

# INDEX

## A

abdominal breathing, 40, 42  
acetylcholine, 138  
acidosis, 50–51, 98  
acromegaly, 213  
ACTH (adrenocorticotrophic hormone), 216, 221  
adenosine triphosphate. See ATP  
ADH (antidiuretic hormone), 92–93, 221  
adrenal cortex, 215–216, 221  
adrenal glands, 204, 215–217  
adrenaline, 139, 208, 217, 221  
adrenal medulla, 215–216, 221  
adrenocorticotrophic hormone (ACTH), 216, 221  
afferent conduction pathways, 136  
albumin, 109  
aldosterone, 92, 93, 96, 216  
alimentary canal (digestive tract), 56–58  
alkalosis, 50–51,  
allergies, 117  
alloosomes (sex chromosomes), 196  
amino acids, 70–71, 89  
amylase, 76  
anabolism, 71  
anaerobic energy, 172  
anal sphincter, 64  
androgens, 216, 217, 220, 221  
androstanedione, 217  
anemia, 113  
angiotensin, 96  
anterior pituitary hormones, 221  
anterior (ventral) root, spinal nerves, 135  
antidiuretic hormone (ADH), 92–93, 221  
antigens, 114  
anuria, 97  
anus, 57, 64  
aorta, 15, 19

aortic valve, 15  
aplastic anemia, 113  
archicortex, 131, 132  
arrhythmias, 24  
arterial blood, 27, 112  
arteries  
    body temperature and, 180  
    coronary, 15, 25–26  
    defined, 28  
    partial pressure of oxygen, 49  
    pulmonary, 19  
asexual reproduction, 198  
aspirating food, 58  
astigmatism, 158  
atmosphere, 48  
atopic dermatitis (eczema), 117  
ATP (adenosine triphosphate)  
    brown fat and, 178  
    citric acid cycle and, 74–75  
    decomposition, 74  
    muscle fibers and, 170  
atrioventricular node, 16–17, 19, 22  
auditory cortex, 132  
auditory ossicles, 159–160  
autonomic nerves, 123–124  
autonomic nervous system  
    circulatory system and, 24–25  
    compared to endocrine system, 205–206  
    enteric nervous system, 141  
    parasympathetic nervous system, 138–141  
    sympathetic nervous system, 138–141  
autosomes, 196  
axillary artery, 28, 180  
axons, 122

**B**

B cells, 115, 116  
balance, 161–162  
ball-and-socket joints, 175

basal metabolism, 214  
Basedow syndrome (Graves' disease), 214  
basophils, 115  
bile, 76, 79, 80  
bilirubin, 79, 80, 114  
bladder, 93–95  
blind spots, 159  
blood  
    arterial, 27, 112  
    blood types, 114  
    clots, 117  
    components of, 111, 112  
    as extracellular fluid, 104  
    interstitial fluid and, 104–105  
    plasma, 111, 118  
    platelets, 117–118  
    pulmonary circulation, 13–15, 26–28  
    red blood cells, 112–114  
    systemic circulation, 13–15, 26–28  
    venous, 27, 112  
    white blood cells, 115–116  
blood pressure  
    defined, 29  
    diastolic pressure, 30  
    factors that determine, 29  
    kidneys and, 96  
    Korotkoff sounds, 30  
    measuring, 30–31  
    systolic pressure, 30  
    units of measurement, 31  
body fluids, 99–118  
    average volume of liquid cycling through body per day, 110  
    blood, 104, 111–118  
    dehydration, 111  
    extracellular fluid, 102, 104–105  
    hydration, 110  
    interstitial fluid, 102, 103–105  
    intracellular fluid, 102, 104

