

# **Circulation and Respiration**

\$800,000), call oneself a screenwriter, and feel morally superior to those Iowa State law school grads who work for Monsanto so they can buy five-thousand-square-foot tract mansions in Des Moines.

My point is not that the Hampshire-graduate bungalow owner is hypocritical—we're all hypocrites these days, one way or another—but rather my point is that we cannot track our ever-shifting forms of consumer narcissism if we do not clearly understand how ancient human instincts interact with the modern economy, and how people display their ancient psychological traits through this week's hot new products.

### The Narcissism Premium for Cost-Dense Products

If we do a little price-comparison exercise, we can better appreciate the two faces of fitness-flaunting consumer narcissism. Let's take consumerism at face value as a form of materialism—a way of buying raw matter that has been transformed and patterned for human use. How can we compare prices and value-densities for very different products, ranging from apples to bras to cars to cocaine? We can measure them on two fundamental scales: their retail cost, and the amount of matter they contain. As economics meets physics, we can ask how many dollars per pound a variety of different products cost, and see if any notable patterns arise. The table below gives estimates for a range of products. (The notes on the book's website give more detail about each product's features and how I calculated the cost per pound.)

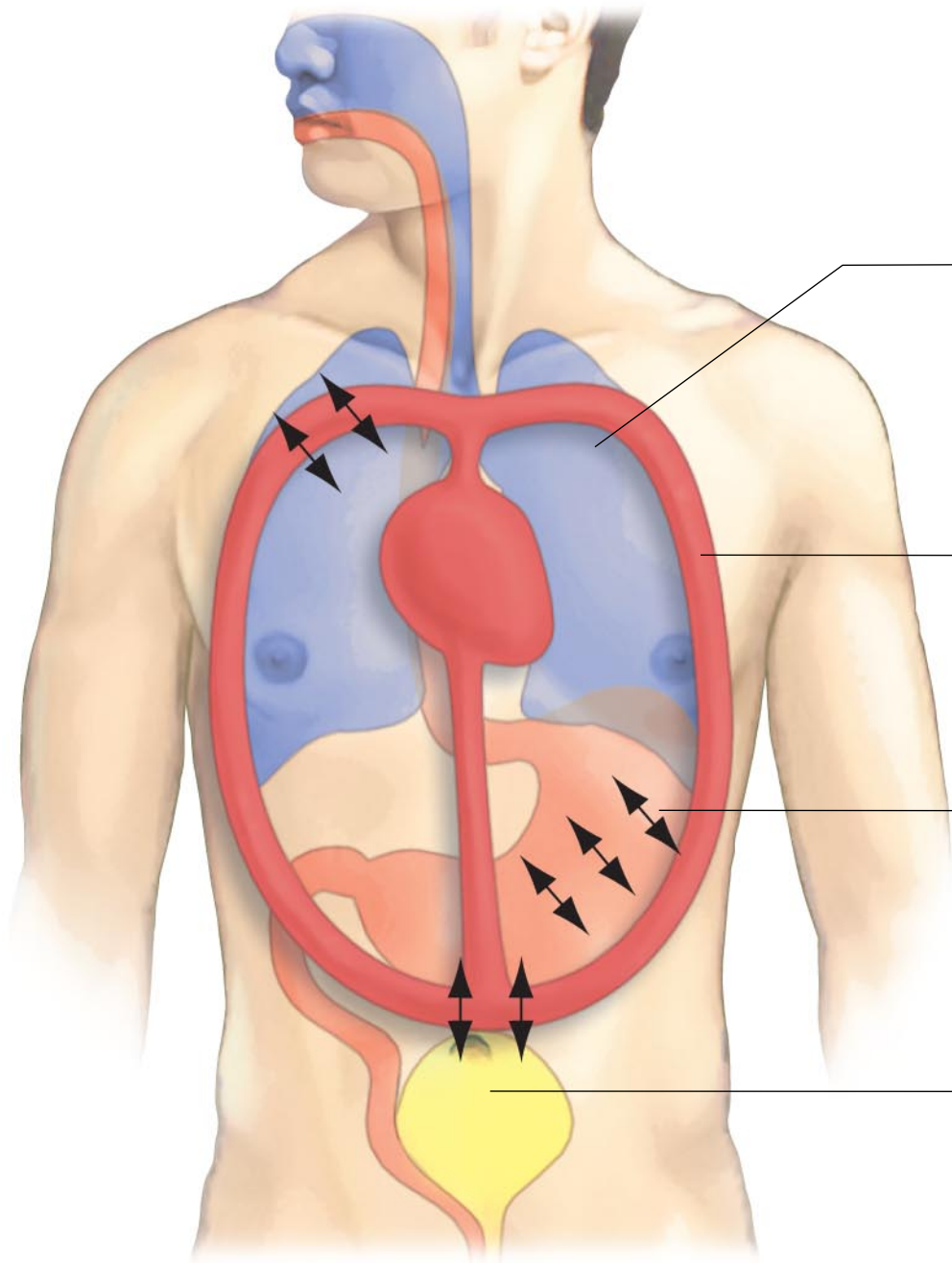
<u>Product</u>	<u>\$US retail (ca. 2008) per pound net weight</u>
Air	free
Tap water (Albuquerque)	0.0000633
Rice	0.29
Sugar	0.34
Gasoline (regular unleaded)	0.7
Can of soda	0.8
Apples	1.6
House (typical suburban)	2

<u>Product</u>	<u>\$US retail (ca. 2008) per pound net weight</u>
Television (Sony HDTV)	6
Car (Toyota Camry LE)	7
Fitness machine (elliptical)	7.5
Wine (decent Shiraz)	9
Pet dog (border collie)	10
Chair (Levenger)	11.7
Coffee (Starbucks beans)	12
Beef (sirloin steak)	12
Book (hardback)	12.5
Bicycle (Fuji)	17
Luxury car (Lexus LS 660)	20
Blue jeans (Levi's)	22
Chain saw (Husqvarna)	37
Human blood	45
Combat knife (Ka-Bar)	103
Watch (Timex)	167
Laptop computer (Dell)	204
Silver bullion	225
Telescope (TEC)	238
Bra (Victoria's Secret)	240
Handgun (Glock)	440
Private jet (Learjet)	460
Music CD	480
Perfume (Samsara)	930
iPod Classic (w/o songs)	980
Fake Columbia U. diploma	1,090
Cell phone (Motorola)	1,390
Porn DVD	1,510
Breast implants	1,930
Lipstick (MAC)	2,600
Marijuana	4,900
\$20 bills (currency)	9,100

