capillaries.

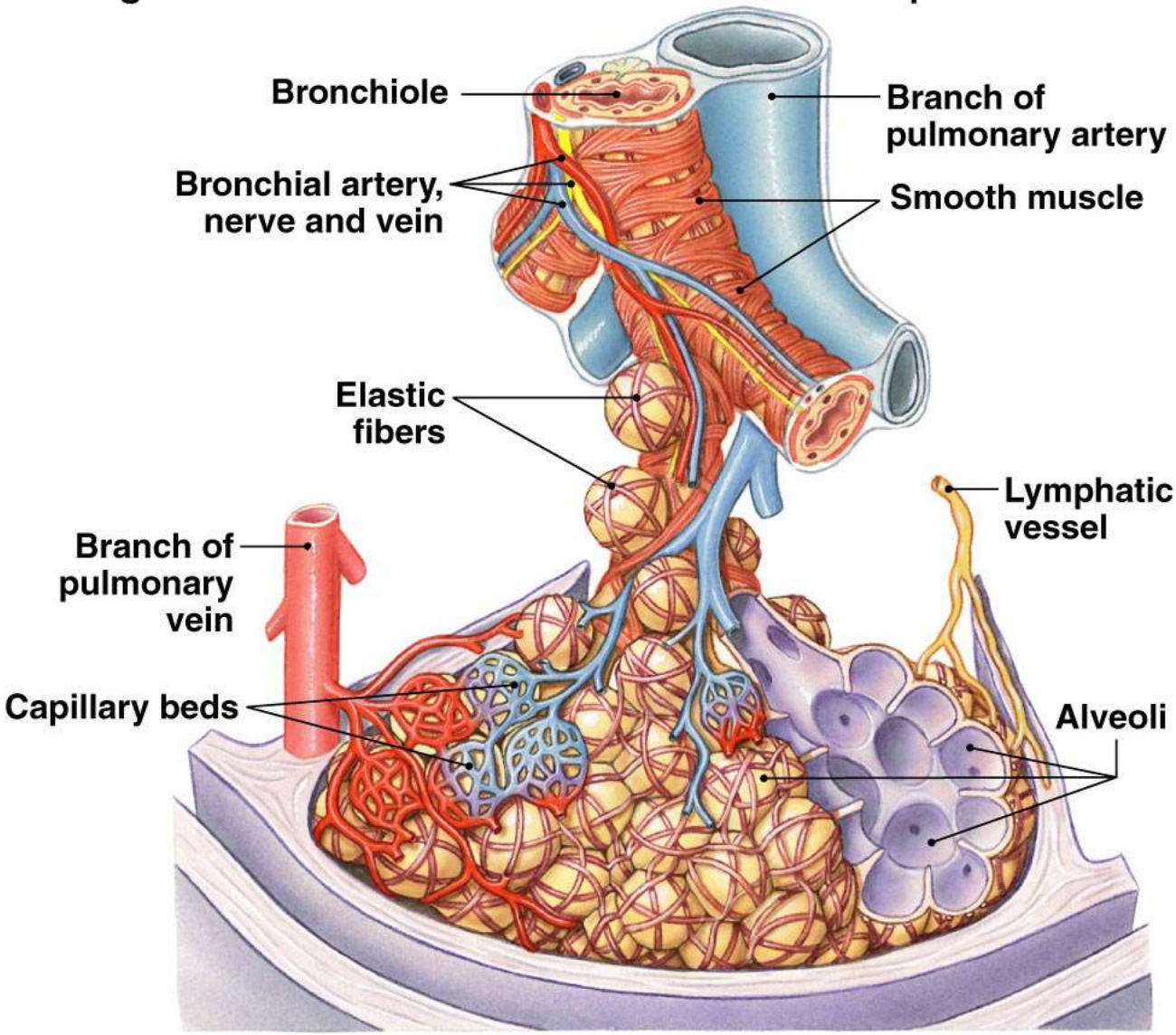


Figure 17-2f

Respiratory Zone

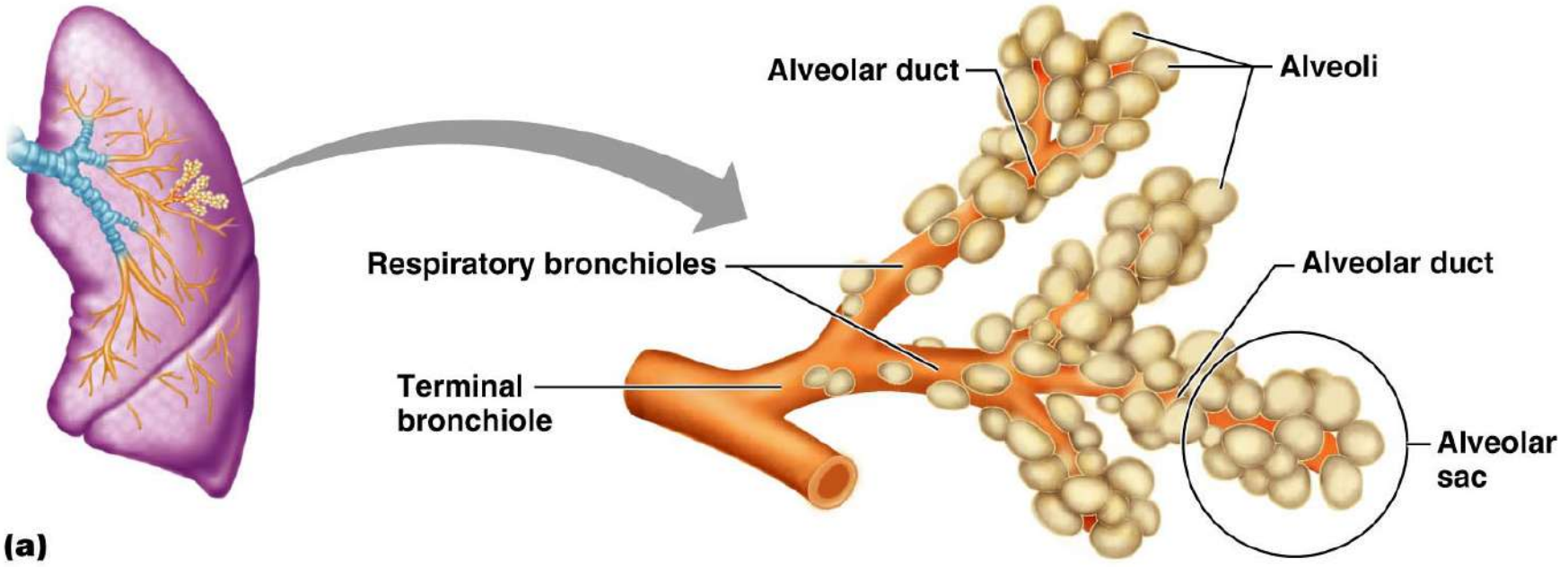


Figure 22.8a

	Name	Division	Diameter (mm)	How many?	Cross-sectional area (cm^2)
Conducting system	Trachea	0	15–22	1	2.5
	Primary bronchi	1	10–15	2	↓
	Smaller bronchi	2	1–10	4	↓
		3		↓	↓
		4		↓	↓
		5		↓	↓
		6–11		1×10^4	↓
	Bronchioles	1–23	0.5–1	2×10^4 ↓ 8×10^7	100 ↓ 5×10^3
Exchange surface	Alveoli	24	0.3	$3–6 \times 10^8$	$>1 \times 10^6$

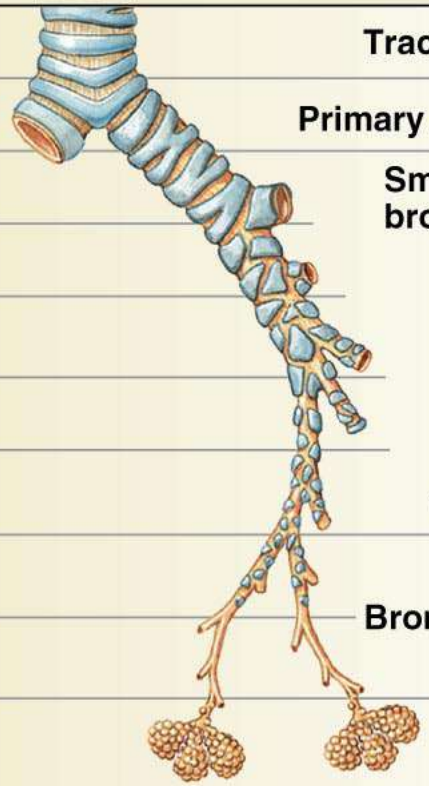


Figure 17-4

Respiratory Membrane

- This air-blood barrier is composed of:
  - Alveolar and capillary walls
  - Their fused basal laminas
- Alveolar walls:
  - Are a single layer of type I epithelial cells
  - Permit gas exchange by simple diffusion
  - Secrete angiotensin converting enzyme (ACE)
- Type II cells secrete surfactant