- body fluids, *continued*  
 intravascular fluid, 102  
 osmotic pressure, 106–109  
 water, 102–105, 110–111
- body temperature  
 arteries and, 180  
 evaporative cooling, 180  
 perspiration, 179–180  
 regulating, 178  
 shivering, 179  
 skeletal muscles and, 178
- bone conduction, hearing, 161
- bone metabolism  
 estrogen, 183  
 ossification, 182  
 osteoblasts, 182  
 osteoclasts, 182–183  
 osteoporosis, 183  
 resorption, 182
- bones  
 bone marrow, 181  
 calcium, 183  
 collagen, 182  
 cortical bone, 181  
 medullary cavity, 181  
 role of, 180  
 trabecular (cancellous) bone, 181
- Bowman's capsule, 85–86
- brachial artery, 28
- bradycardia, 24
- brain. *See also* nervous system  
 autonomic nervous system, 138–141  
 conduction pathways, 136  
 injuries to, 133–134  
 parts of, 130  
 somatic nervous system, 137–138  
 spinal cord and, 134–137  
 structure of, 131–133
- brain death, 134
- brain freeze, 151–152
- brainstem, 43, 45, 130
- breathing  
 abdominal, 40, 42  
 thoracic, 40–41
- Broca's area, 132, 133
- brown fat, 178
- Bundle of His, 17, 19, 22
- C**
- calcitriol, 96
- calcium  
 in bones, 183  
 hypercalcemia, 214  
 metabolism of, 97  
 parathormones and, 215
- cancellous (trabecular) bone, 181
- carbohydrates, 66–67
- carbon dioxide, 37, 43–45, 48–49
- cardiac muscle (myocardium), 15–18, 22, 169
- carotid artery, 28, 180
- cartilage, 174
- catabolism, 71
- cecum, 57
- cell body, 122
- cell division  
 chromosomes, 196  
 meiosis, 198  
 mitosis, 197
- cell membrane, 187
- cells, 105, 185–190. *See also* DNA  
 cell division, 196–198  
 cell membrane, 187  
 chromosomes, 196  
 connective tissue, 190  
 cytoplasm, 187  
 defined, 187  
 epithelial tissue, 190  
 Golgi apparatus, 187  
 intracellular fluid, 102, 104  
 meiosis, 198  
 mitochondria, 187–188  
 mitosis, 197  
 muscle tissue, 190  
 nervous tissue, 190  
 nucleus, 187–188  
 organelles, 187  
 osmotic pressure, 106–109  
 ribosomes, 187–188  
 sexual reproduction, 198–201  
 tissue, 190
- central nervous system, 130
- central sulcus, 132
- cerebellum, 130, 133
- cerebral cortex (gray matter), 131, 133
- cerebral limbic system, 130, 163
- cerebrospinal fluid, 130
- cerebrum, 130  
 nervous system and, 125–128  
 prenatal and postnatal, 135
- chest leads, electrocardiogram, 23
- chewing (mastication), 57, 72
- cholesterol, 68
- chromosomes, 196
- chyme, 61, 73
- cilia, 200
- circulatory system  
 affect of nervous system on, 24–25  
 blood pressure, 29–31  
 coronary arteries, 25–26  
 electrocardiograms, 23–24  
 heart movements and waveforms, 18–20  
 impulse conduction system of heart, 12–17, 22–23  
 lymphatic system, 31–32  
 pulmonary circulation, 26–28  
 systemic circulation, 26–28
- citric acid cycle (Krebs cycle), 74–76, 170
- clots, blood, 117
- coagulation, 118
- cochlea, 160
- collagen, 182
- collecting tubule, 97–98
- colloid osmotic pressure (oncotic pressure), 109
- colors and light, 159
- conduction pathways, 136
- conductive hearing loss, 160–161
- cone cells, 156, 159
- connective tissue, 190
- corneas, 156
- coronary arteries, 15, 25–26
- corpus luteum, 199
- cortical bone, 181

cortical bones, 181  
cranial nerves, 137–138  
creatine, 170  
creatinine, 83  
cystitis, 95  
cytoplasm, 187

## D

deep sensations, 149  
defecation, 63–64  
deglutition (swallowing), 58, 72  
dehydration, 111  
dendrites, 138–141  
deoxyribonucleic acid. See DNA  
depth perception, 156–157  
detoxification, 78, 79  
diabetes mellitus, 219  
dialysis, kidney, 98  
diaphragm, 38–40, 45  
diastolic pressure, 30  
diencephalon (interbrain), 130  
diffusion process, 47, 107  
digestive system, 55–80  
adenosine triphosphate, 74–75  
alimentary canal, 56–58  
anus, 64  
citric acid cycle, 74–76  
deglutition, 72  
digestive enzymes, 57–58, 76–77  
digestive fluids, 76  
duodenum, 61, 73  
esophagus, 59–60  
large intestine, 63–64, 73  
liver and, 78–80  
mastication, 72  
metabolism and, 65–71  
nutrients, 65–71  
pancreas, 61  
rectum, 64, 73  
saliva, 72  
small intestine, 62–63, 73  
stomach, 59–60, 72  
diploid cells, 196  
disaccharides, 67  
distal convoluted tubule, 88