*Continued*

<u>Product</u>	<u>\$US retail (ca. 2008) per pound net weight</u>
Luxury watch (Rolex)	10,100
Fake diamonds (zirconia)	13,600
Gold bullion	14,000
Human kidney (black market)	16,200
Cocaine	36,200
Human semen (from donor)	52,900
Viagra	53,000
Prozac	63,000
Heroin	68,000
Ecstasy	75,600
iPod Classic (full of songs)	106,700
Botox injection	141,600
Real Columbia U. diploma	1.25 million
Real diamonds	15 million
Van Gogh painting	28 million
LSD (pure liquid)	30 million
Human egg (from donor)	4.5 trillion

This table reveals some shocking truths. First, there is a rather wide spread of cost densities—an implanted human egg costs about 72 quadrillion times as much per pound as tap water, though the egg is constituted mostly of water, plus some chromosomes, membranes, and organelles. The implanted egg represents genuine evolutionary fitness—successful reproduction itself—the gold standard of human



**Respiratory system moves  $O_2$  into, and  $CO_2$  out of, the body.**

**Cardiovascular system transports materials to and from all other systems.**

**Digestive system transforms food into a form that can be transported throughout the body.**

**Urinary system filters bodily fluids, removes waste while conserving water and other materials.**

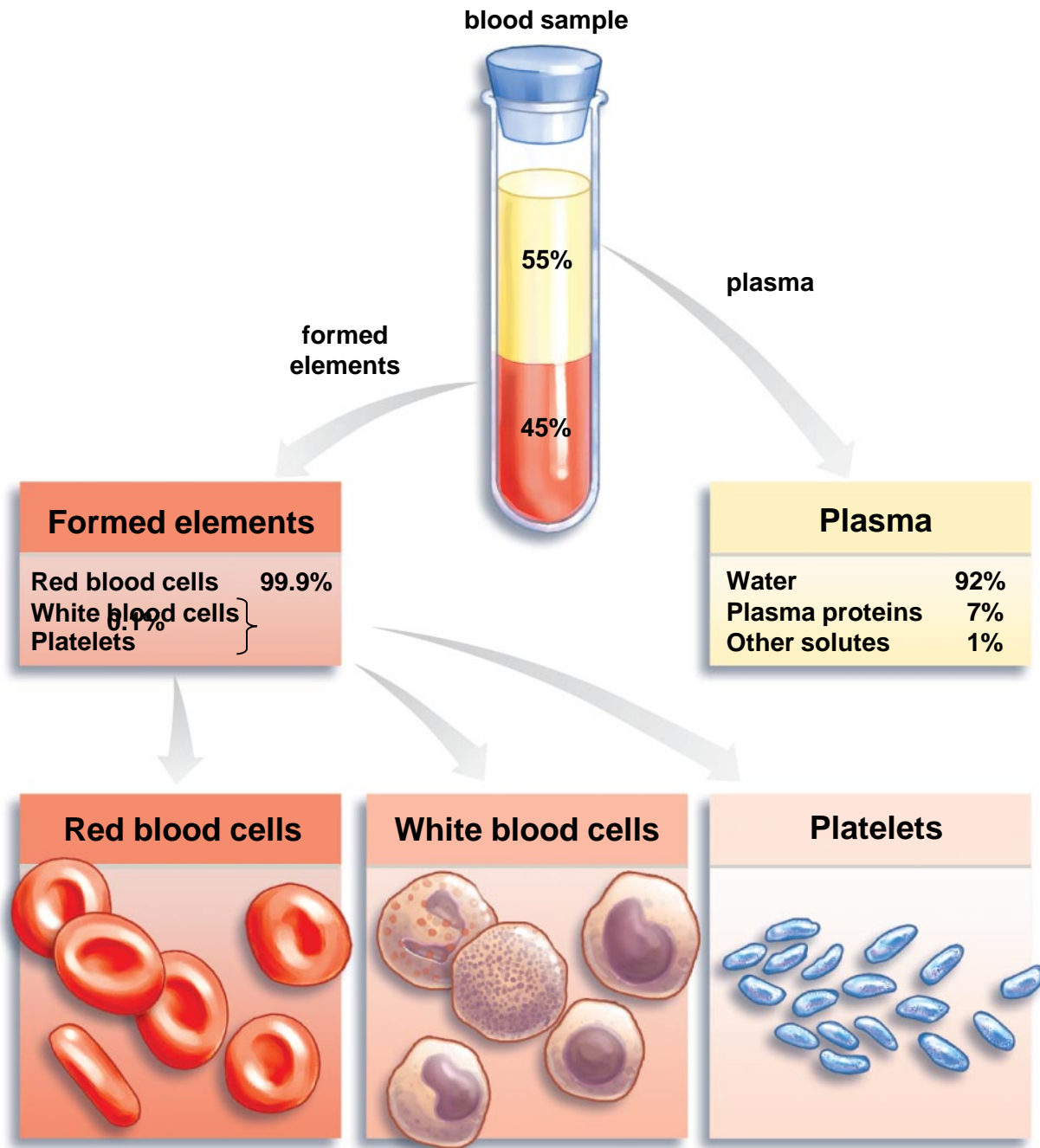
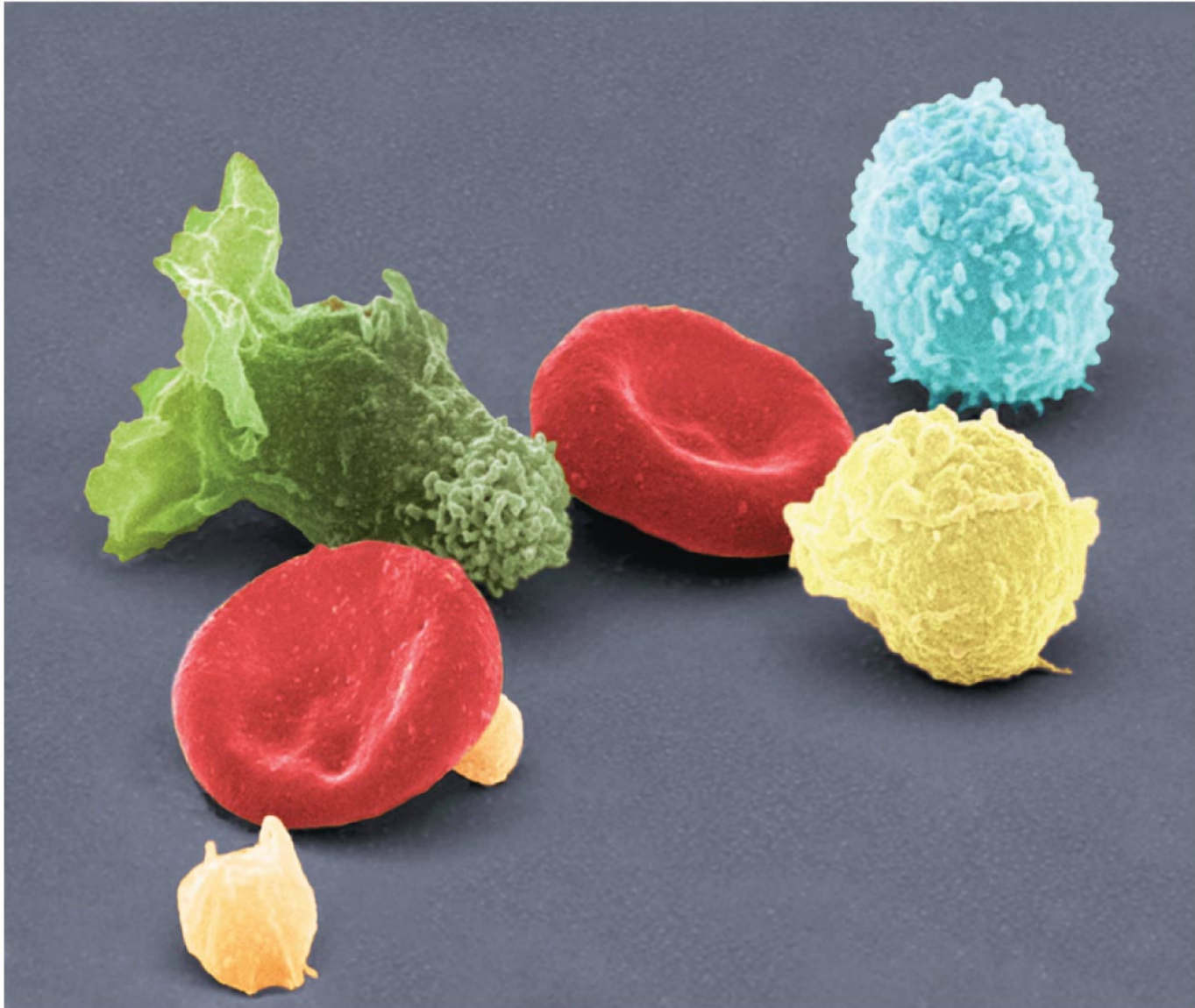