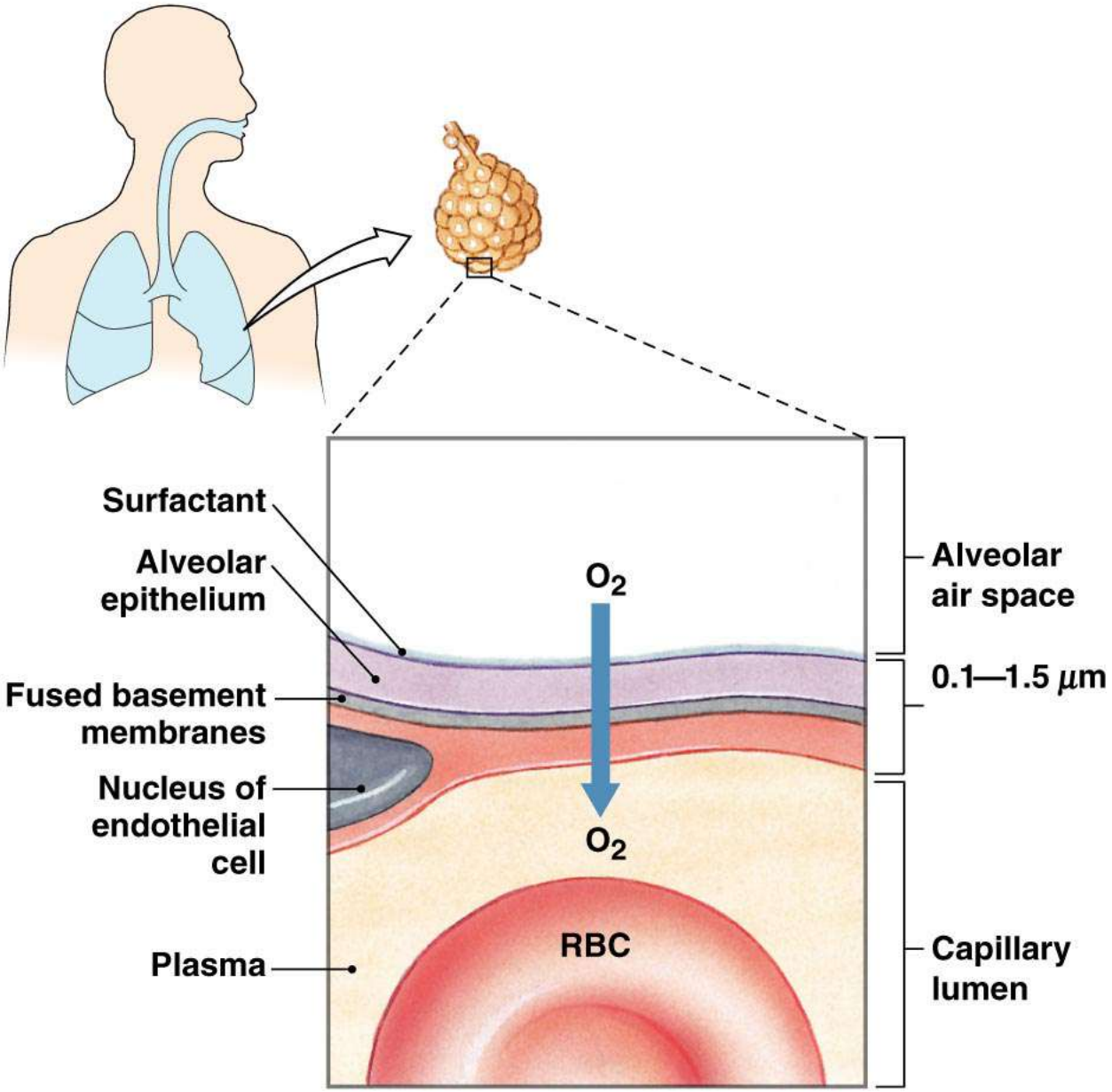


Figure 18-5

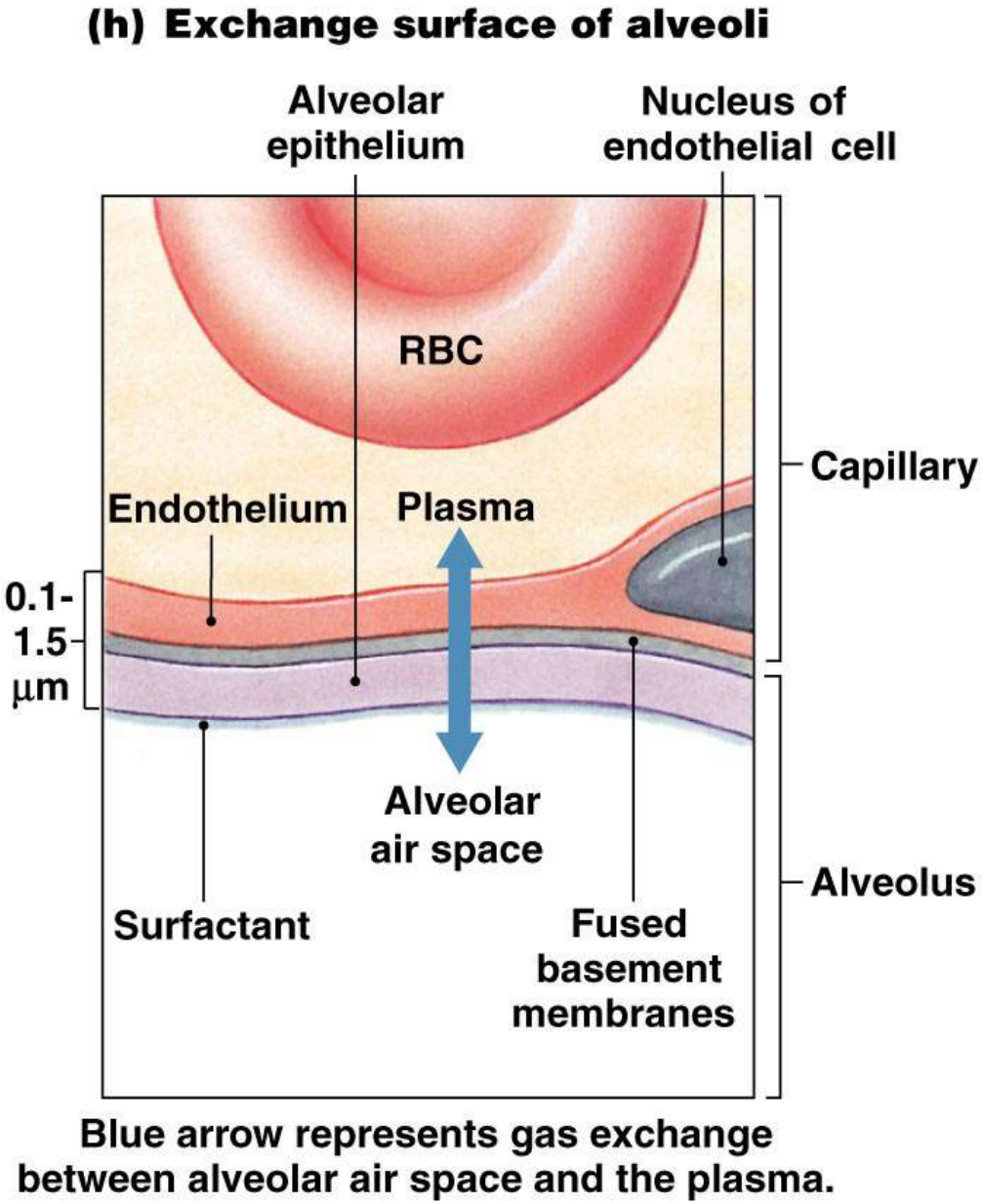


Figure 17-2h

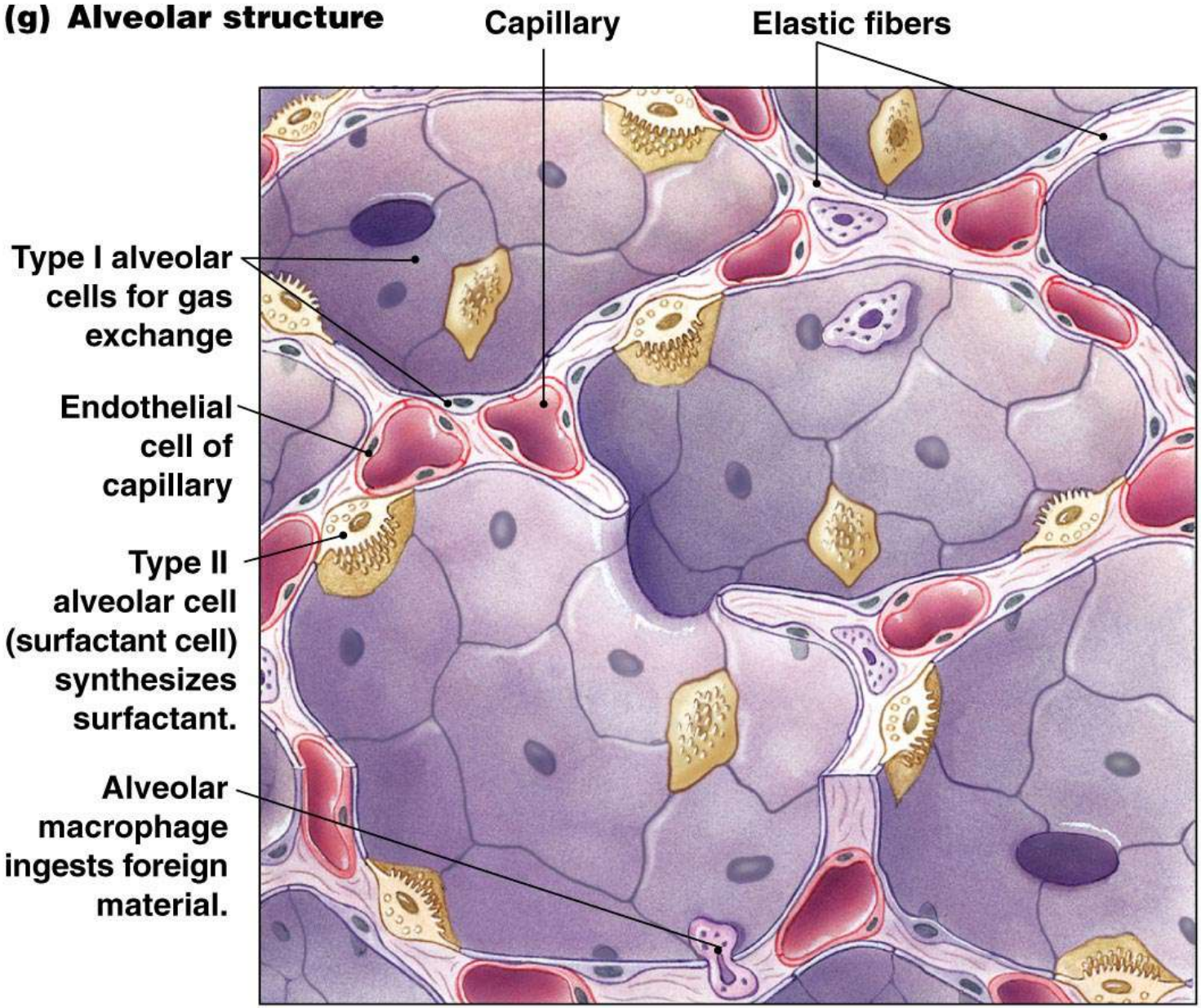


Figure 17-2g

TABLE 17-1 Gas Laws

1. The total pressure of a mixture of gases is the sum of the pressures of the individual gases (Dalton's law).
2. Gases, singly or in a mixture, move from areas of higher pressure to areas of lower pressure.
3. If the volume of a container of gas changes, the pressure of the gas will change in an inverse manner (Boyle's law).

TABLE 17-2 Partial Pressures (P_{gas}) of Atmospheric Gases at 760 mm Hg

GAS AND ITS PERCENTAGE IN AIR	P_{gas} IN DRY, 25° C AIR	P_{gas} IN 25° C AIR, 100% HUMIDITY	P_{gas} IN 37° C AIR, 100% HUMIDITY
Nitrogen (N_2) 78%	593 mm Hg	574 mm Hg	556 mm Hg
Oxygen (O_2) 21%	160 mm Hg	155 mm Hg	150 mm Hg
Carbon dioxide (CO_2) 0.033%	0.25 mm Hg	0.24 mm Hg	0.235 mm Hg
Water vapor	0 mm Hg	24 mm Hg	47 mm Hg

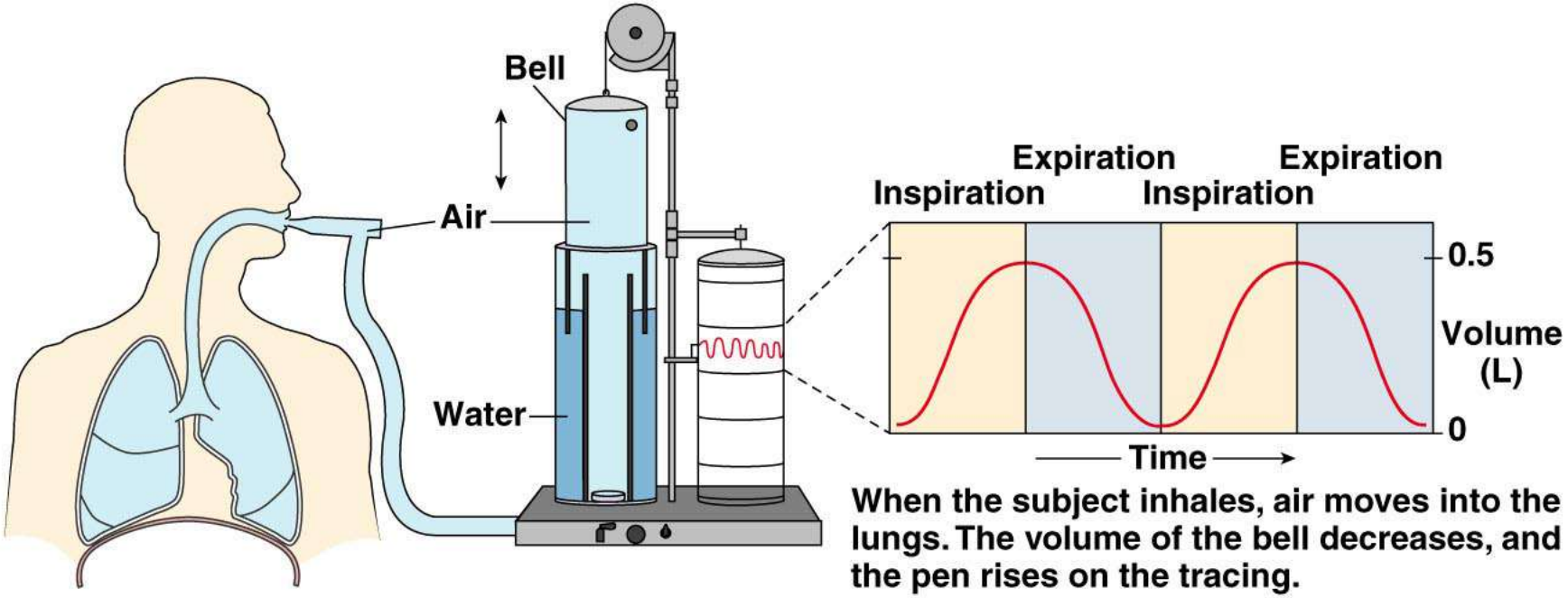


Figure 17-6

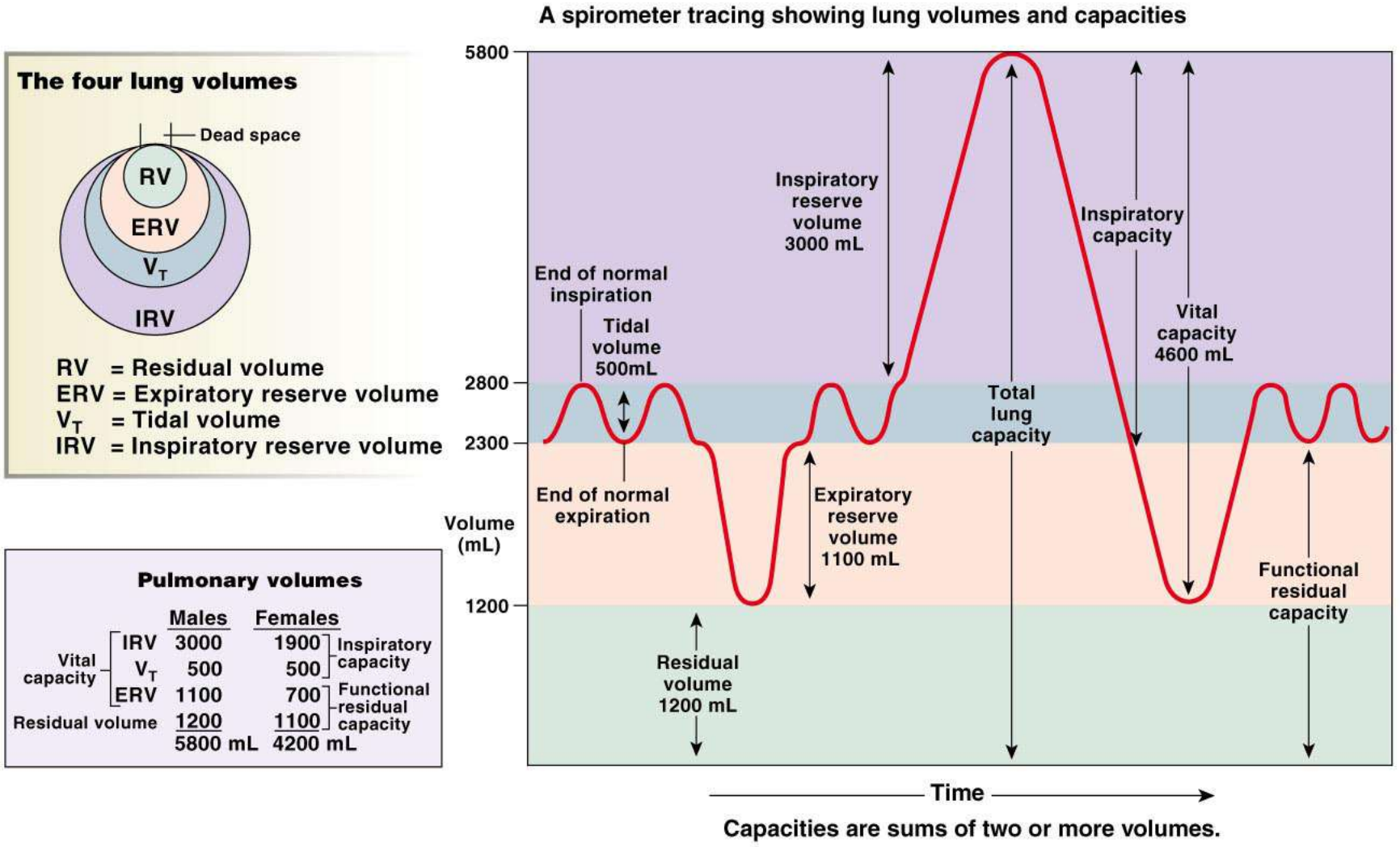


Figure 17-7

(a) At rest, diaphragm is relaxed.

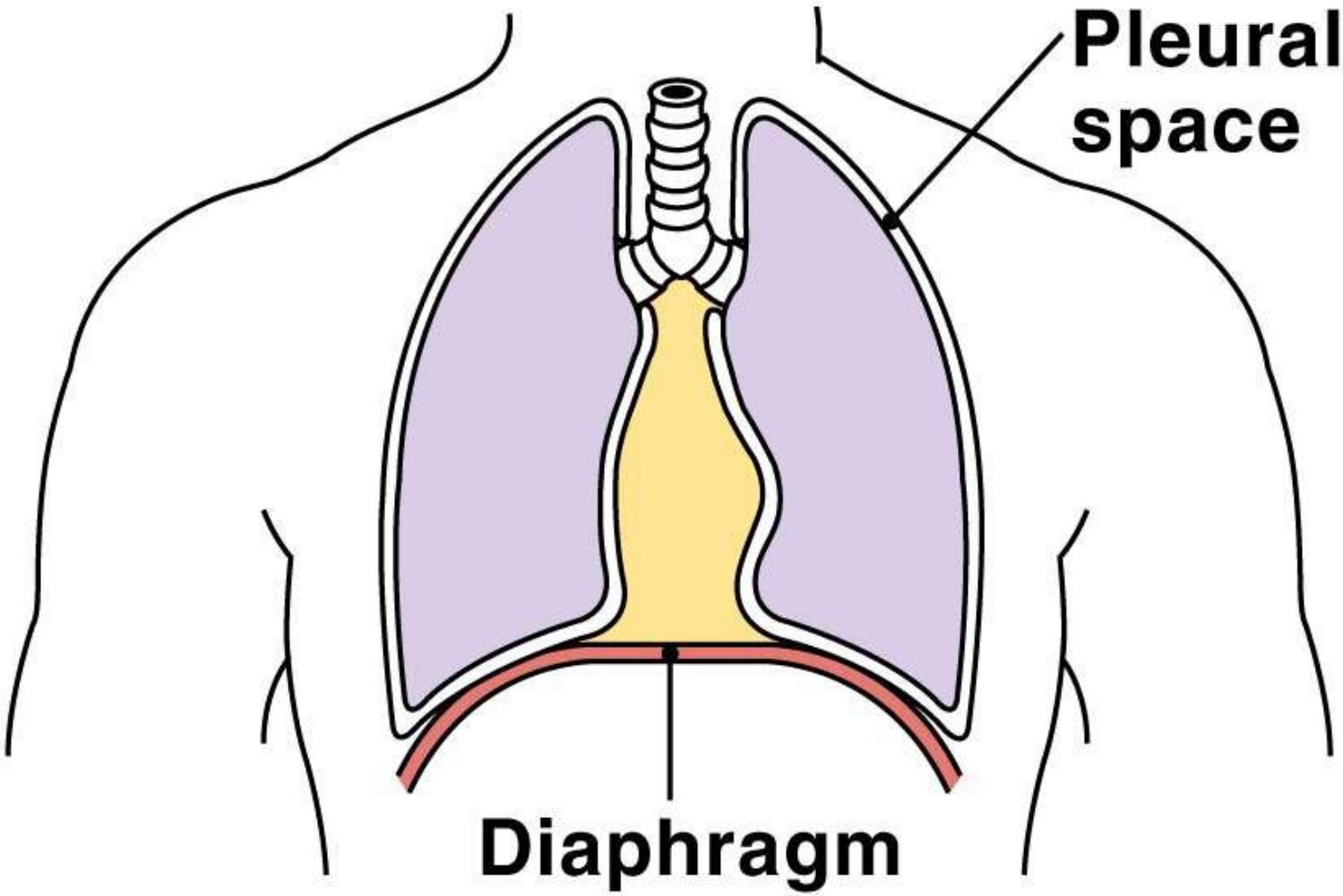


Figure 17-9a

(b) Diaphragm contracts, thoracic volume increases.