DNA (deoxyribonucleic acid), 191–195  
difference between genes and, 192  
genetic research, 194–195  
proteins and, 191  
dorsal artery of foot, 28  
dorsal (posterior) root, spinal nerves, 135  
duodenum, 57, 61, 62, 73

## E

eardrum (tympanic membrane), 159  
ears, 159–161  
equalizing pressure, 161  
inner, 159  
middle, 159  
outer, 159  
structure of, 160  
eczema (atopic dermatitis), 117  
edema, 98, 109, 214  
efferent conduction pathways, 136  
egg cells, 198–199  
electrocardiograms (EKGs), 18–20  
    chest leads, 23–24  
    limb leads, 23–24  
    P wave, 19  
    QRS complex, 19  
    T wave, 20  
electrolytes, 108  
electron transport chain, 75  
end arteries, 26  
endocrine system  
    adrenal cortex, 221  
    adrenal glands, 204, 215–217  
    adrenal medulla, 221  
    anterior pituitary hormones, 221  
    balancing hormone levels, 207–208  
    compared to autonomic nervous system, 205–206  
    growth hormone disorders, 213  
    hormones, 205–206  
    hypothalamus, 204, 212–213  
kidneys, 95–96  
ovaries, 204, 221  
pancreas, 204, 217–219, 221  
parathyroid glands, 214–215, 221  
pituitary gland, 204, 212–213  
posterior pituitary hormones, 221  
sex hormones, 219–220  
testicles, 204, 221  
thyroid gland, 204, 213–214, 221  
endometrium, 200, 220  
enteric nervous system, 141  
eosinophils, 115  
epiglottis, 58  
epinephrine (adrenaline), 139, 208, 217, 221  
epithelial tissue, 190  
equalizing ear pressure, 161  
erythropoietin, 96  
esophagus, 57, 59–60  
essential amino acids, 71  
essential fatty acids, 68  
estrogen, 183, 220, 221  
Eustachian tube, 161  
evaporative cooling, 180  
excretion, 83–84  
exocrine gland, 217  
extensor muscles, 176  
exterior anal sphincter, 64  
external intercostal muscles, 41, 45  
external respiration, 46–47  
external sphincter muscles, 93–94  
extracellular dehydration, 111  
extracellular fluid, 102, 104–105.  
    See also blood  
extraocular muscles, 157  
eyes, 156–159  
    astigmatism, 158  
    blind spots, 159  
    colors and light, 159  
    cone cells, 156, 159  
    cornea, 156  
    crystalline lens, 156