Figure 30.2

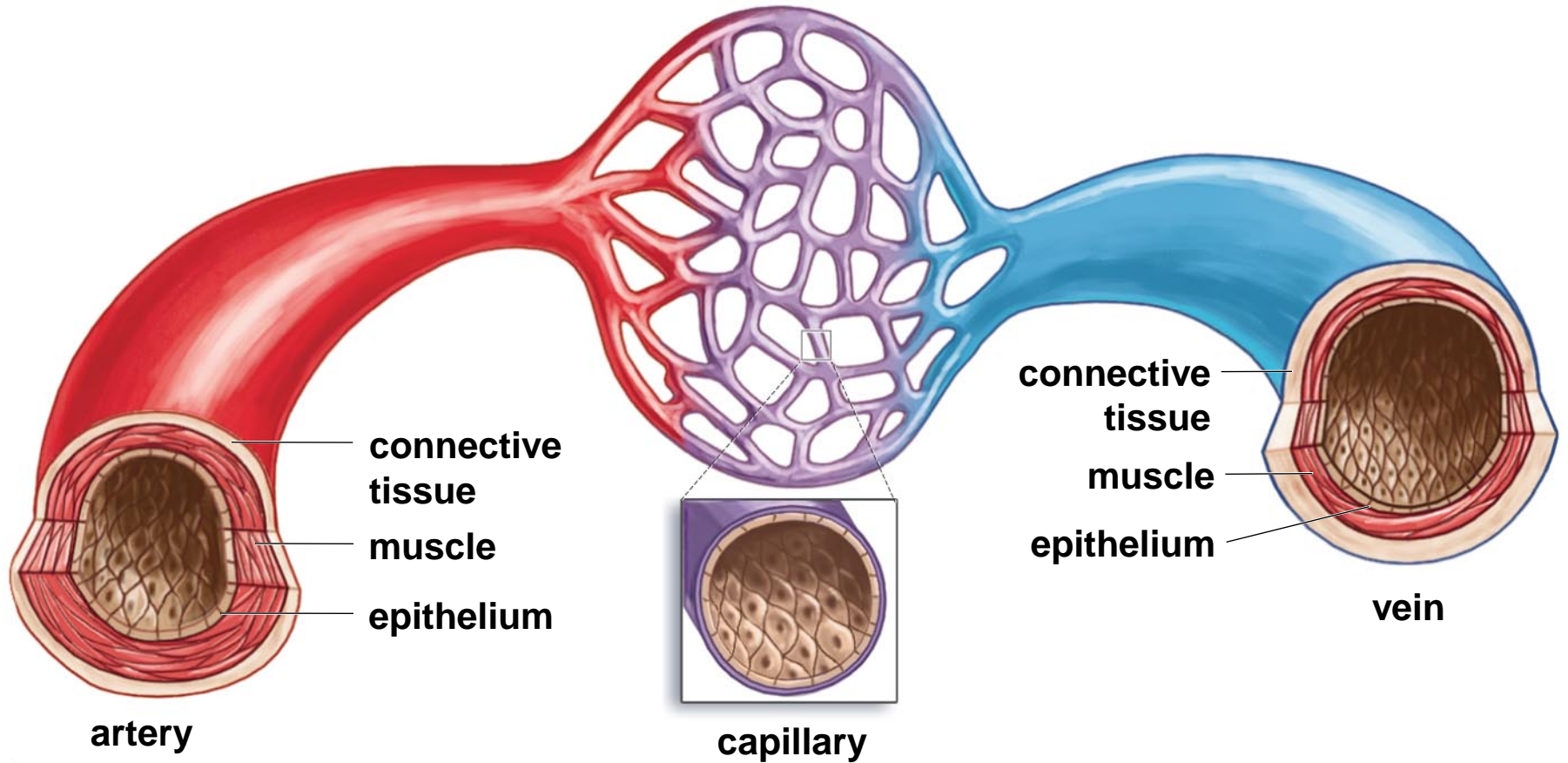
# Formed Elements



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Figure 30.3