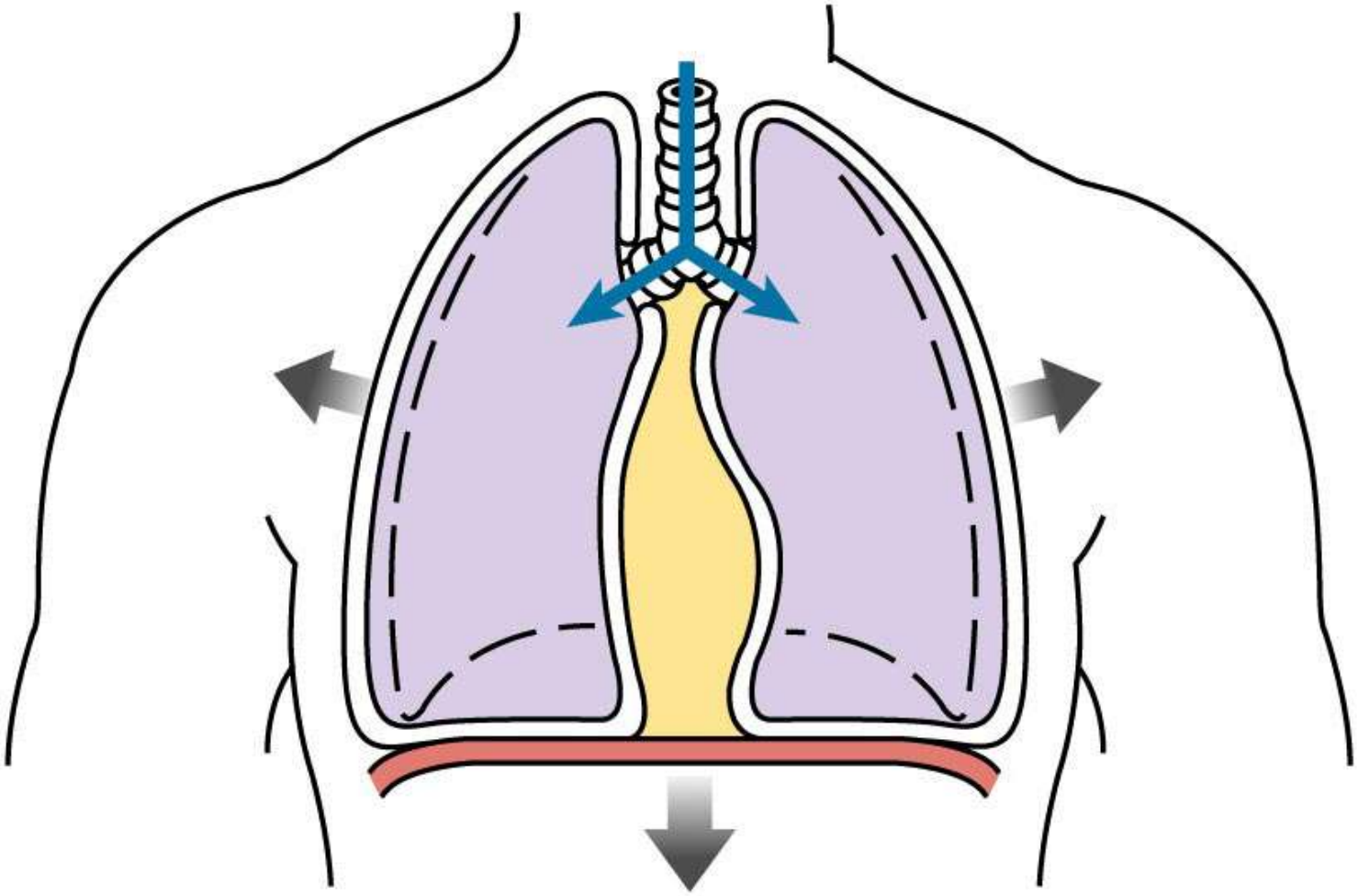


Figure 17-9b

(c) Diaphragm relaxes, thoracic volume decreases.

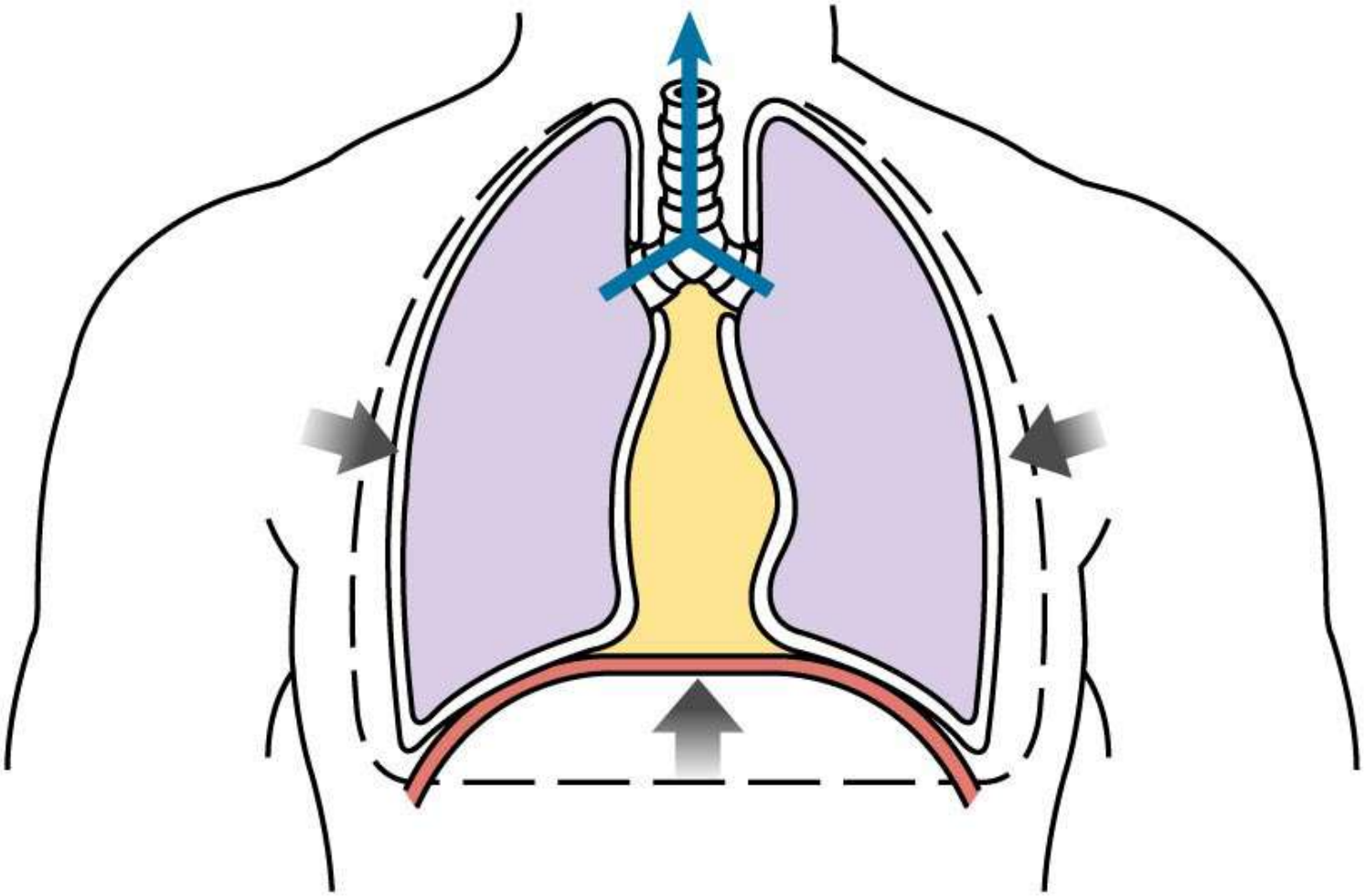


Figure 17-9c

(a) "Pump handle" motion increases anterior-posterior dimension of rib cage.

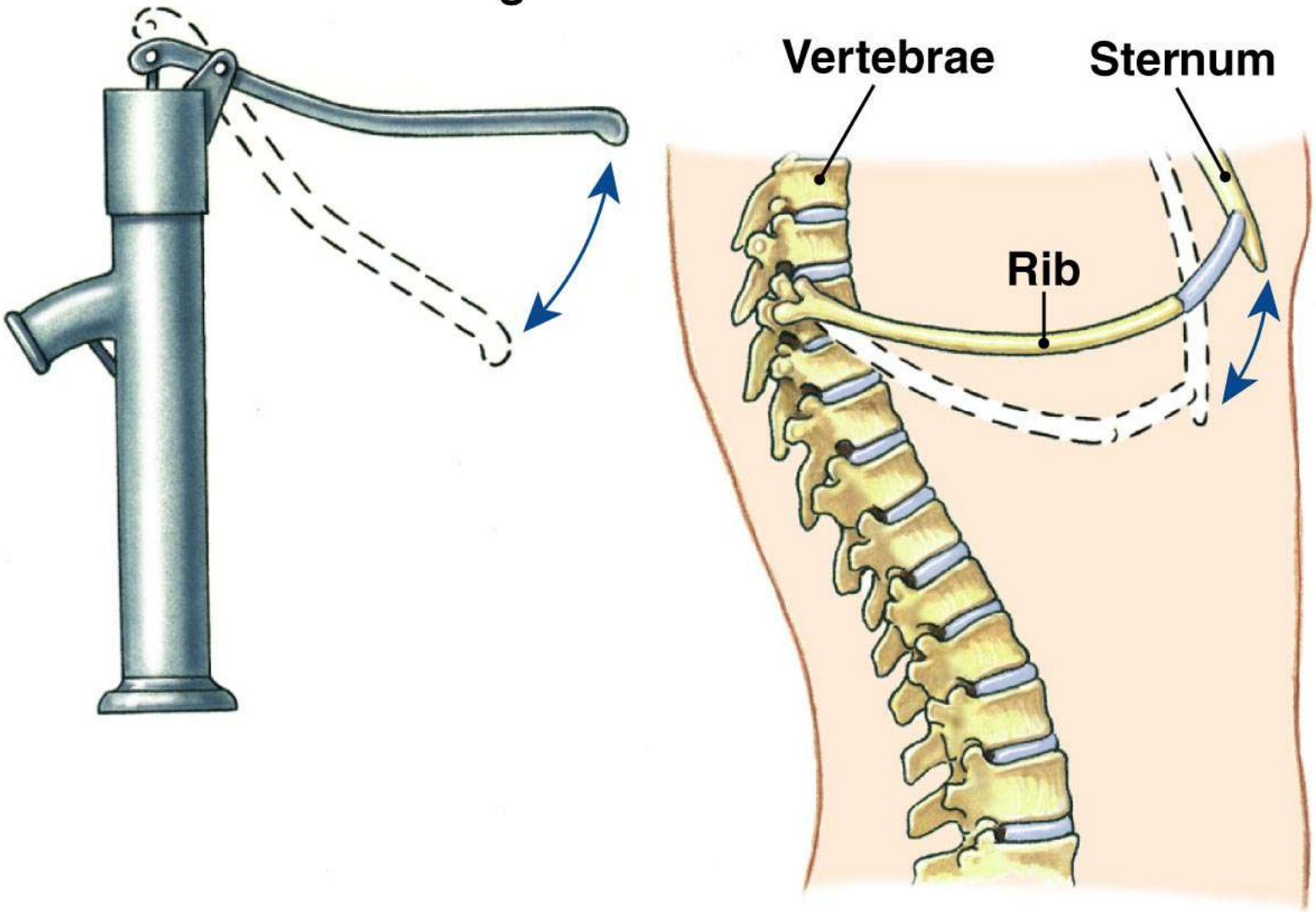


Figure 17-10a

(b) "Bucket handle" motion increases lateral dimension of rib cage.