- eyes, *continued*  
 depth perception, 156–157  
 extraocular muscles, 157  
 hyperopia, 158  
 iris, 156  
 macula, 156, 159  
 myopia, 158  
 optic chiasm, 157, 158  
 optic nerve, 156  
 presbyopia, 158  
 pupils, 157  
 retina, 156  
 rod cells, 156, 159  
 structure of, 157  
 visual acuity, 159  
 visual cortex, 157
- F**  
 fallopian tubes, 199  
 fats  
 cholesterol, 68  
 fatty acids, 68–69  
 lipids, 68–69  
 neutral fat, 68–69  
 fatty acids, 68–69  
 femoral artery, 28, 180  
 fertilization, 198–201  
 fibrin, 117  
 fibrinogen, 117  
 fibrinolysis, 118  
 filiform papillae, tongue, 165  
 filtering blood  
 Bowman's capsule, 85–86  
 creatinine, 83  
 excretion, 83–84  
 glomerulus, 84–85  
 primary urine, 86  
 renal corpuscle, 85  
 urea, 83  
 uric acid, 83  
 urine, 83–84  
 urobilinogen, 83  
 waste products, 83  
 fimbriae, 199  
 flexor muscles, 176  
 follicle-stimulating hormone (FSH), 221
- fovea centralis, macula, 156, 159  
 FSH (follicle-stimulating hormone), 221  
 functional specialization (localization of brain functions), 132
- G**  
 gametes (reproductive cells), 198  
 ganglia, 124  
 gas exchange, 37, 46–47  
 gastric juice, 76  
 genes  
 difference between DNA and, 192  
 genetic research, 194–195  
 germ (reproductive) cells, 198  
 gestation period, 201  
 GH (growth hormone), 221  
 disorders, 213  
 gigantism, 213  
 glomerular filtrate (primary urine), 86, 90–91  
 glomerulus, 84–85, 89  
 glucagon, 208, 219, 221  
 glucocorticoids, 208, 216, 221  
 glucose, 66–67  
 brain and, 134  
 from liver, 79  
 osmotic pressure, 108  
 reabsorption of, 89  
 glycerol, 69  
 glycogen, 219  
 glycolysis, 75  
 Golgi apparatus, 187  
 gonadotropins, 220  
 granulocytes, 115  
 Graves' disease (Basedow syndrome), 214  
 gray matter (cerebral cortex), 131, 133  
 growth hormone (GH), 221  
 disorders, 213
- H**  
 haploid cells, 198  
 HCl (hydrochloric acid), 60, 72
- hearing, 159–161  
 heart  
 heart failure, 98  
 impulse conduction system, 12–17, 22–23  
 infants versus adults, 24  
 movements and waveforms, 18–20  
 stroke volume, 24  
 heartbeat, 20  
 hematocrit, 111  
 heme, 114  
 hemoglobin, 80, 112–113  
 hemolytic anemia, 113  
 hemostasis, 117  
 hepatic arteries, 78  
 hinge joints, 175–176  
 homeostasis, 50, 89, 92–95  
 homeotherms, 178  
 hormones. *See also* endocrine system  
 adrenaline, 139, 208, 217, 221  
 adrenocorticotrophic hormone, 216, 221  
 aldosterone, 92, 93, 96, 216  
 androgens, 216, 217, 220, 221  
 androstenedione, 217  
 angiotensin, 96  
 anterior pituitary, 221  
 antidiuretic hormone (ADH), 92–93, 221  
 balancing, 207–208  
 erythropoietin, 96  
 estrogen, 183, 220, 221  
 follicle-stimulating hormone (FSH), 221  
 glucagon, 208, 219, 221  
 glucocorticoids, 208, 216, 221  
 glycogen, 219  
 growth hormone (GH), 221  
 growth hormone disorders, 213  
 insulin, 218–219, 221  
 luteinizing hormone (LH), 221  
 mineralocorticoids, 216, 221

oxytocin, 221  
parathormone (PTH), 214, 215, 221  
posterior pituitary, 221  
progesterone, 220, 221  
prolactin, 221  
renin, 96  
sex, 219–220  
somatostatin, 213  
steroid, 216  
thyroid-stimulating hormone (TSH), 213, 221  
thyroxine (T4), 214, 221  
triiodothyronine (T3), 214, 221  
vasopressin, 92–93, 221  
hydration, 110  
hydrochloric acid (HCl), 60, 72  
hyperalgesia, 154  
hypercalcemia, 214  
hyperopia, 158  
hyperthyroidism, 214  
hyperventilation, 51  
hypoproteinemia, 109  
hypothalamus, 204, 212–213  
hypothyroidism, 214  
hypoventilation, 51

## I

ileum, 57, 62  
immature egg cell (ovum), 198, 220  
immune system, 114, 115, 117, 216  
implantation, 201  
impulse conduction system of heart, 12–17  
atrioventricular node, 22–23  
Bundle of His, 22  
Left bundle branch, 22  
left heart, 13–15  
myocardium, 15, 16–17, 22  
pulmonary circulation, 15  
Purkinje fibers, 22  
Right bundle branch, 22  
right heart, 13–15  
sinoatrial node, 16–17, 22–23  
systemic circulation, 15