# Blood Vessels

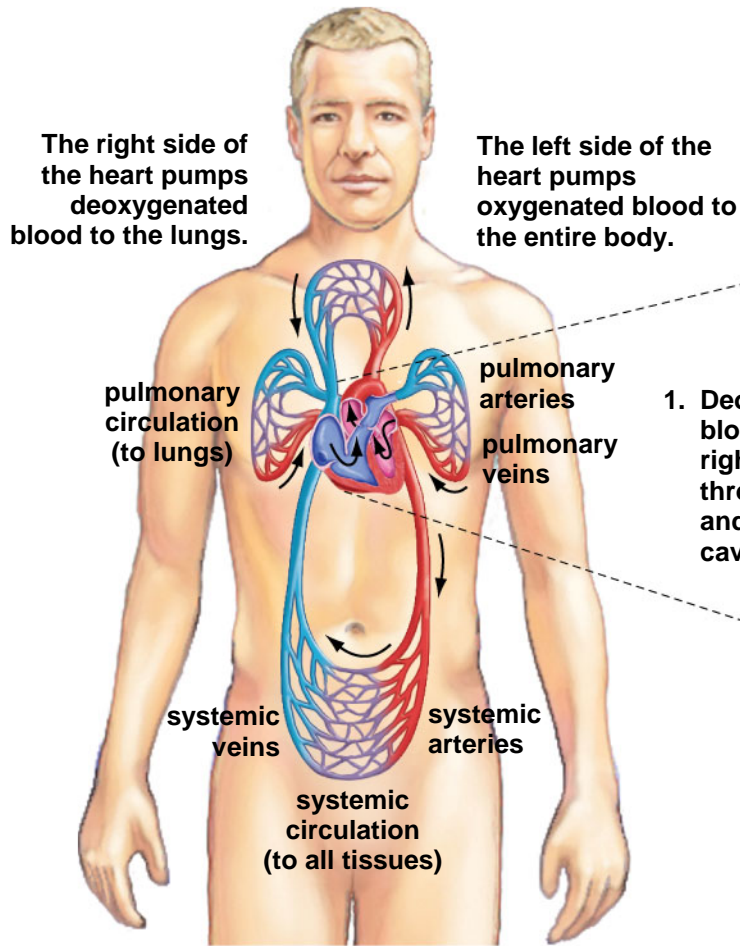


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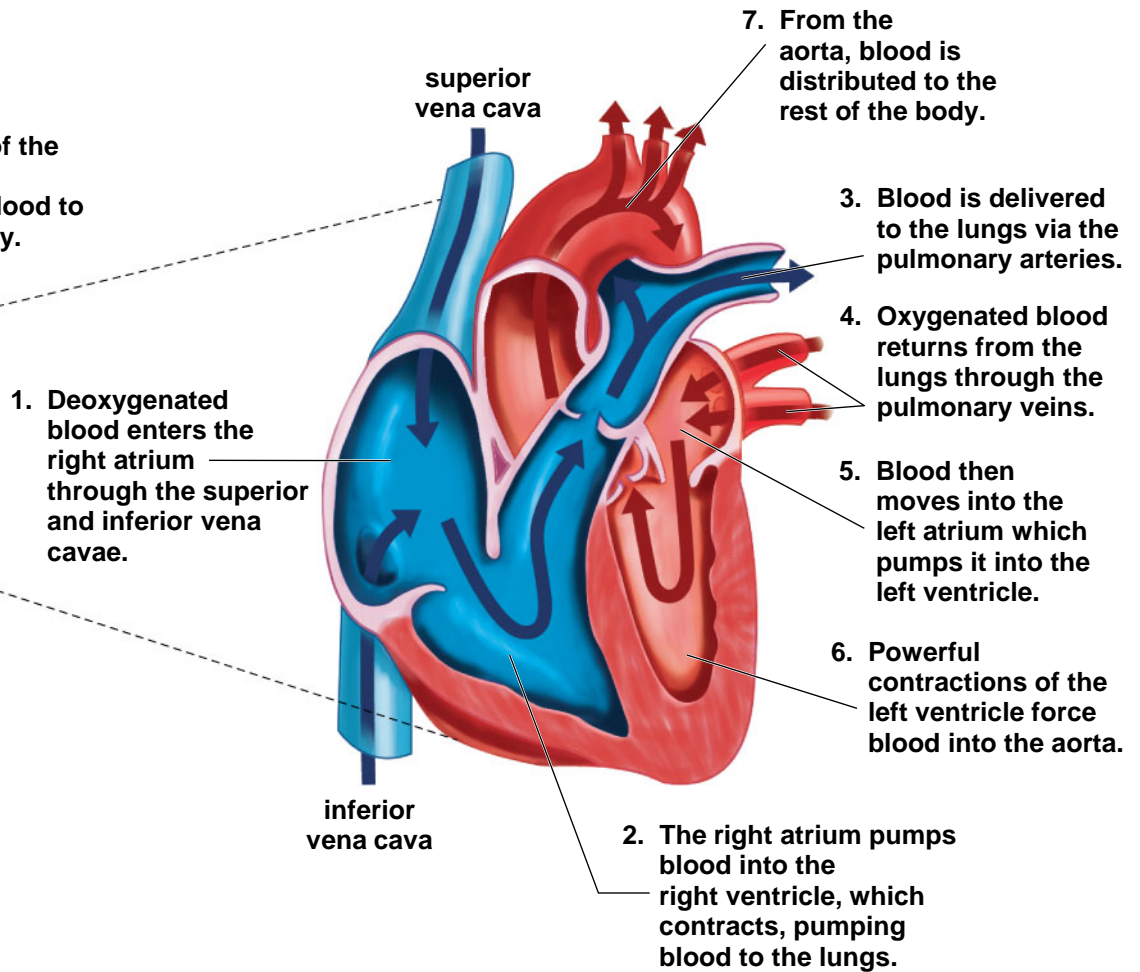
Figure 30.4