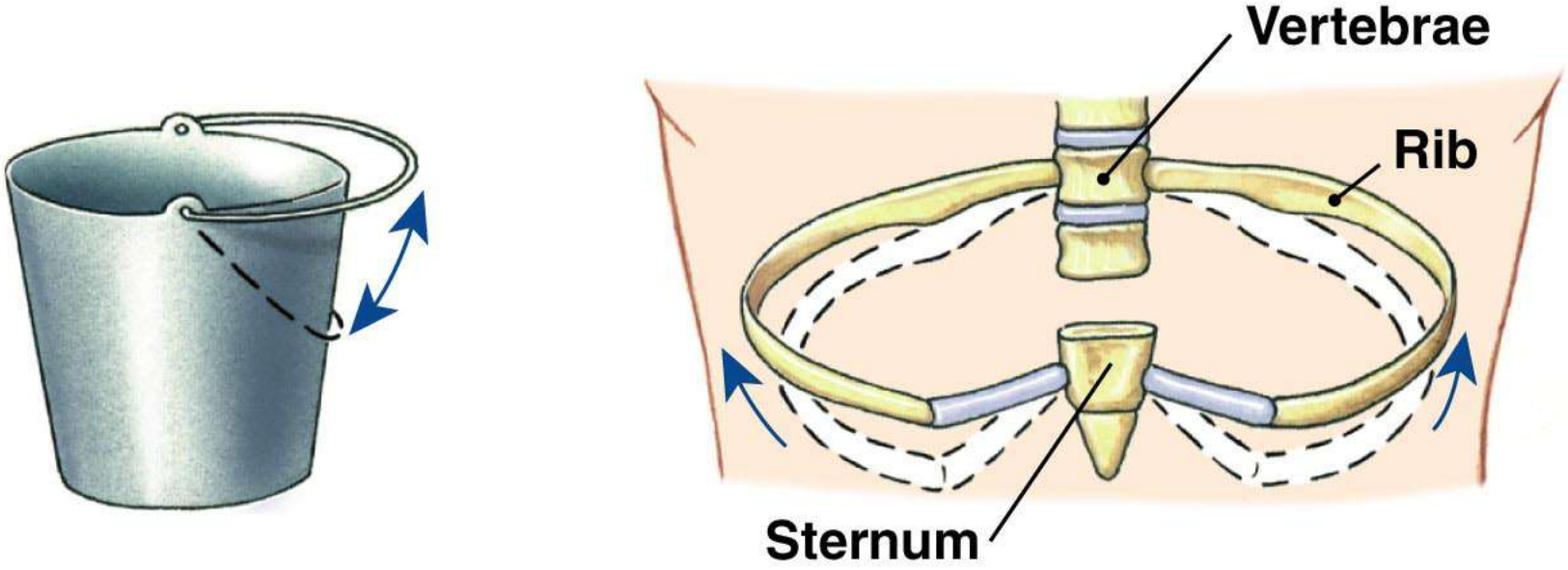


Figure 17-10b

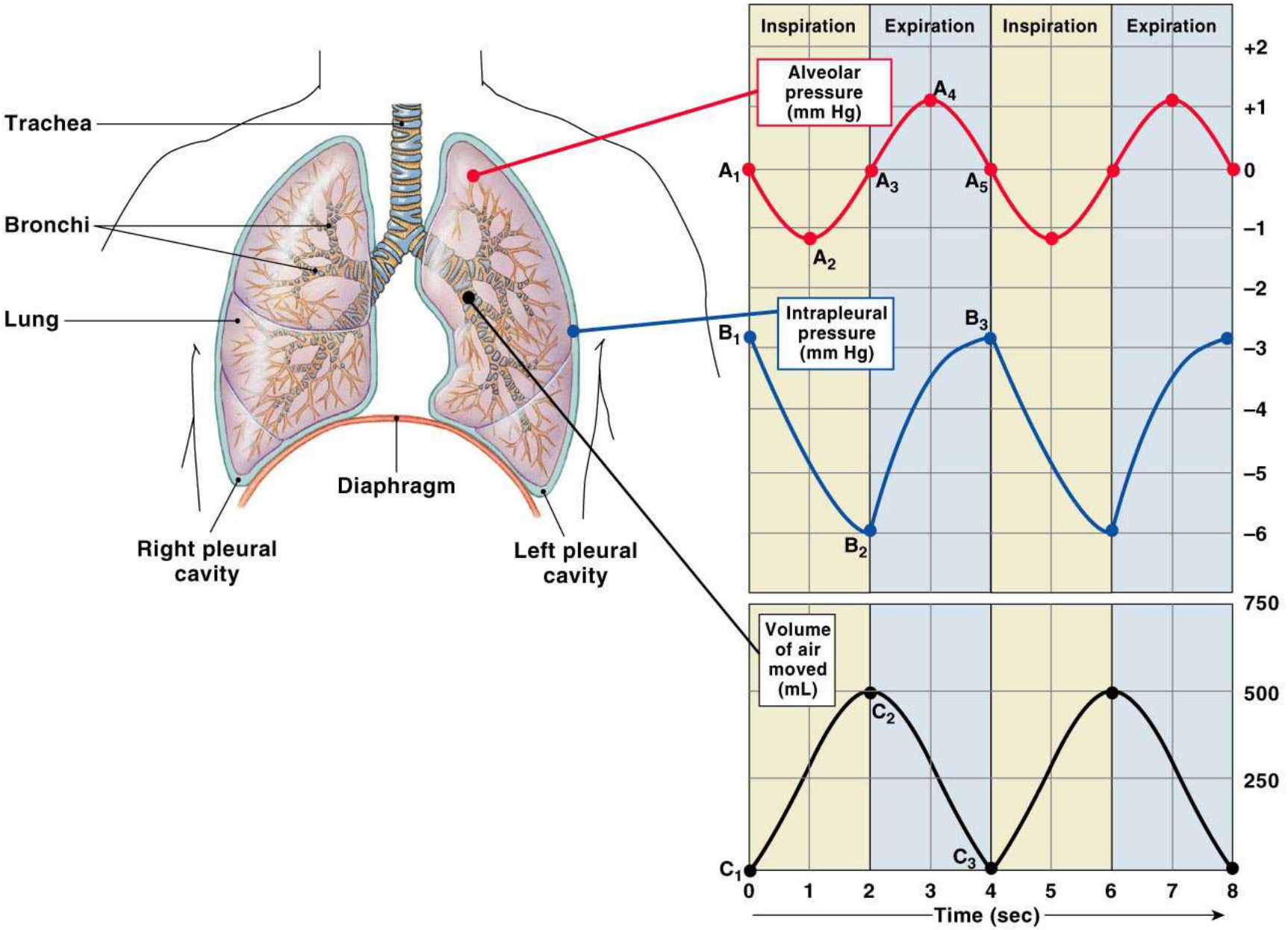


Figure 17-11

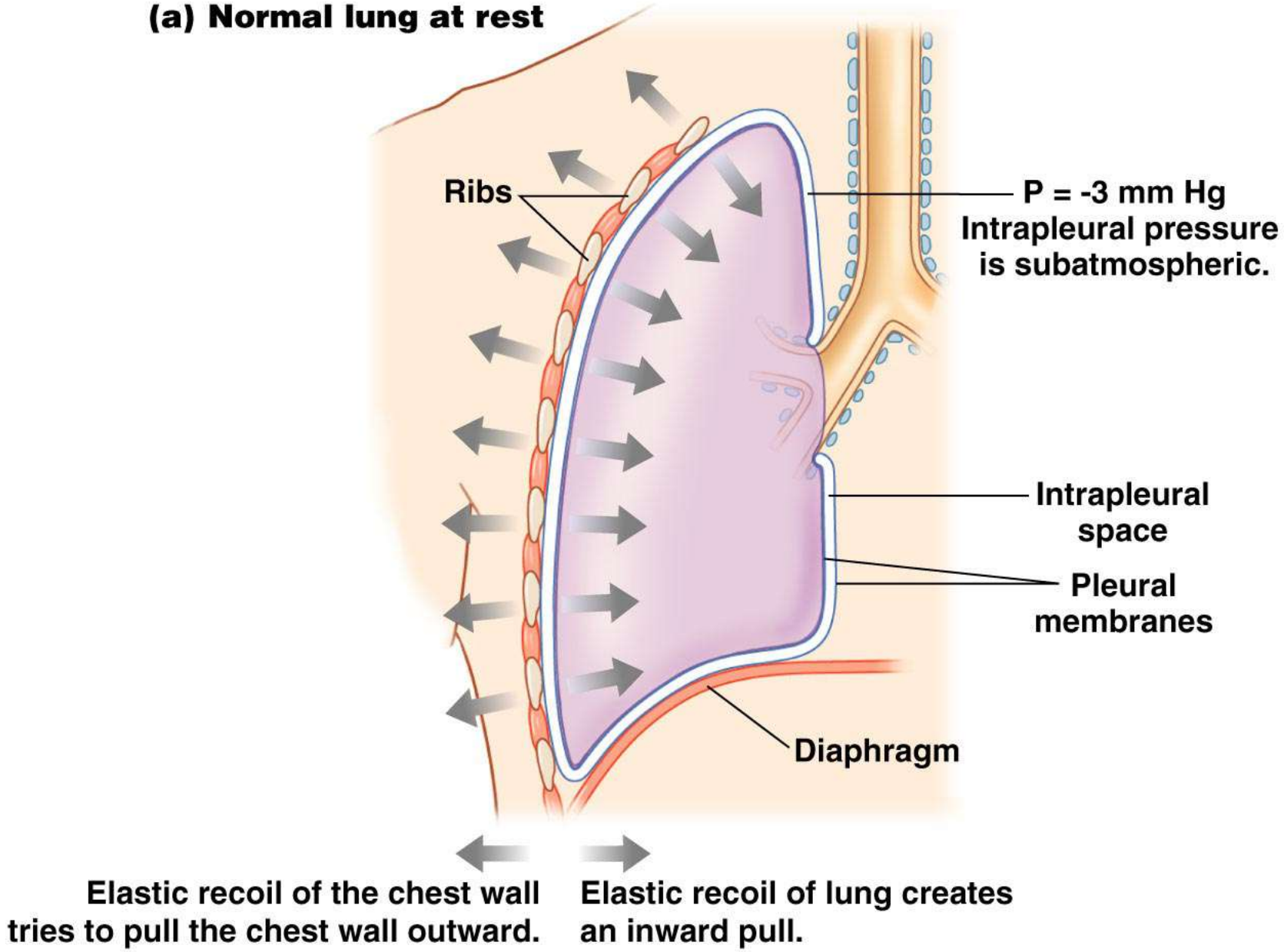


Figure 17-12a

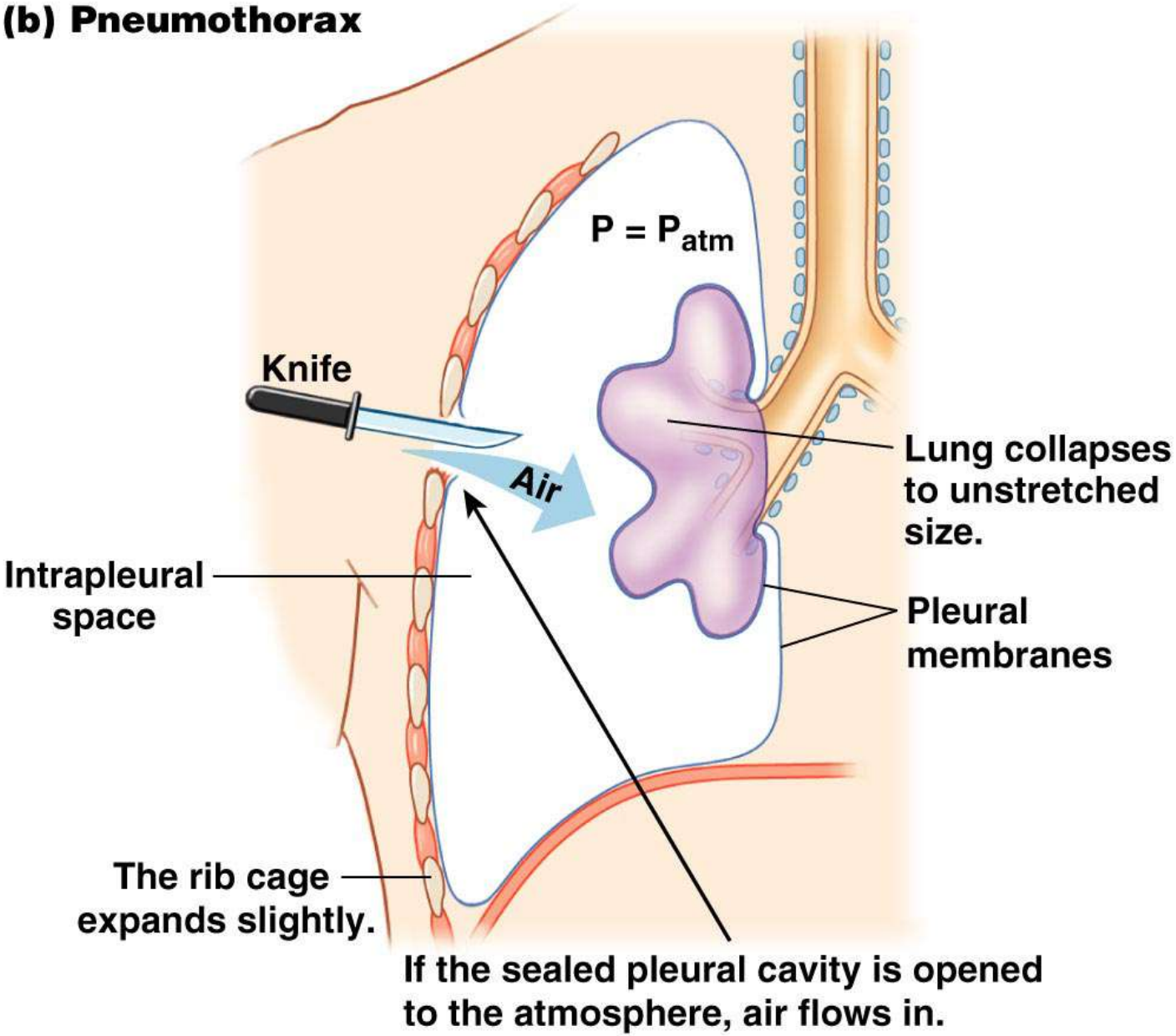


Figure 17-12b

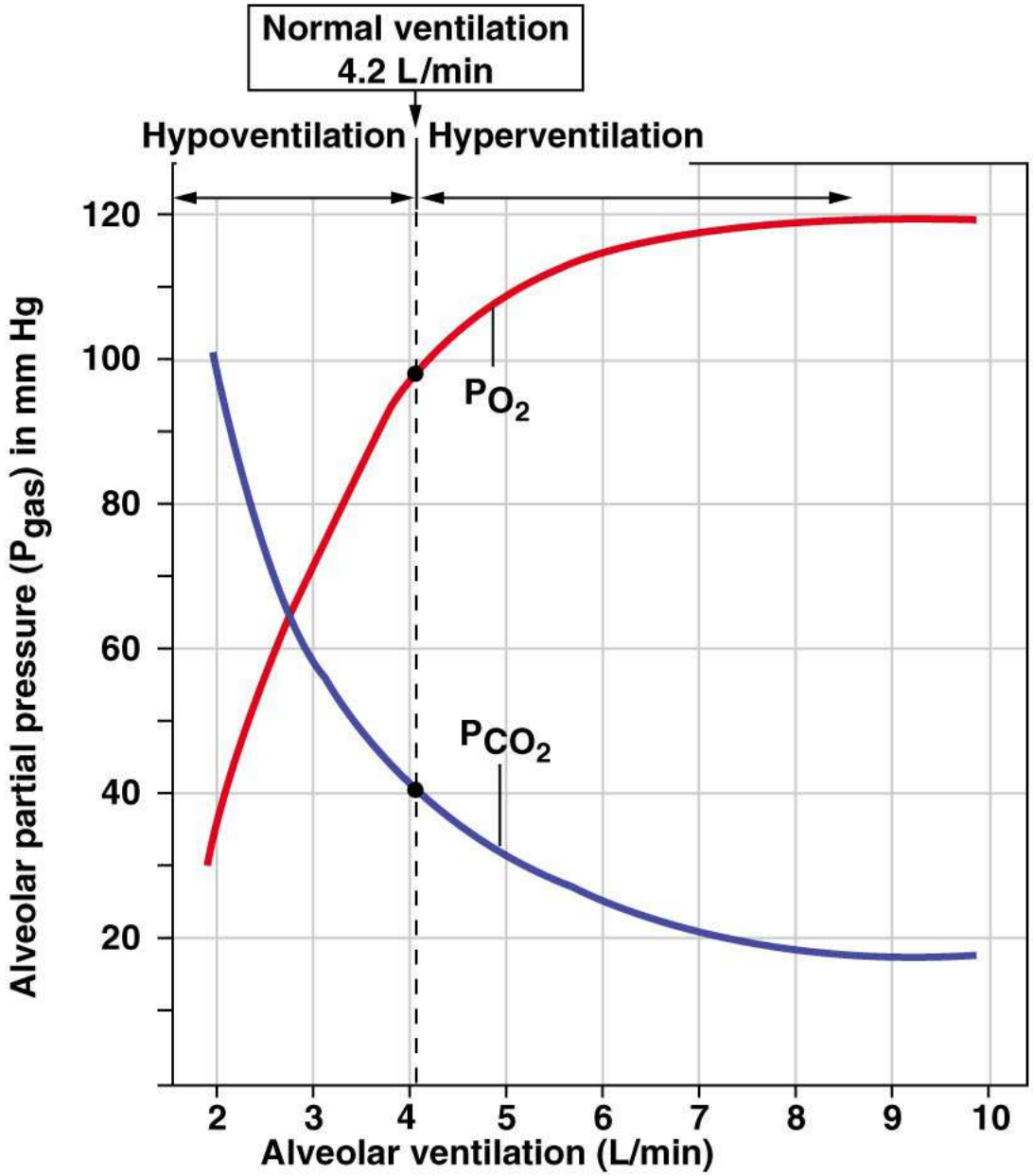


Figure 17-15