inclination of the head motion, 161, 162  
incus, 159  
infants  
    heart rate, 24  
    risk of dehydration, 111  
injuries, brain, 133–134  
inner ear, 159, 161–162  
insulin, 218–219, 221  
interbrain (diencephalon), 130  
intercostal muscles, 41, 45  
interior anal sphincter, 64  
internal intercostal muscles, 41, 45  
internal respiration, 46–47  
internal sphincter muscles, 94  
interphase, cells, 198  
interstitial (tissue) fluid, 102–105  
intervertebral disks, 174  
intestines  
    large, 57, 63–64, 73  
    small, 57, 62–63, 73  
intracellular dehydration, 111  
intracellular fluid, 102, 104  
intravascular fluid, 102  
involuntary (smooth) muscles, 169  
iris, 156  
iron-deficiency anemia, 113  
islets of Langerhans, 217, 218

## J

jejunum, 57, 62  
joint capsules, 174  
joints, 173–177  
    ball-and-socket, 175  
    cartilage, 174  
    defined, 174  
    extensor muscles and, 176  
    flexor muscles and, 176  
    hinge, 175–176  
    intervertebral disks, 174  
    joint capsules, 174  
    ligaments and, 174  
    mutually antagonistic muscles and, 176  
    range of motion, 175  
    synovial fluid, 174

## K

kidneys and renal system, 81–98  
    Bowman's capsule, 85–86  
    creatinine, 83  
    dialysis, 98  
    distal convoluted tubule, 88  
    excretion, 83–84  
    filtering blood, 83–86  
    glomerulus, 84–85, 89  
    homeostasis, 89, 92–95  
    loop of Henle, 88  
    monitoring blood, 95–96  
    nephron, 88  
    primary urine, 86, 90–91  
    proximal convoluted tubule, 88  
    reabsorption, 87–89  
    renal corpuscle, 85  
    renal insufficiency, 97–98  
    renal tubule, 87–89  
    urea, 83  
    uric acid, 83  
    urination, 93–95  
    urine, 83–84, 90–95  
    urobilinogen, 83  
    vitamin D activation, 96–97  
    waste products, 83

kinesthesia, 149

Korotkoff sounds, 30

Krebs, Hans Adolf, 76

Krebs cycle (citric acid cycle), 74–76, 170

## L

lactose, 66–67  
large intestine, 57, 63–64, 73  
lead electrocardiograms, 23  
left atrium, 13–15, 19  
left bundle branch, 17, 22  
left coronary artery, 25  
left heart, 13–15  
left internal jugular vein, 31  
left subclavian vein, 31  
left venous angles, lymphatic system, 31–32  
left ventricle, 13–15  
LH (luteinizing hormone), 221  
ligaments, 174

limbic system, 130, 163  
limb leads, electrocardiogram, 23  
lipase, 76  
lipids, 68–69  
liver  
  detoxification, 78  
  digestive system and, 78–80  
  metabolism, 79  
  processing of red blood cells, 114  
localization of brain  
  functions (functional specialization), 132  
loop of Henle, 88  
lungs  
  blood circulation, 27  
  pulmonary circulation, 13–15, 26–28  
  pulmonary function testing, 52–53  
  ventilation, 37–41  
luteinizing hormone (LH), 221  
lymph, 31  
lymphatic system, 31–32  
lymphatic vessels, 31  
lymph fluid, 160  
lymphocytes, 115  
lymphoma, 32

## M

macrophages, 115, 116  
macula, 156, 159  
malleus, 159  
maltose, 66–67  
marrow, bone, 181  
mastication (chewing), 57, 72  
median cubital vein, 28  
medulla oblongata, 130  
medullary cavity, 181  
megakaryocytes, 117  
meiosis, 198  
meninges, 130  
menopause, 183, 217  
mesencephalon (midbrain), 130  
mesenteric veins, 78  
metabolism  
  adenosine triphosphate, 74–76  
  bone, 182–183