# The Heart and Blood

(a) The pulmonary and systemic circulation networks



(b) The circulation of blood through the heart



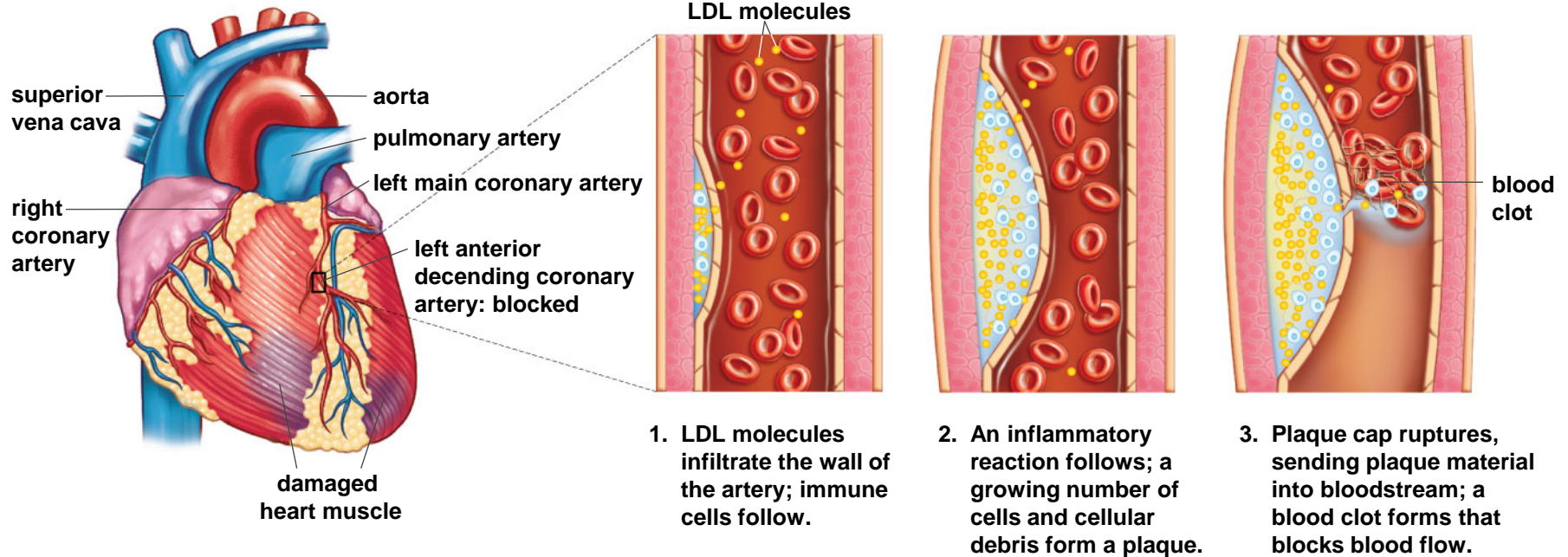


# Heart Valves

Mitral valves: <https://www.youtube.com/watch?v=LhhWu4JCrBw>

Beating heart transplant: <https://www.youtube.com/watch?v=Fwd32Xa3uwc>

# Critical Vessels



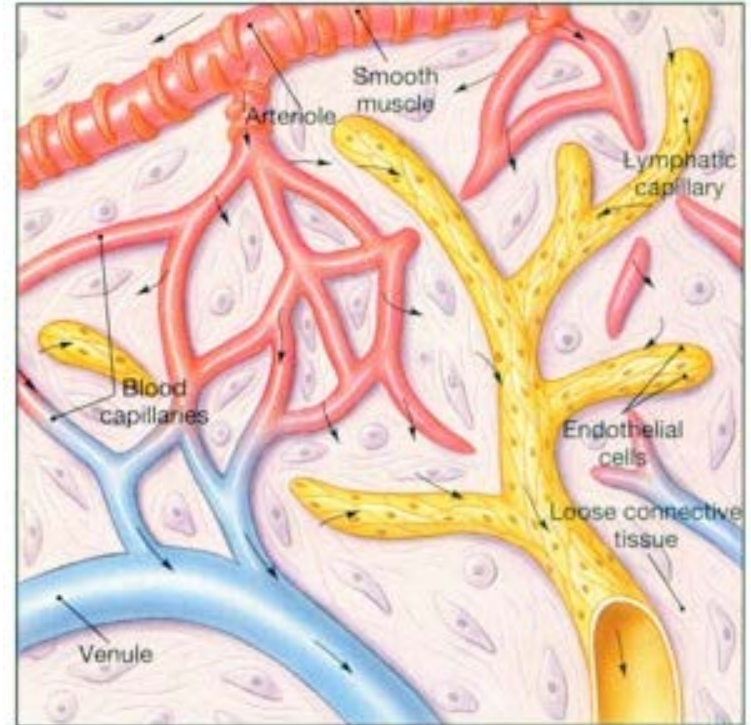
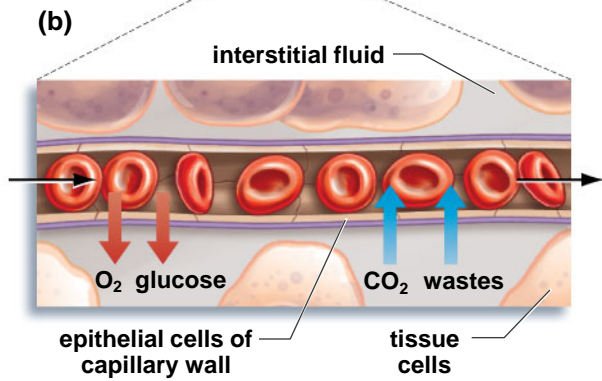
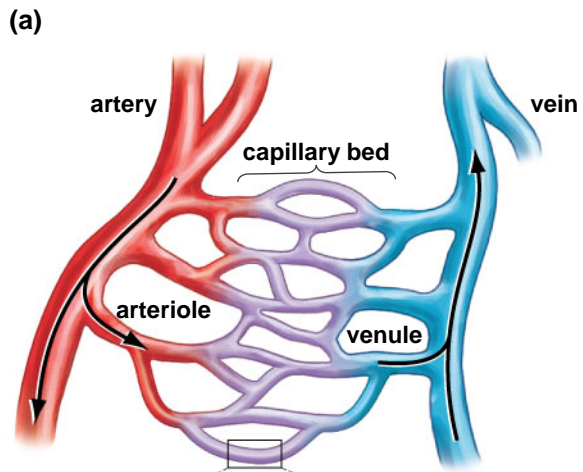
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Figure 30.7