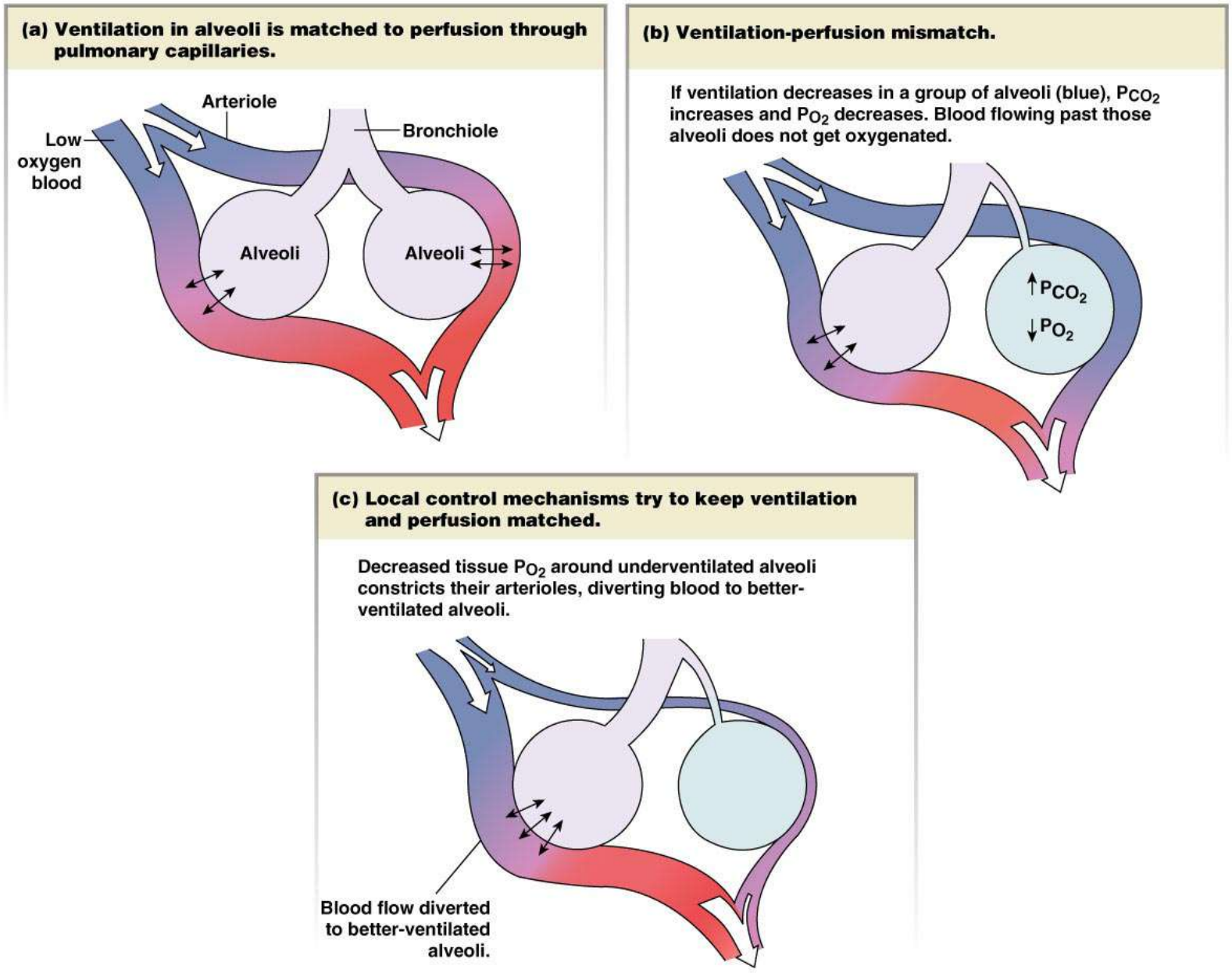
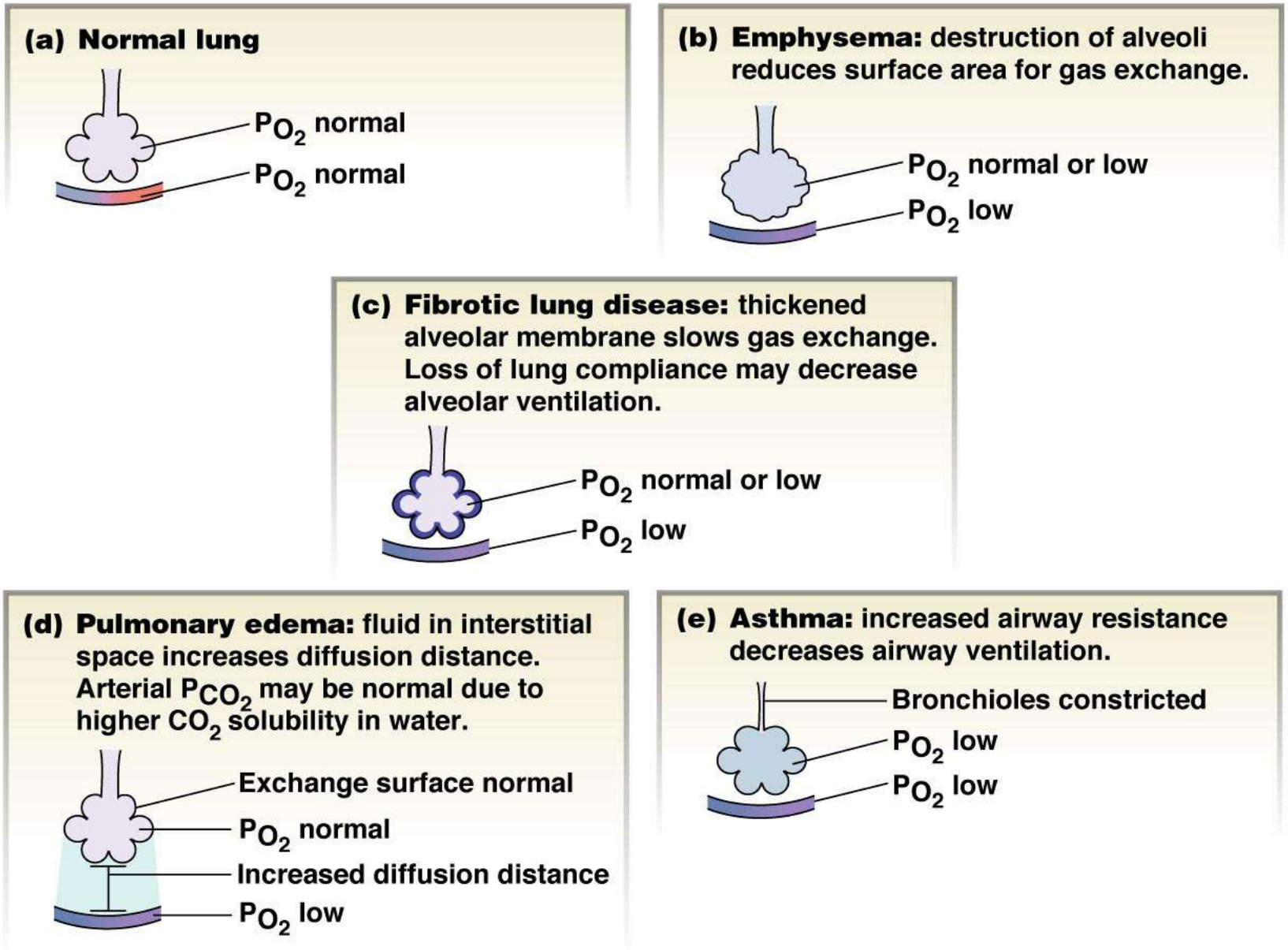


Figure 17-16 - Overview



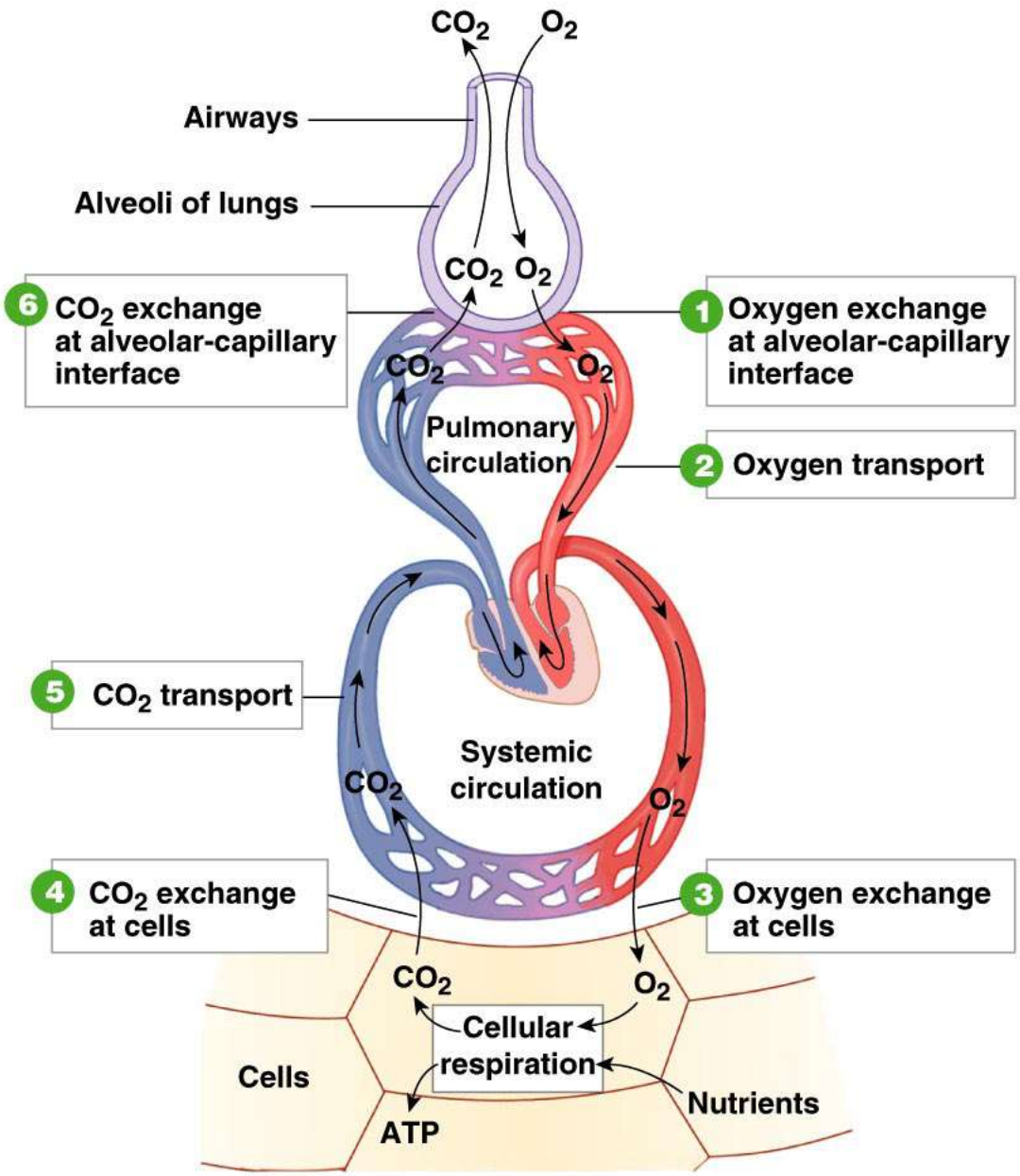


Figure 18-1 - Overview

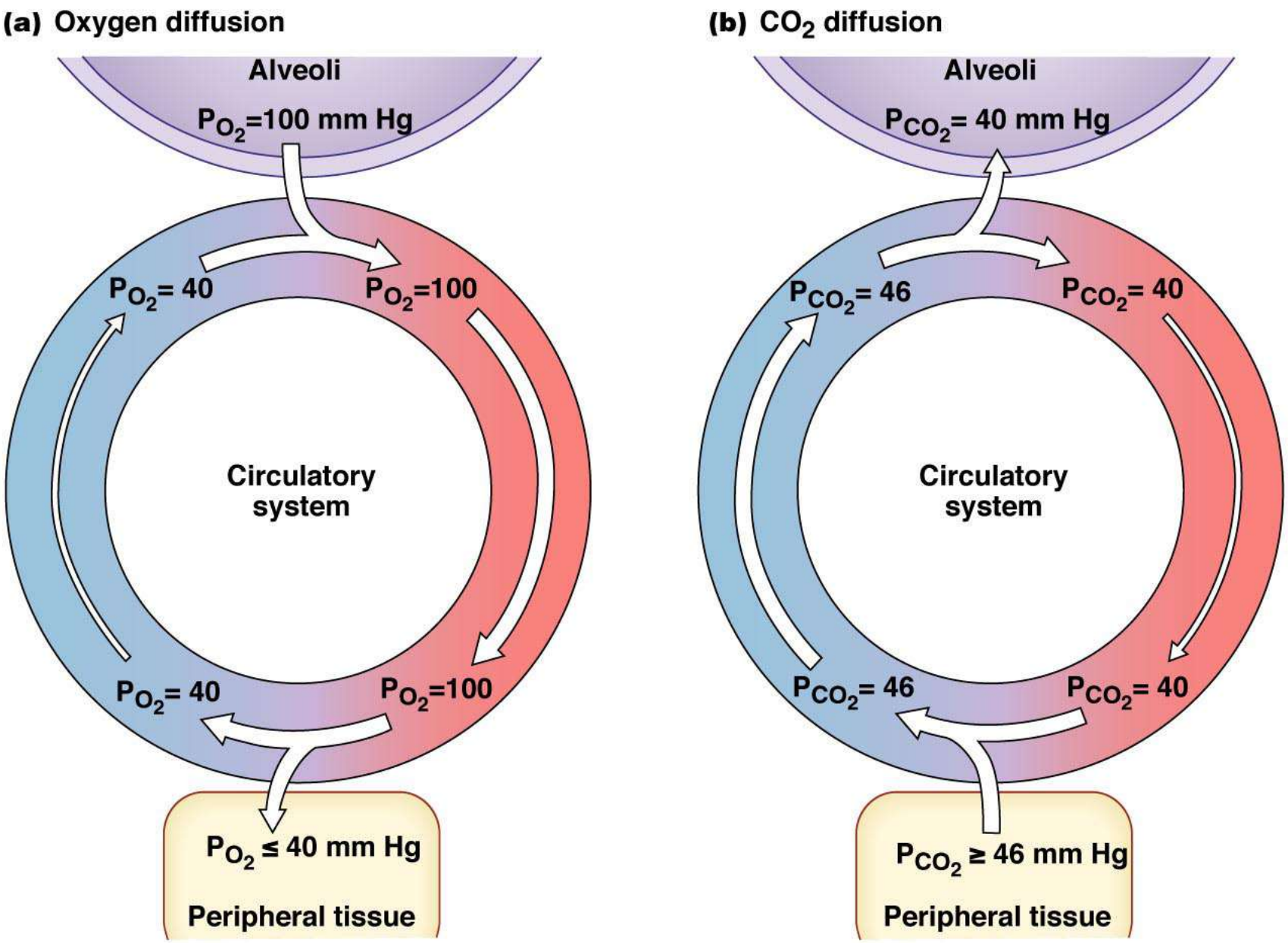


Figure 18-3 - Overview

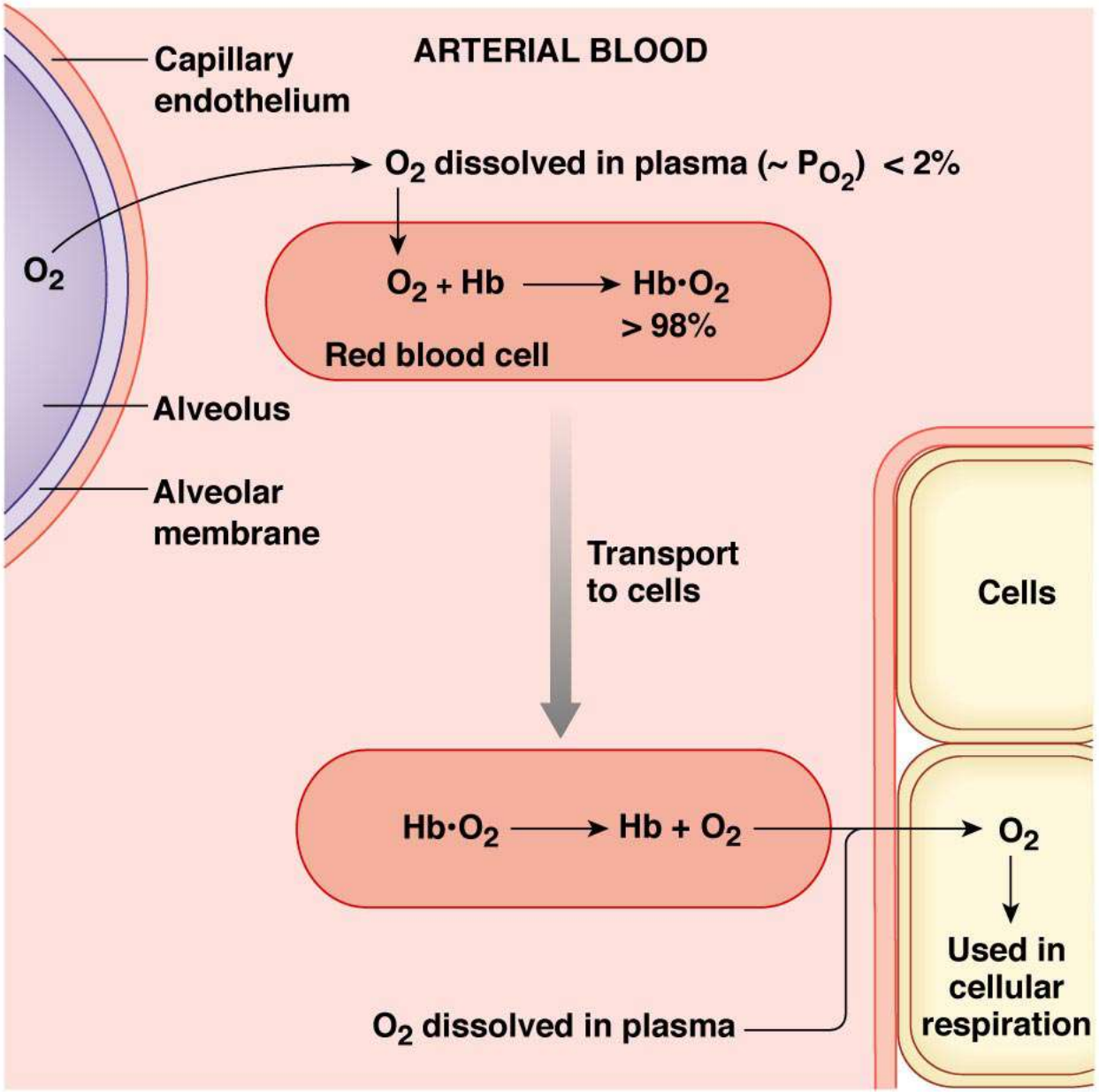
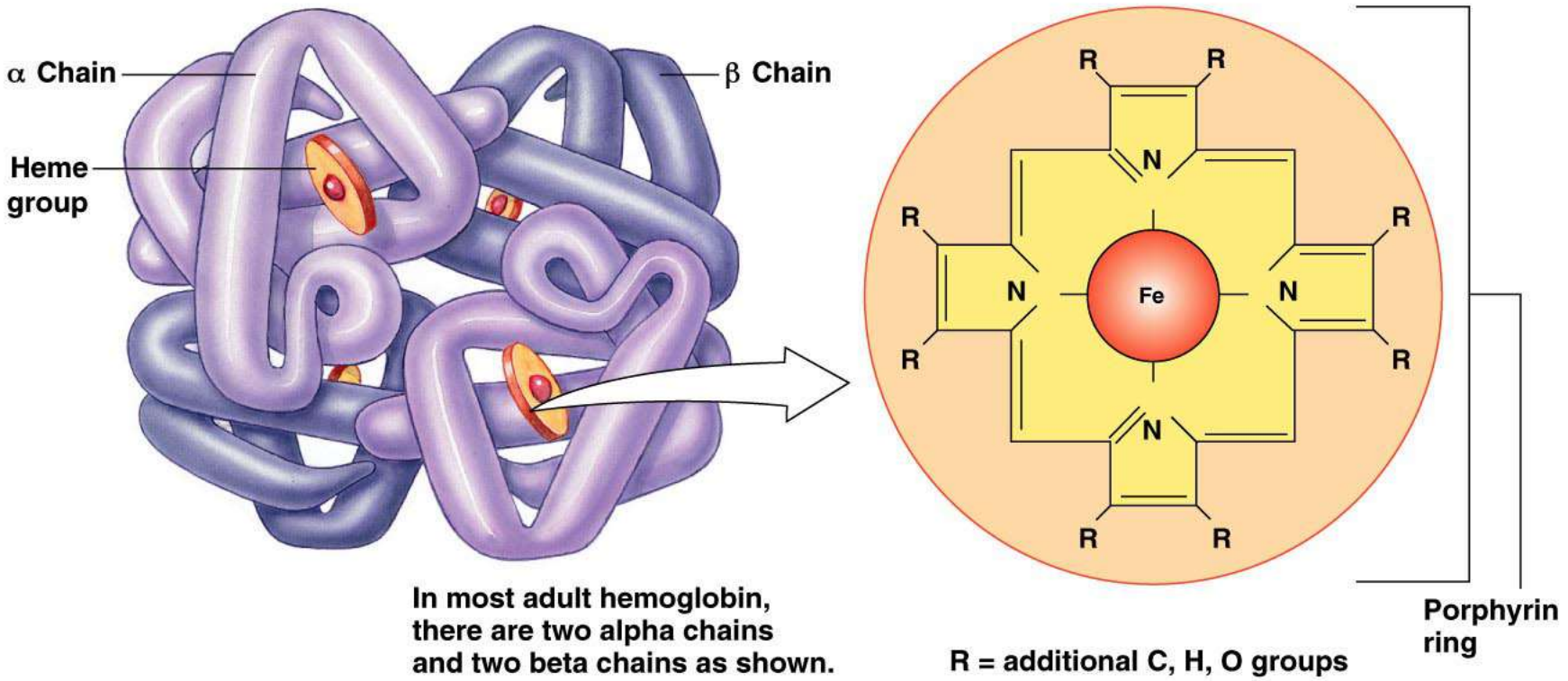