liver and, 78–80  
respiratory system and, 36  
thyroid gland and, 214  
microtubules, 197  
midbrain (mesencephalon), 130  
middle ear, 159  
millimeters of mercury (mm Hg)  
  blood pressure, 31  
  partial pressures of gases, 48  
mineralocorticoids, 216, 221  
minerals, 89  
mitochondria, 187–188  
mitosis, 197  
mitral valve, 15  
mm Hg (millimeters of mercury)  
  blood pressure, 31  
  partial pressures of gases, 48  
monitoring blood, 95–96  
monocytes, 115, 116  
monosaccharides, 67  
motor cortex, 132–133  
motor nerves, 123–124  
movements and waveforms, heart  
  electrocardiograms, 18–20  
  P wave, 19  
  QRS complex, 19  
  T wave, 20  
mucus barrier, 60  
muscle fibers, 168–172  
  adenosine triphosphate, 170  
  anaerobic energy, 172  
  cardiac muscles, 15–18, 22, 169  
  citric acid cycle, 170  
  myoglobin, 172–173  
  red, 171–172  
  skeletal muscles, 169  
  smooth muscles, 169  
  striation, 169  
  white, 171–172  
muscle tissue, 190  
musculoskeletal system, 167–183  
  bone metabolism, 182–183  
  bones, 180–183  
  joints, 173–177  
  muscle fibers, 168–172  
  regulating body temperature, 178–180

mutually antagonistic muscles, 176  
myocardium (cardiac muscle), 15–18, 22, 169  
myoglobin, 172–173  
myopia, 158

## N

natural killer (NK) cells, 115  
neocortex, 131, 132  
nephrons, 88  
nerve plexus, 138  
nervous system, 119, 120. See also sensory nervous system  
  affect on circulatory system, 24–25  
  autonomic, 138–141  
  autonomic nerves, 123–124  
  cerebrum, 125–128  
  ganglia, 124  
  motor nerves, 123–124  
  neurons, 121, 122, 123  
  peripheral, 123–128  
  sensory nerves, 123–124  
  somatic, 137–138  
  spinal reflex, 125  
nervous tissue, 190  
neurons, 121, 122, 123  
neurotransmitters, 122, 141  
neutral fat, 68–69  
neutrophils, 115, 116  
NK (natural killer) cells, 115  
norepinephrine, 139  
nose, 162–164  
nucleus, 187–188  
nutrients, 65–71  
  carbohydrates, 65–67  
  fats, 65, 68–69  
  proteins, 65, 70–71

## O

odorants, 163  
olfactory epithelium, 162, 163  
oliguria, 97  
oncotic pressure (colloid osmotic pressure), 109  
optic chiasm, 157, 158

optic nerve, 156  
oral cavity, 57  
organelles, 187  
osmosis, 107–108  
osmotic pressure  
    diffusion, 107  
    electrolytes, 108  
    glucose, 108  
oncotic pressure, 109  
proteins, 108, 109  
semipermeable membrane,  
    106–109  
ossicles, auditory, 159–160  
ossification, 182  
osteoblasts, 182  
osteoclasts, 182–183  
osteoporosis, 183  
outer ear, 159  
ovarian follicles, 198–199  
ovaries, 204, 221  
ovulation process, 198–199, 220  
ovum (immature egg cell),  
    198, 220  
oxidation, 74  
oxygen. *See also* respiratory  
    system  
    gas exchange, 37  
    kidneys and, 96  
oxytocin, 221

## P

P waves, electrocardiogram, 19  
pain  
    pain receptors, 154–156  
    radiating, 151  
    referred, 151  
paleocortex, 131, 132  
pancreas, 61, 204, 217–219, 221  
pancreatic juice, 61  
papillae, tongue, 165  
parasympathetic nervous system  
    (PNS), 24–25, 138–140  
parathormone (PTH), 214,  
    215, 221  
parathyroid glands, 214–215, 221  
partial pressures of gases, 43–45,  
    48–49