# Bypass Surgery

Coronary artery: <https://www.youtube.com/watch?v=3Nf6Q2skGOM>

# Capillary beds



thodgesImp.com

Figure 30.8

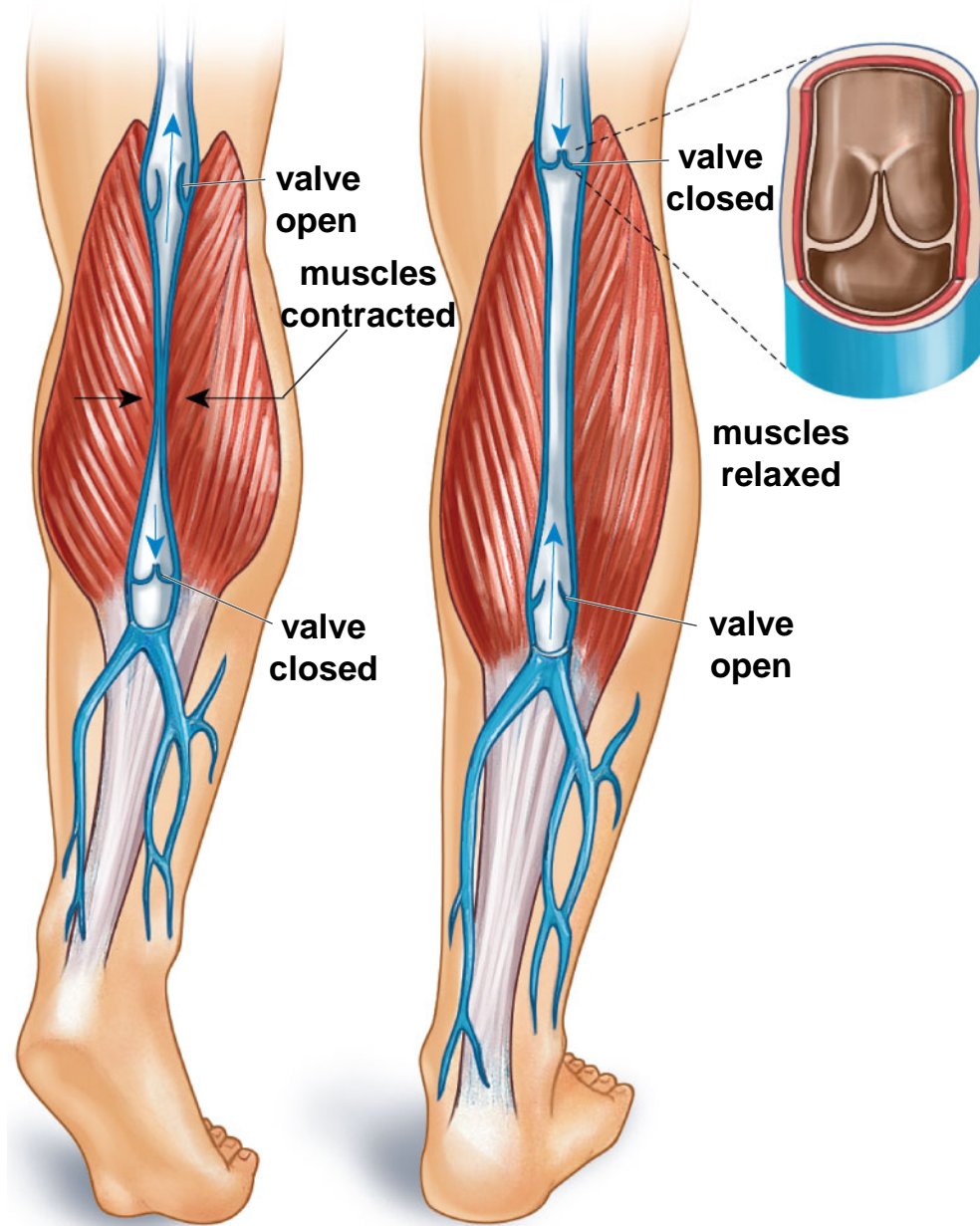
# Elephantiasis



medindia.net

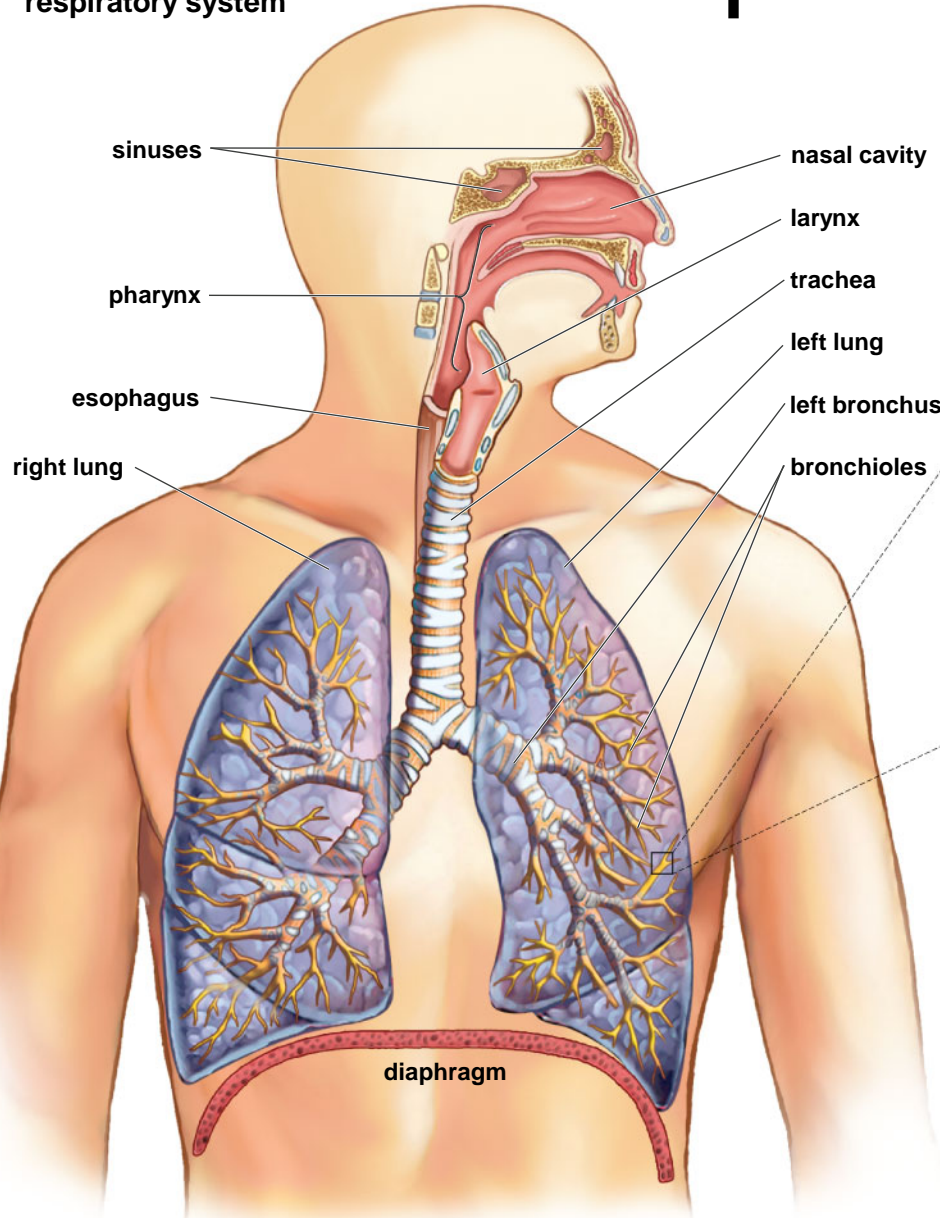
**Valves allow blood  
to go forward . . .**