Figure 18-6

(a) A hemoglobin molecule is composed of four protein globin chains, each surrounding a central heme group.

(b) Each heme group consists of a porphyrin ring with an iron atom in the center.



In most adult hemoglobin, there are two alpha chains and two beta chains as shown.

R = additional C, H, O groups

Figure 18-8 - Overview

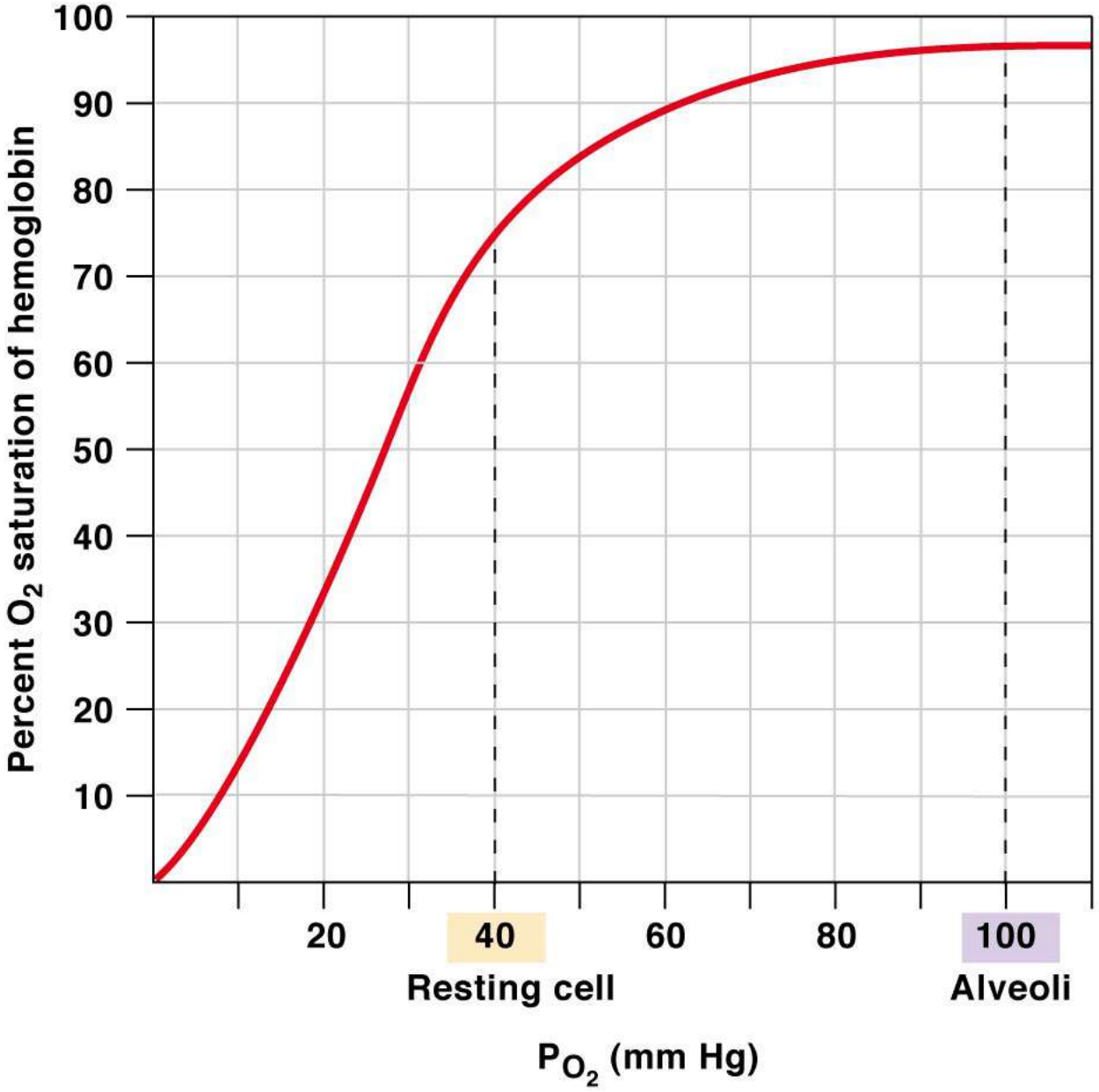


Figure 18-9

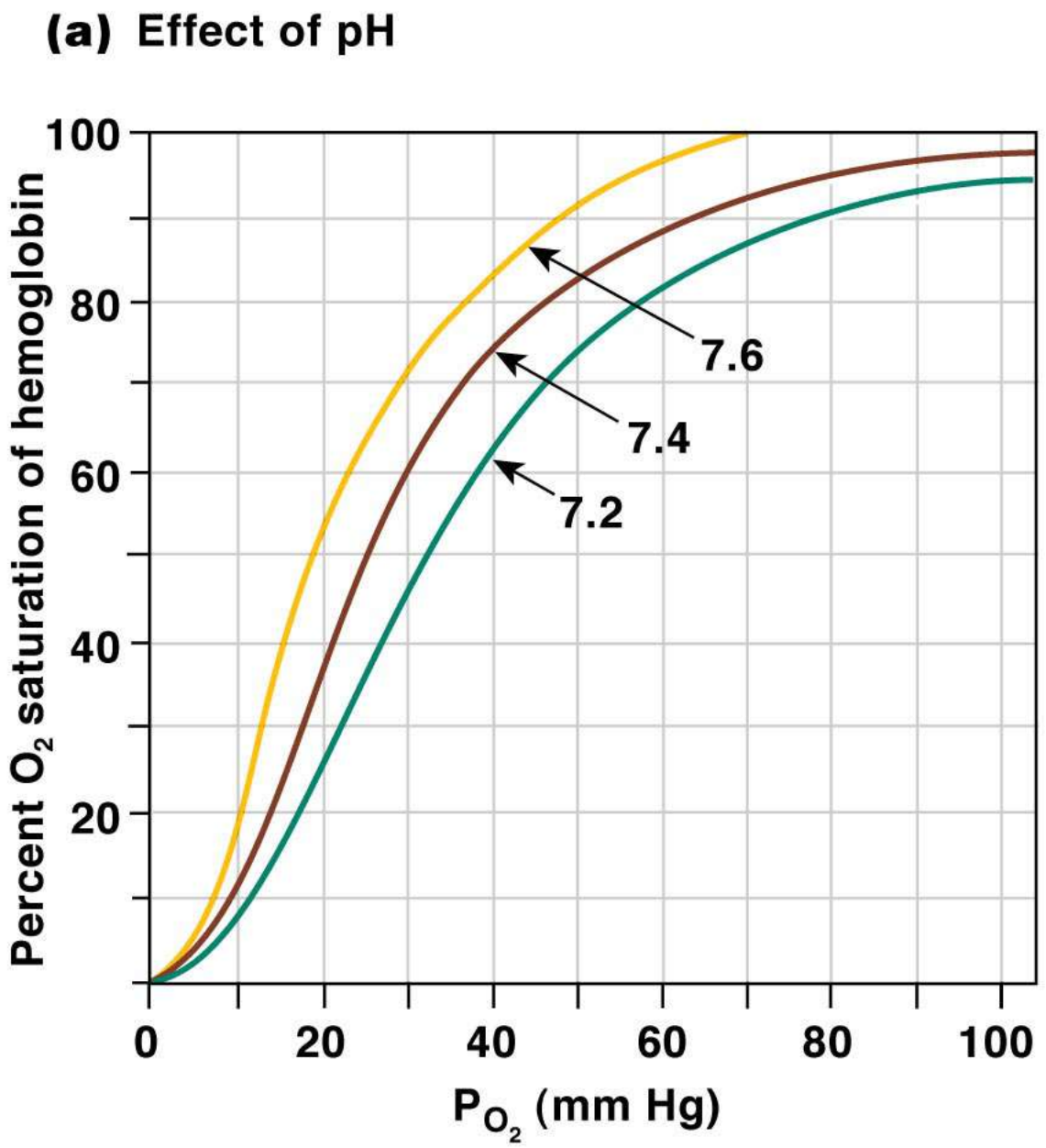


Figure 18-10a

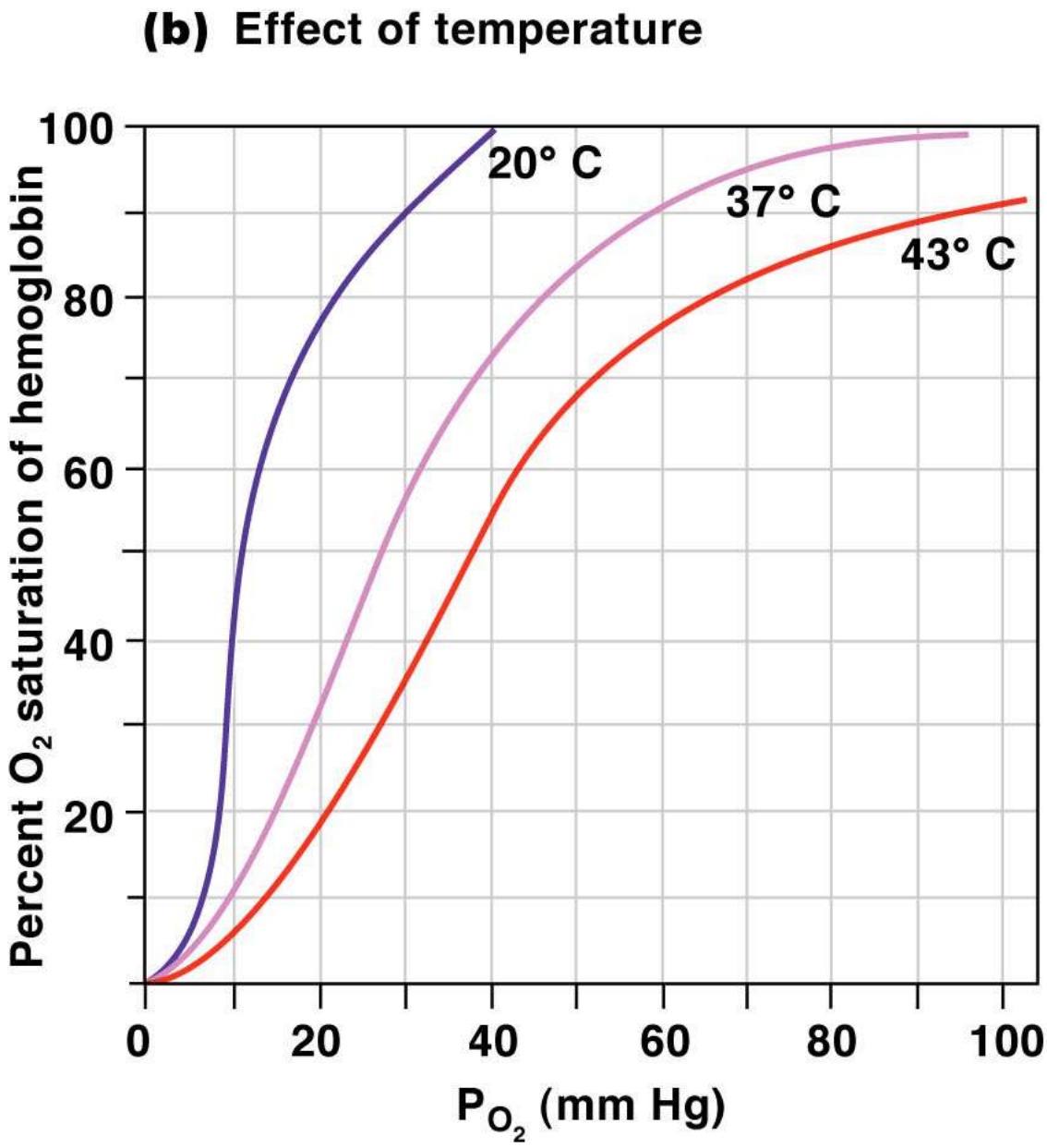


Figure 18-10b

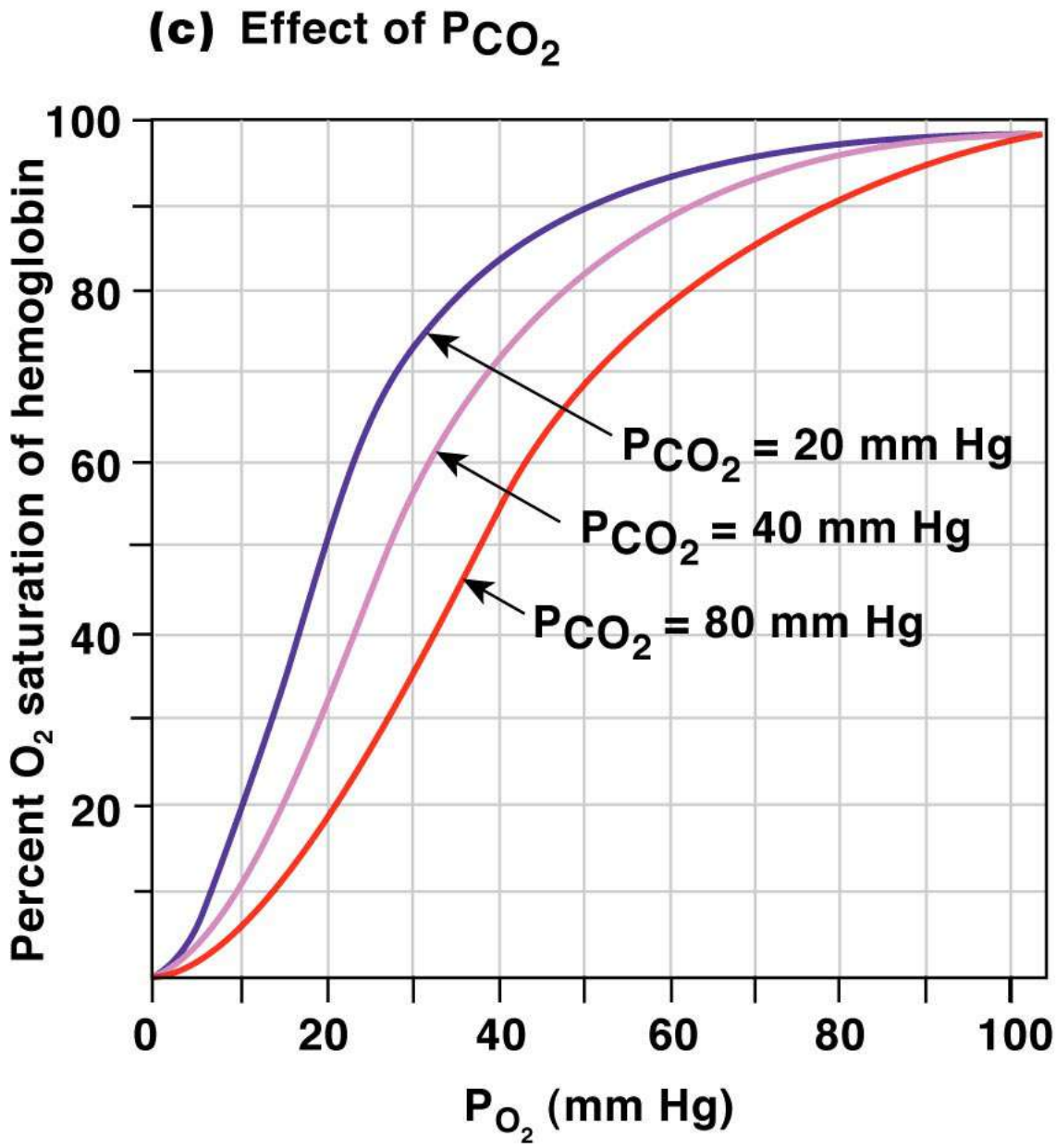


Figure 18-10c

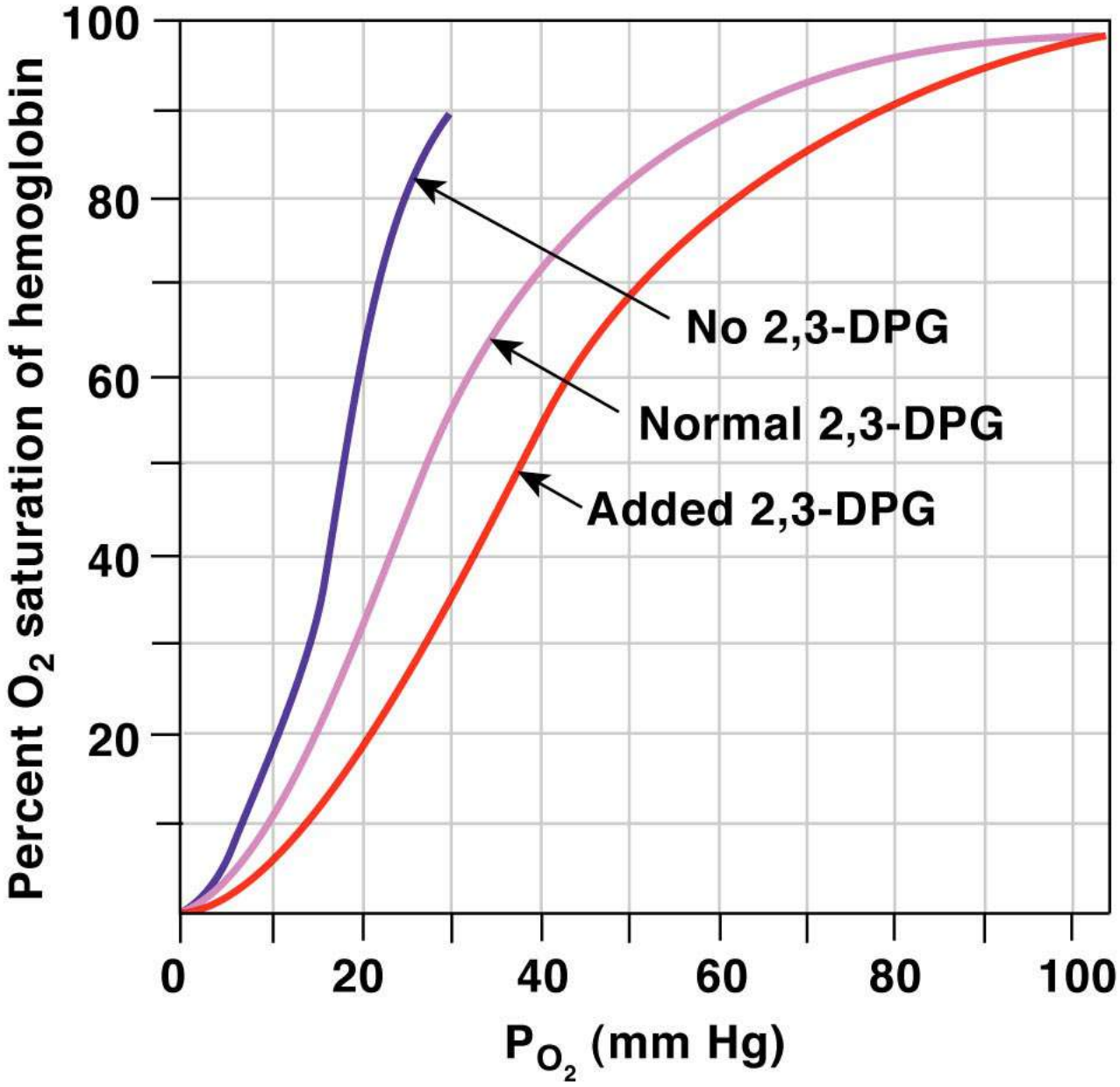


Figure 18-11

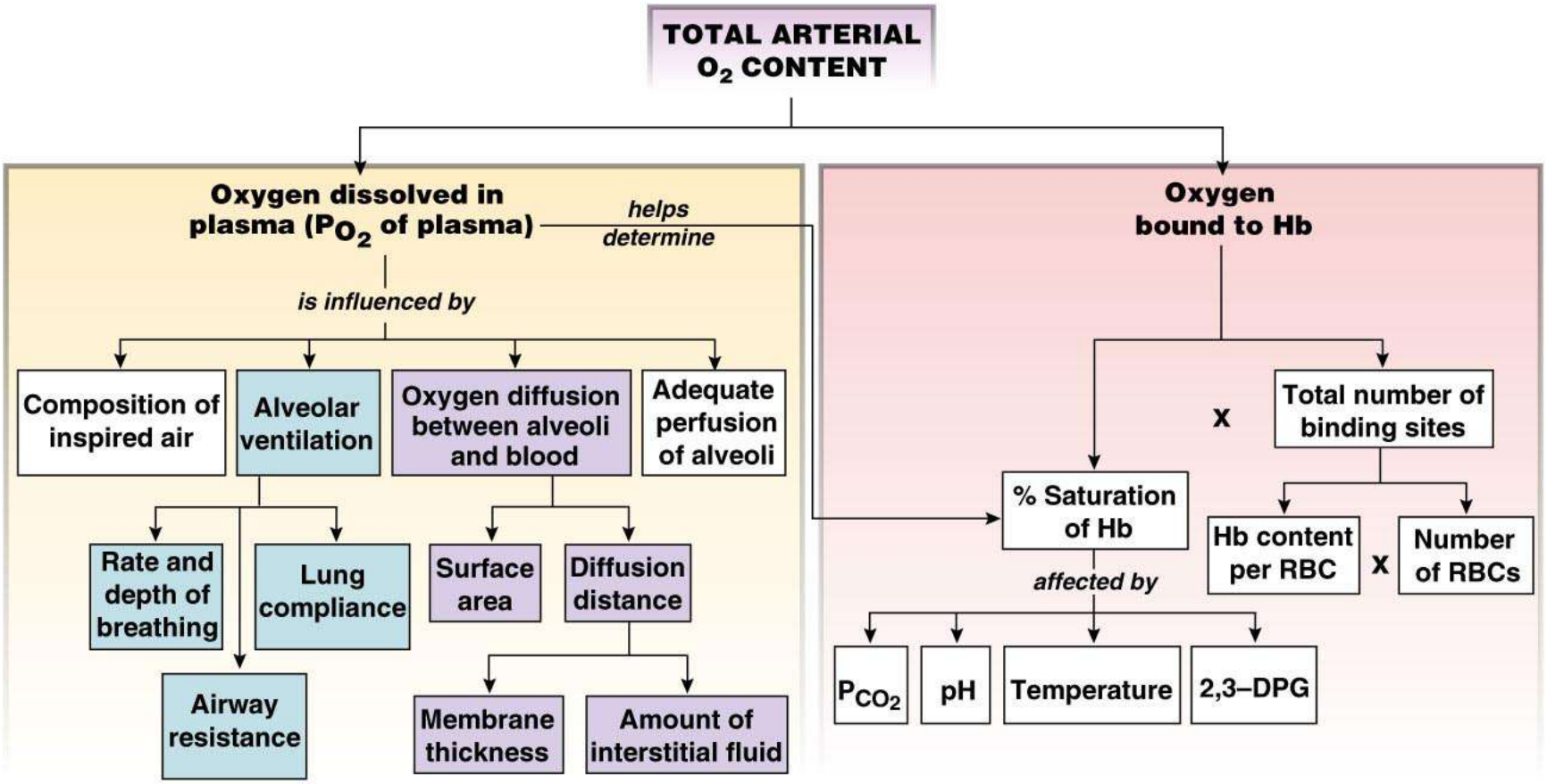


Figure 18-13