pepsin, 60, 70  
peptides, 70–71  
peripheral nervous system,  
    123–128  
peripheral venous blood, 112  
peristalsis, 59, 62  
perspiration, 179–180  
pH, 50  
phagocytosis, 115  
pituitary gland, 204, 212–213  
plasma, 111, 118  
platelets, 117–118  
PNS (parasympathetic nervous  
    system), 24–25, 138–140  
polysaccharides, 67  
pons, 130  
popliteal artery, 28  
portal vein, 78  
posterior (dorsal) root, spinal  
    nerves, 135  
posterior pituitary hormones, 221  
potassium  
    intracellular fluid, 105  
    reabsorption of, 89  
    renal insufficiency and, 98  
pregnancy, 196, 199, 200–201,  
    220. *See also* sexual  
        reproduction  
presbyopia, 158  
primary sex characteristics,  
    219–220  
primary urine (glomerular  
    filtrate), 86, 90–91  
proenzyme, 60  
proenzyme (zymogen), 60  
progenitor cells, 181  
progesterone, 220, 221  
prolactin, 221  
proprioception, 148–149  
protease, 76–77  
proteins  
    collagen, 182  
    DNA and, 191  
    as energy source, 65  
    hypoproteinemia, 109  
    metabolism and, 70–71  
    osmotic pressure, 108, 109

proximal convoluted tubule, 88  
PTH (parathormone), 214,  
    215, 221  
pulmonary alveoli, 37  
pulmonary artery, 19  
pulmonary aspiration, 58  
pulmonary circulation, 13–15,  
    26–28  
pulmonary edema, 98  
pulmonary valve, 15  
pulmonary vein, 15  
pulse, locations for taking, 28  
pupils, 157  
Purkinje fibers, 17, 19, 22

## Q

QRS complex, 19

## R

radial artery, 28  
radiating pain, 151  
range of motion, joints, 175  
reabsorption  
    distal convoluted tubule, 88  
    glomerulus, 89  
    homeostasis, 89  
    loop of Henle, 88  
    nephron, 88  
    proximal convoluted tubule, 88  
    renal tubule, 87–89  
rectum, 57, 64, 73  
red blood cells, 112–114  
    anemia, 113  
    antigens, 114  
    hemoglobin, 112–113  
    recycling of by liver and  
        spleen, 114  
red muscle fibers, 171–172  
referred pain, 151  
reflexes, 64  
renal corpuscle, 85  
renal insufficiency (renal failure),  
    97–98  
renal system. *See* kidneys and  
    renal system  
renal tubule, 87–89  
renin, 96

- reproductive cells, 198  
 residual urine, 94  
 residual volume, lungs, 53  
 resorption, 182  
 respiratory centers, 43  
 respiratory system, 33–53  
     acidosis, 50–51  
     alkalosis, 50–51  
     controlling respiration, 42–45  
     diffusion, 47  
     external respiration, 46–47  
     gas exchange, 46–47  
     hyperventilation, 51  
     hypoventilation, 51  
     internal respiration, 46–47  
     lungs, 52–53  
     metabolism and, 36  
     partial pressures of gases, 48–49  
     pulmonary alveoli, 46  
     spirogram, 52  
     ventilation, 37–41
- retina, 156  
 ribosomes, 187–188  
 right atrium, 13–15, 19  
 right bundle branch, 17, 22  
 right coronary, 25  
 right heart, 13–15  
 right internal jugular vein, 31  
 right subclavian vein, 31  
 right venous angles, lymphatic system, 31–32  
 right ventricle, 13–15  
 rod cells, 156, 159  
 rotational motion, 161, 162
- S**
- saliva, 57, 72, 76  
 saturated fat, 69  
 secondary sex characteristics, 219–220  
 semipermeable membranes, 106–109  
 sensorineural hearing loss, 161  
 sensory adaptation, 155, 164  
 sensory cortex, 132–133  
 sensory nerves, 123–124
- sensory nervous system, 143–165  
     balance and inner ear, 161–162  
     deep sensations, 149  
     hearing and ear, 159–161  
     kinesthesia, 149  
     proprioception, 148–149  
     referred pain, 151  
     sensory adaptation, 155  
     sight and eye, 156–159  
     smell and nose, 162–164  
     somatic sensations, 149  
     superficial sensations, 146–148  
     taste and tongue, 164–165  
     thresholds, 151–155  
     visceral sensations, 150–151
- serotonin, 141  
 sex chromosomes  
     (allosomes), 196  
 sex hormones, 219–220  
 sexual reproduction, 198–201  
     asexual reproduction, 198  
     cell interphase, 198  
     cilia, 200  
     corpus luteum, 199  
     egg cells, 198–199  
     endometrium, 200  
     fallopian tubes, 199  
     fertilization, 200–201  
     fimbriae, 199  
     gestation period, 201  
     haploid cells, 198  
     implantation, 201  
     ovarian follicles, 198–199  
     ovulation process, 198–199  
     ovum, 198, 220  
     pregnancy, 196, 199, 200–201, 220  
     reproductive cells, 198  
     sperm cells, 198
- shivering, 179  
 sight, 156–159  
 sinoatrial node, 16–17, 19, 22, 25
- skeletal muscles  
     body temperature and, 178  
     defined, 169
- red muscle fibers, 171–172  
 white muscle fibers, 171–172  
 small intestine, 57, 62–63, 73  
 smells, 162–164  
 smooth (involuntary) muscles, 169  
 SNS (sympathetic nervous system), 24–25, 138–140  
 sodium  
     extracellular fluid, 105  
     reabsorption of, 89
- solutes, 107, 111  
 somatic nervous system, 137–138  
 somatic sensations  
     deep sensations, 149  
     superficial sensations, 146–148
- somatostatin, 213  
 sperm cells, 196, 198  
 spinal cord, 134–137  
     nerve cell paths to and from, 136  
     prenatal and postnatal, 135  
     spinal reflex shortcuts, 137
- spinal nerves, 137–138  
 spinal reflex, 125  
 spirograms, 52  
 spleen, 114  
 stapes, 159  
 starches, 66–67  
 steroid hormones, 216  
 stomach, 57, 59–60, 72  
 stool, 63–64, 73  
 striation, 169  
 stroke volume, heart, 24  
 sucrose, 66–67  
 superficial sensations, 146–148  
 superficial veins, 28  
 supernatant, 111  
 swallowing (deglutition), 58, 72  
 sympathetic nervous system (SNS), 24–25, 138–140  
 synapses, 122  
 synovial fluid, 174  
 systemic circulation, 13–15, 26–28  
 systolic pressure, 30