**. . . but not  
backward**

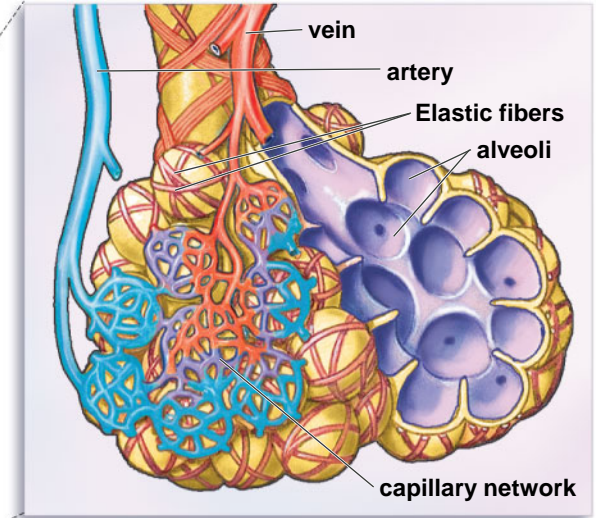


# The Respiratory System

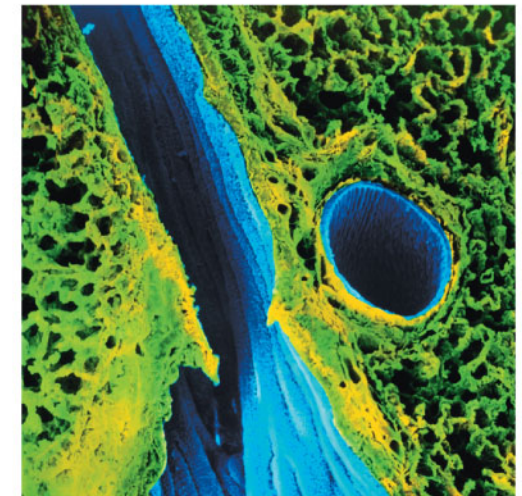
(a) Anatomy of the respiratory system



(b) The structure of alveoli

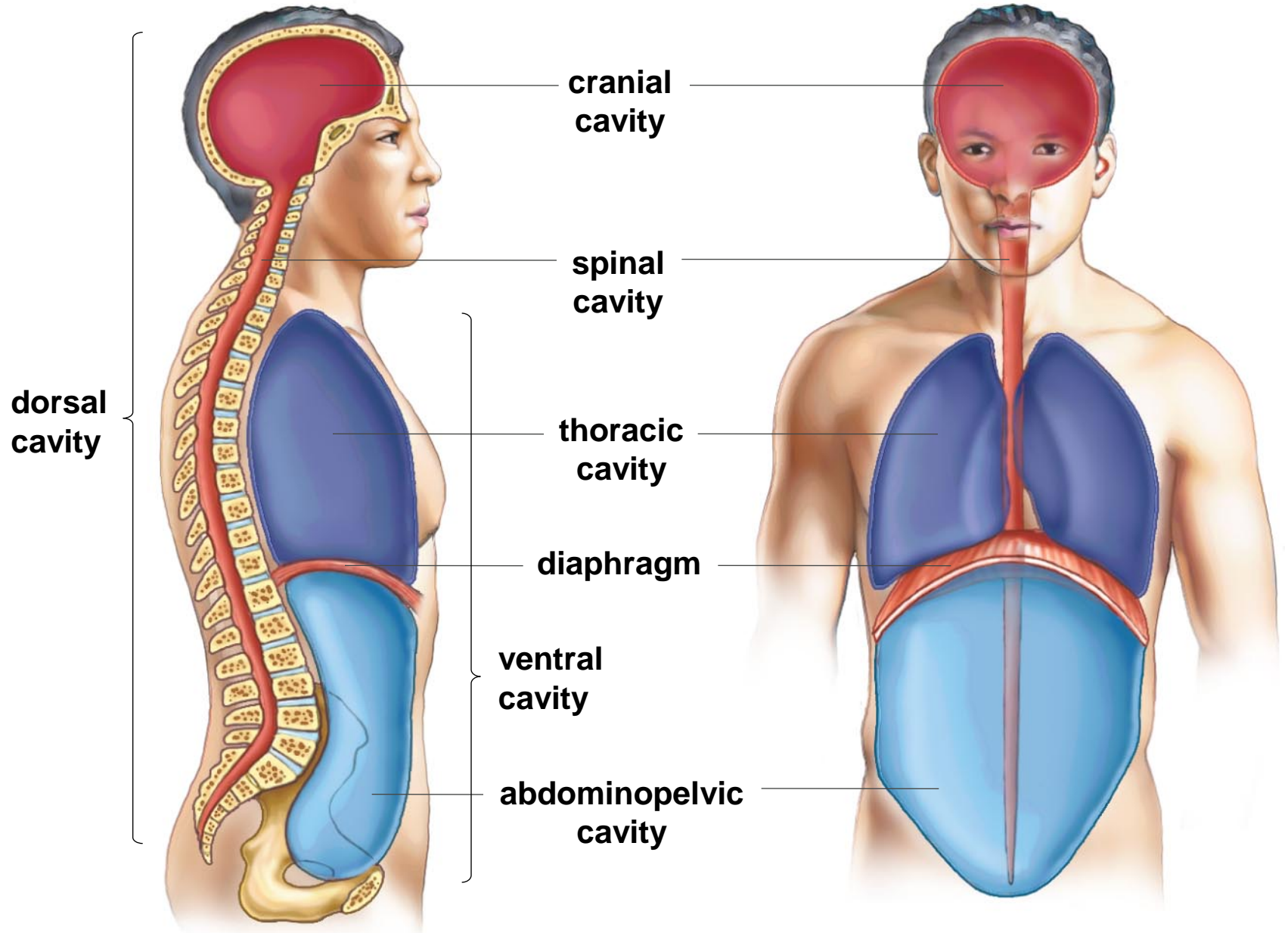