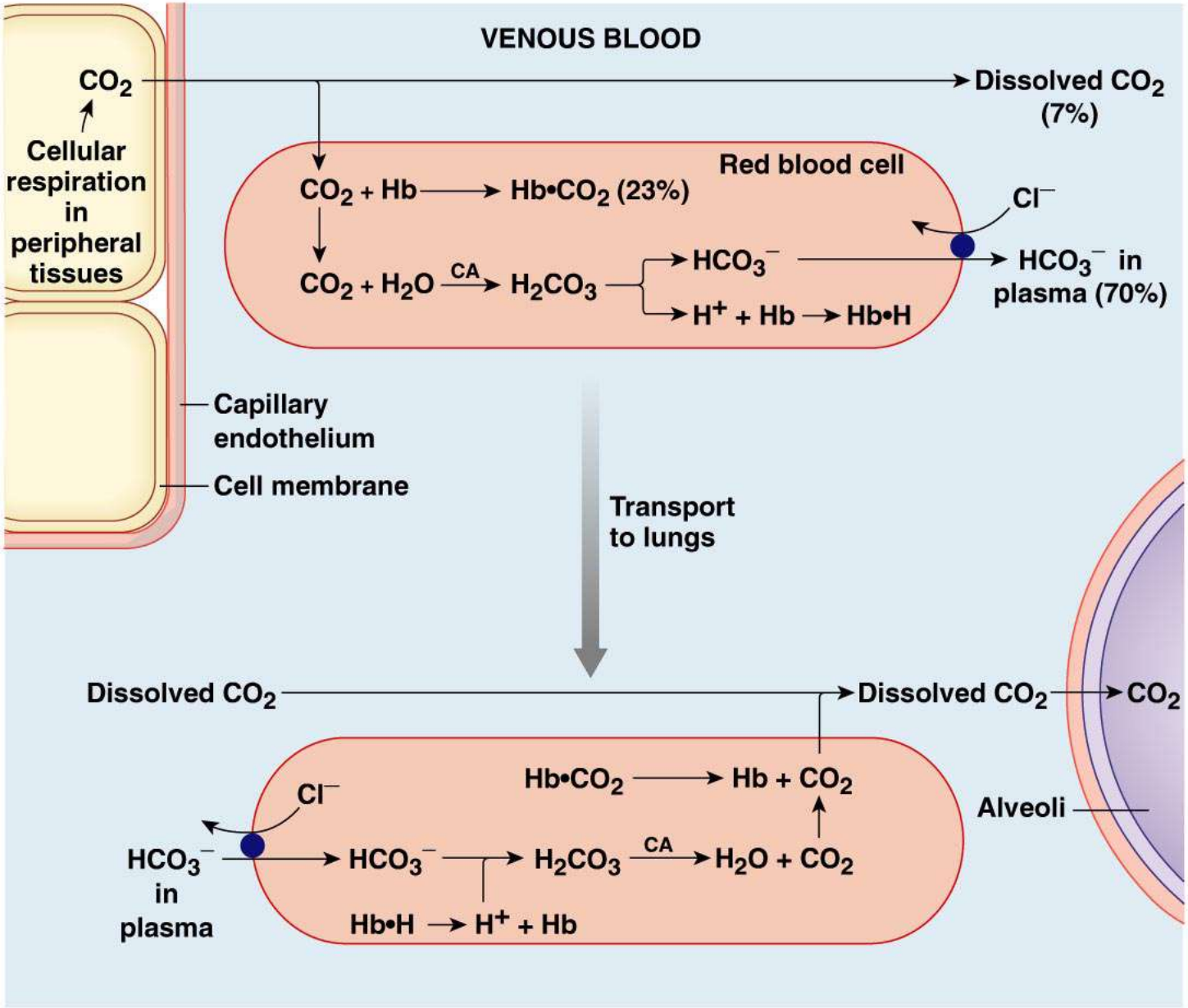


Figure 18-14

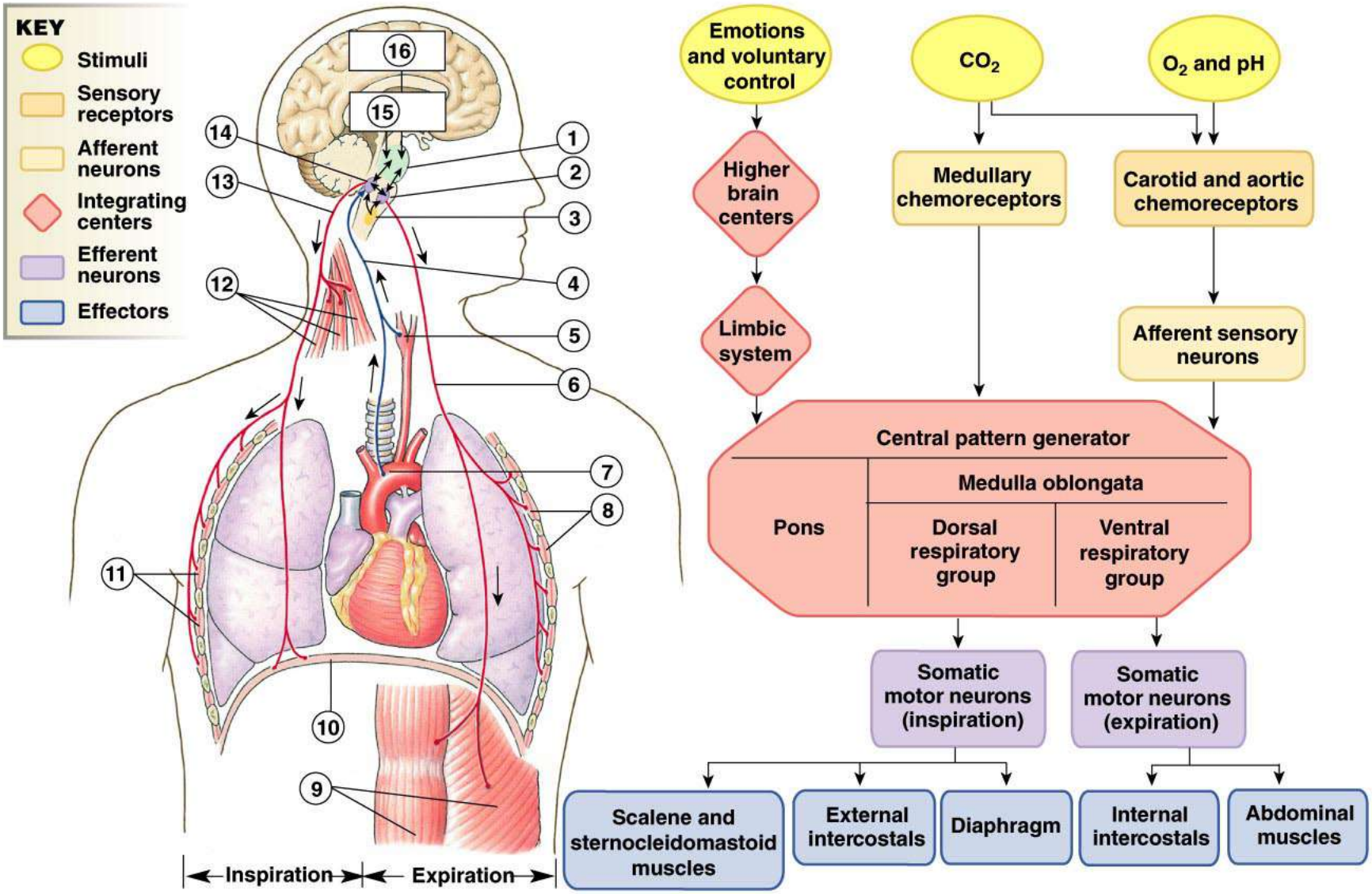


Figure 18-16

Medullary Respiratory Centers

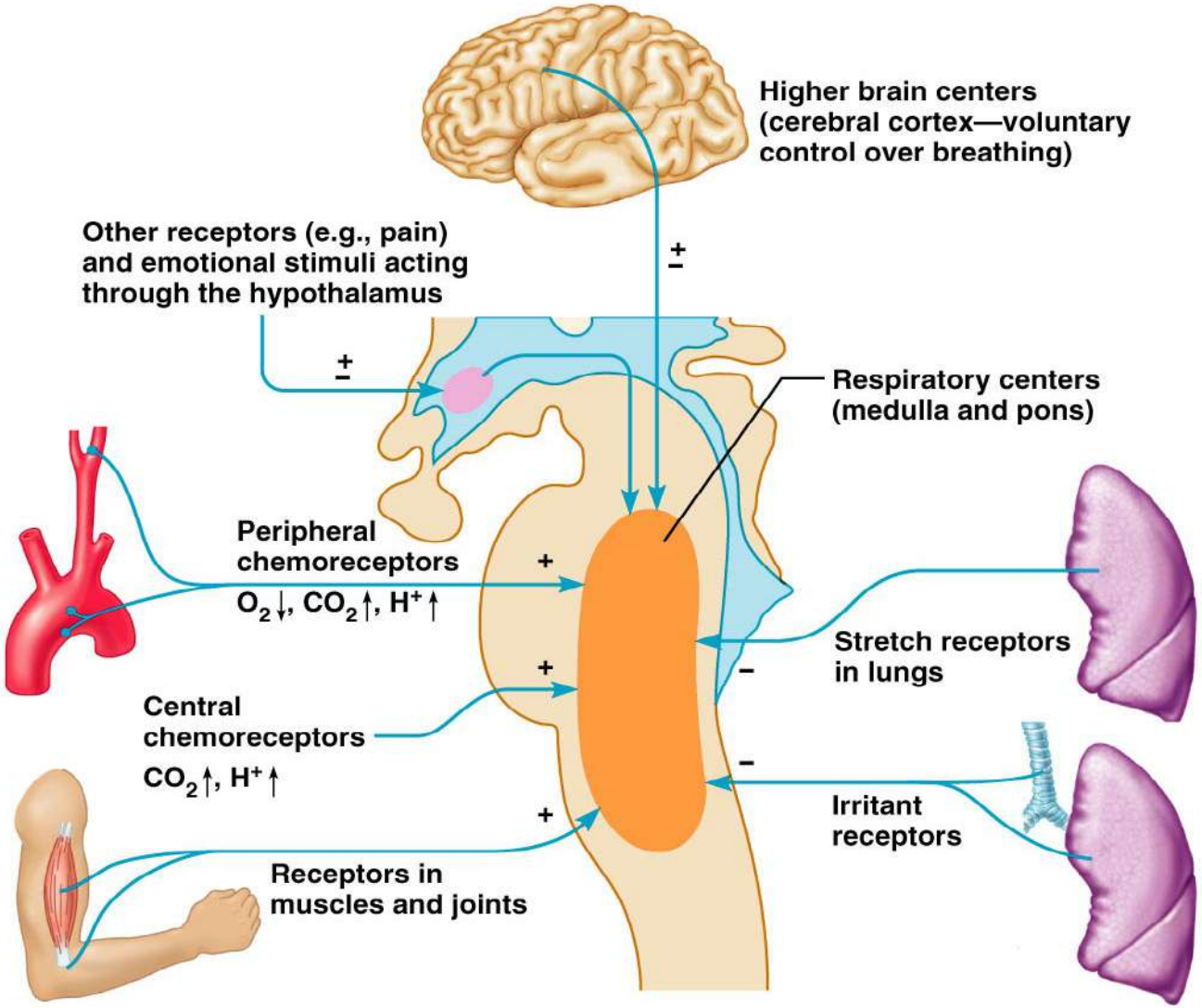


Figure 22.25

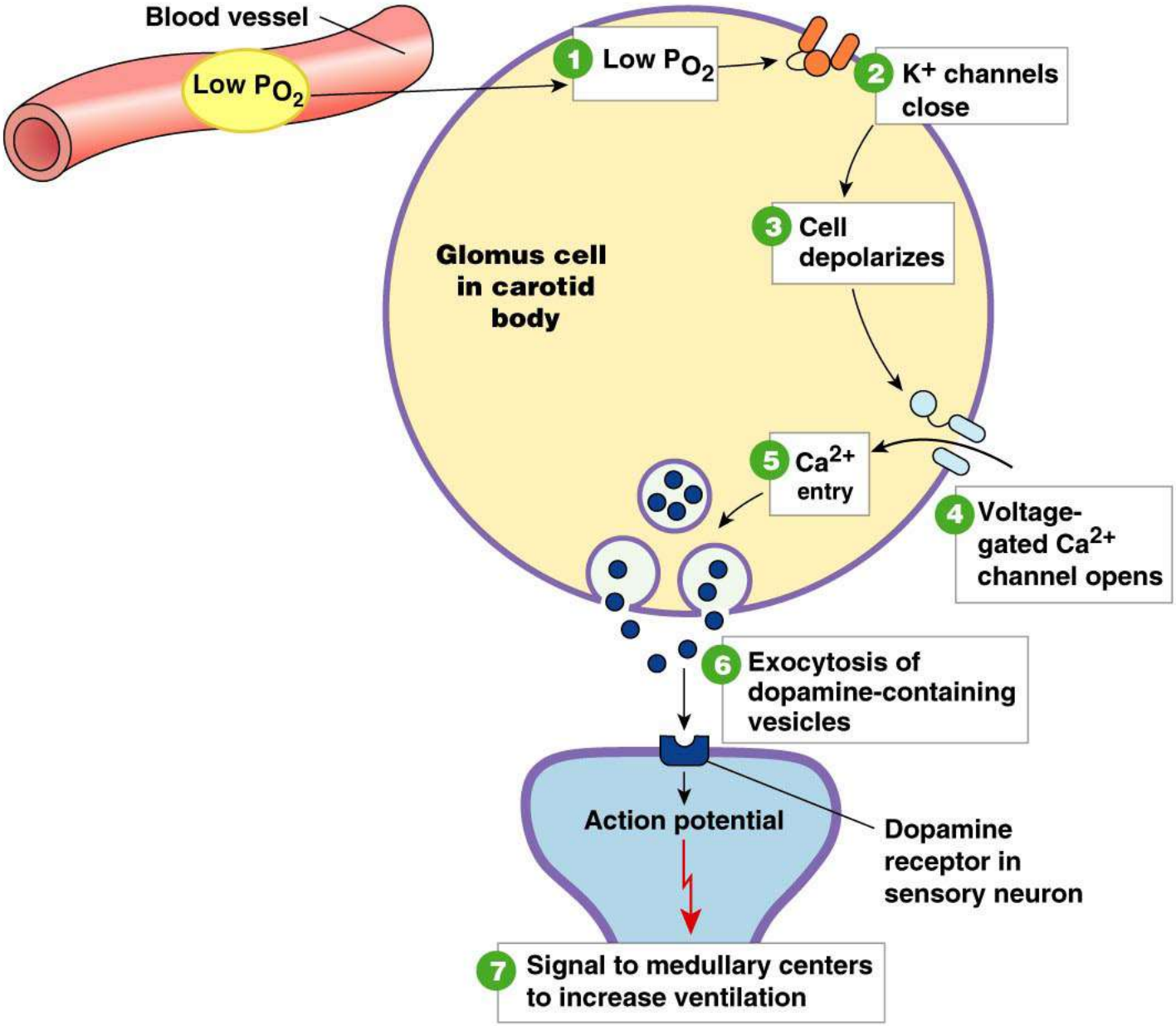


Figure 18-18

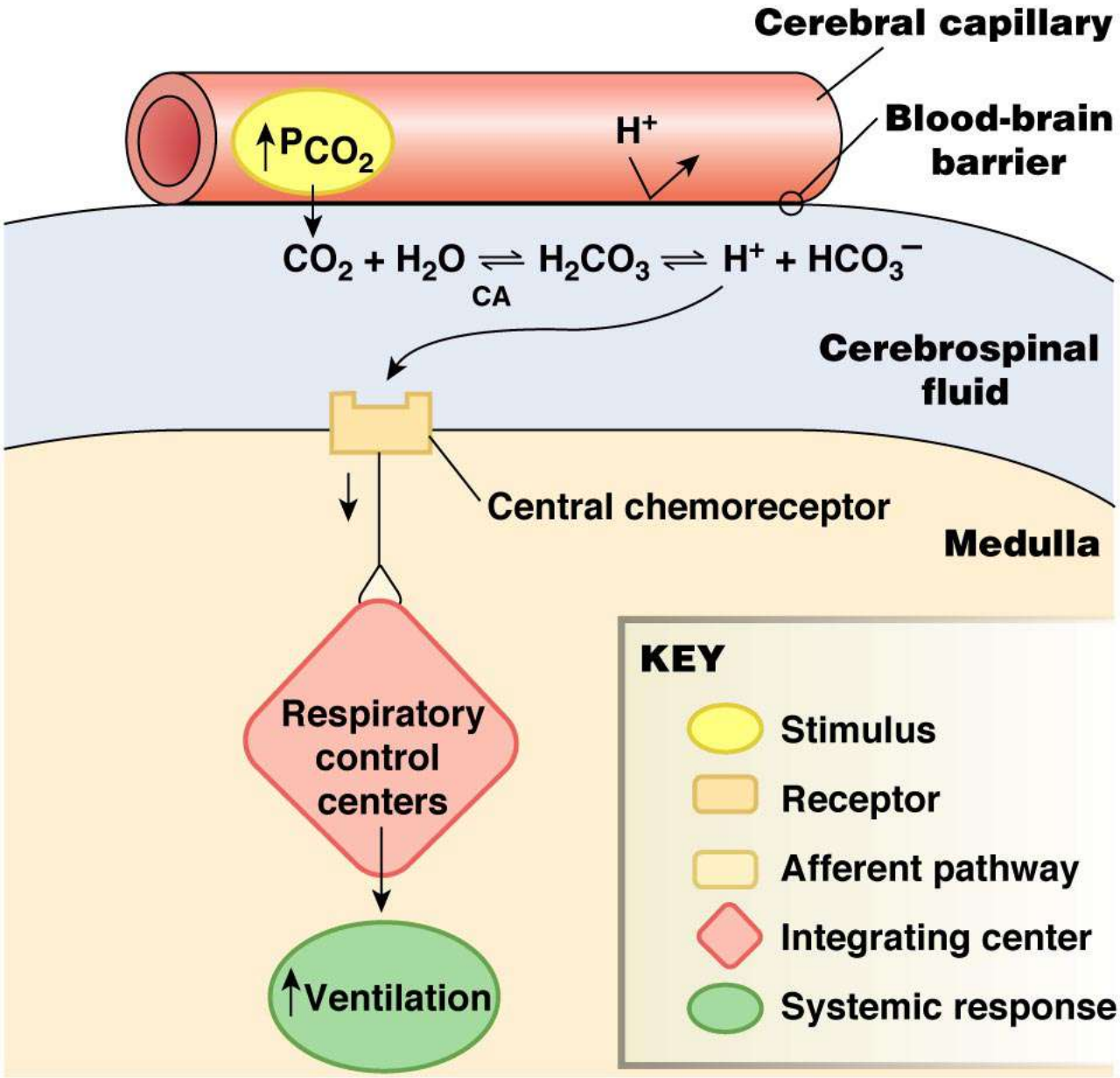


Figure 18-19

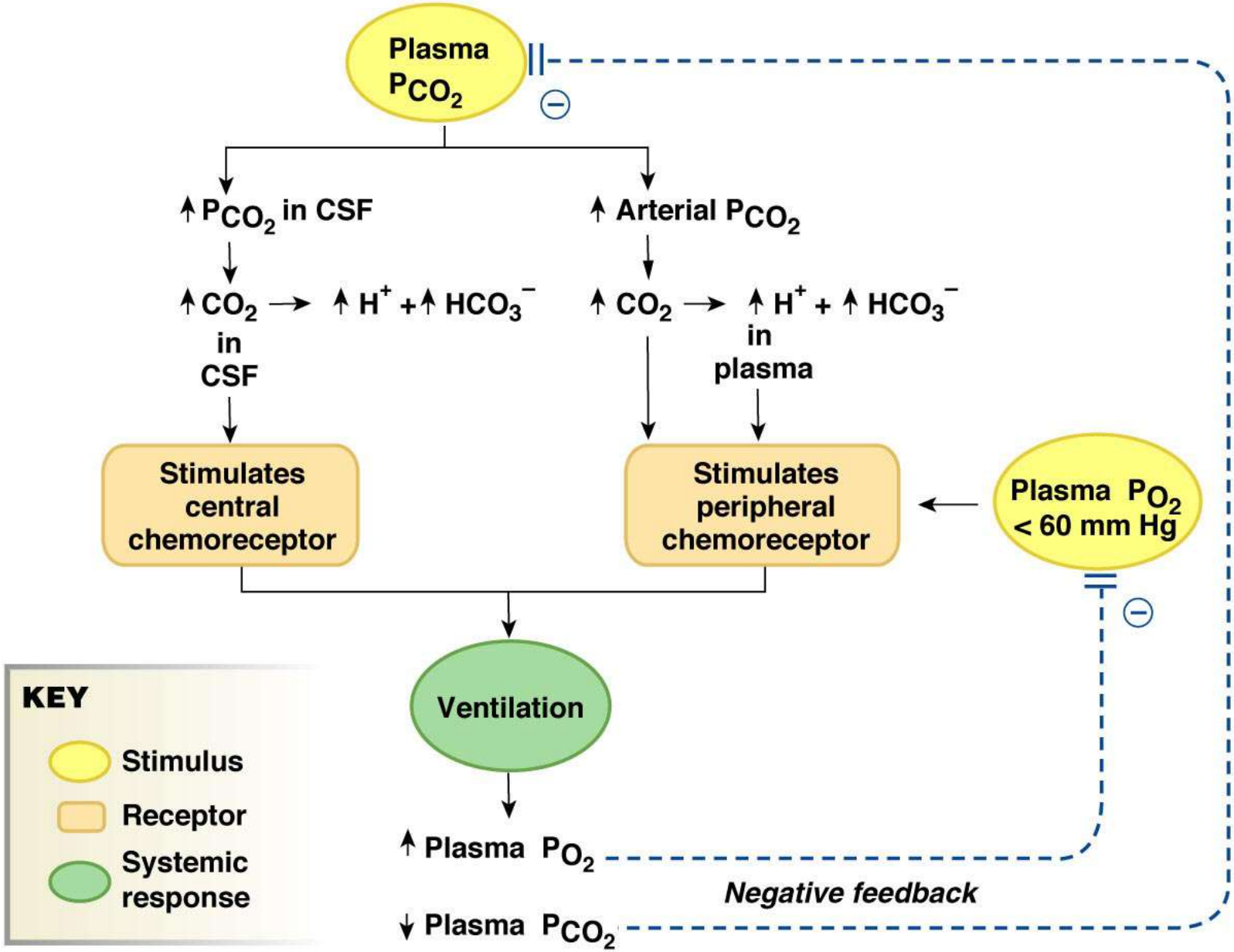


Figure 18-20