(c) A bronchiole and its alveoli



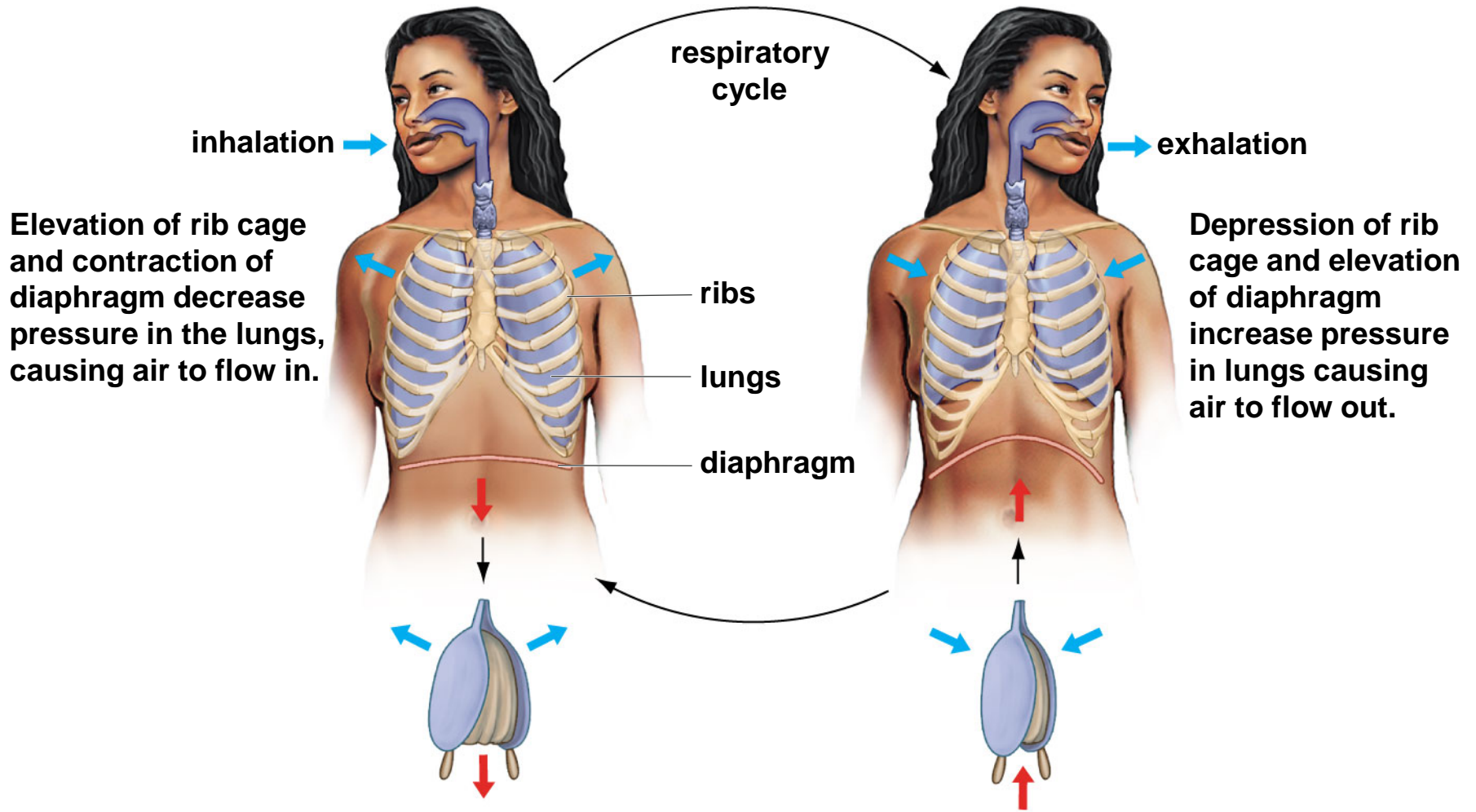
**(a) Side view of body cavities**

**(b) Front view of body cavities**





# Ventilation



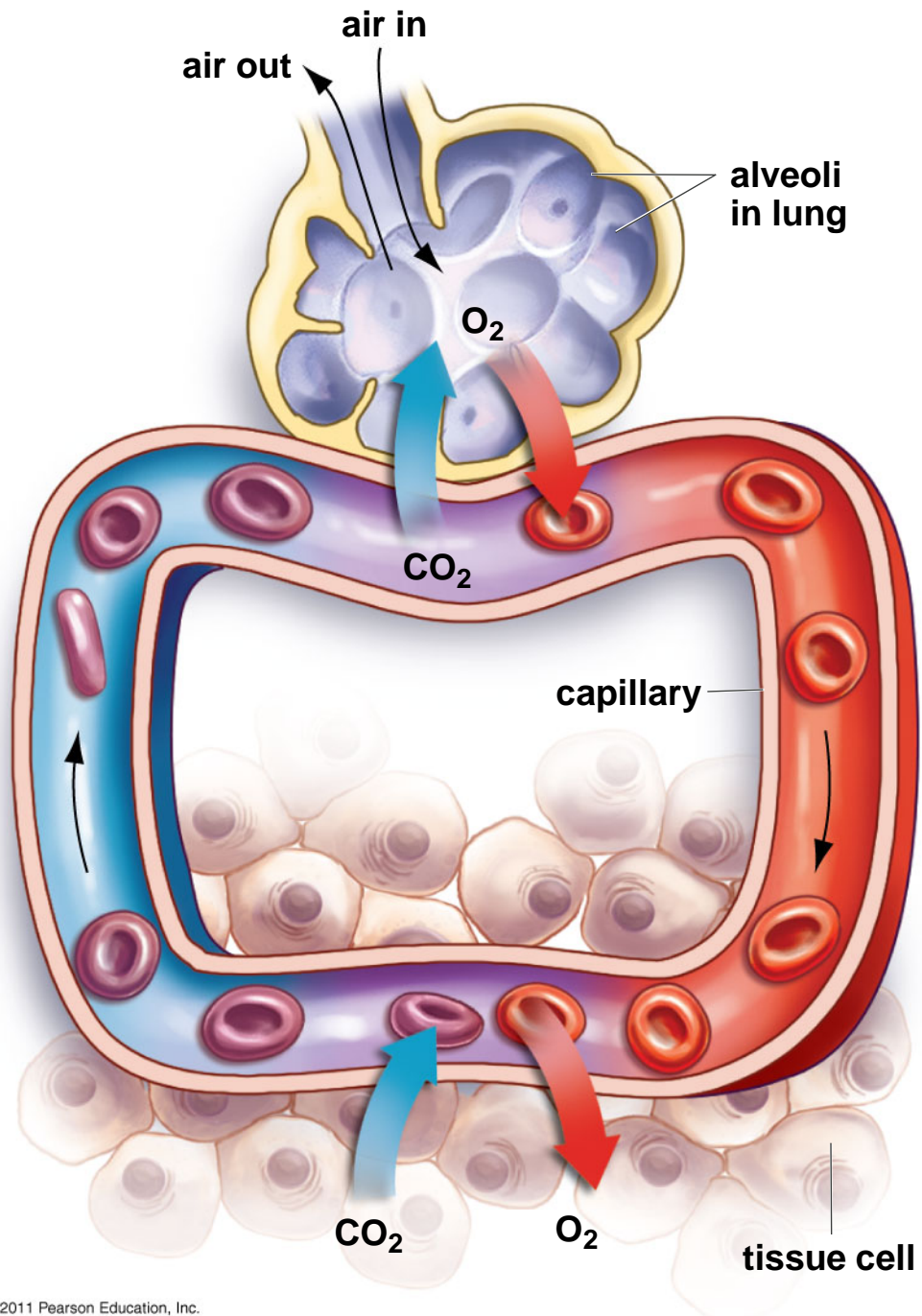


Figure 30.12