## T

T3 (triiodothyronine), 214, 221  
T4 (thyroxine), 214, 221  
T cells, 115, 116  
T waves, electrocardiogram, 20  
tachycardia, 24, 214  
taste  
  smells and, 164  
  taste buds, 164, 165  
TCA cycle (citric acid cycle), 74–76, 170  
temporal artery, 28  
testicles, 204, 221  
thoracic breathing, 40–41  
thoracic cavity, 38–39  
thresholds, sensations, 151–155  
threshold value, 154  
thyroid gland, 204, 213–214, 221  
thyroid-stimulating hormone (TSH), 213, 221  
thyroxine (T4), 214, 221  
tidal volume, respiration, 42  
tissue  
  interstitial fluid, 102–105  
  types of, 190  
tongue, 164–165  
total lung capacity, 53  
trabecular (cancellous) bone, 181  
tricuspid valve, 15  
triglycerides, 69  
triiodothyronine (T3), 214, 221  
TSH (thyroid-stimulating hormone), 213, 221  
tympanic membrane (eardrum), 159  
Type 1 diabetes, 219  
Type 2 diabetes, 219

## U

ulnar artery, 28  
unsaturated fat, 69  
urea, 83  
uremia, 97  
urethra, 95  
uric acid, 83  
urinary tract, 94

urinary tract infection (UTI), 95  
urination, 93–95  
urine  
  anuria, 97  
  homeostasis and, 90–95  
  oliguria, 97  
  residual, 94  
urobilinogen, 83  
UTI (urinary tract infection), 95

## V

vagus nerve, 137  
valves, heart  
  aortic, 15  
  heartbeat, 20  
  mitral, 15  
  pulmonary, 15  
  tricuspid, 15  
vasopressin (antidiuretic hormone), 92–93, 221  
vegetative state, brain, 133–134  
veins  
  defined, 28  
  heart, 15  
  left internal jugular, 31  
  left subclavian, 31  
  median cubital, 28  
  mesenteric, 78  
  portal, 78  
  pulmonary, 15  
  right internal jugular, 31  
  right subclavian, 31  
  superficial, 28  
vena cava, 15  
venous blood, 27, 112  
ventilation  
  abdominal breathing, 40  
  carbon dioxide, 37  
  diaphragm, 38–40  
  gas exchange, 37  
  intercostal muscles, 41  
  lungs, 38–39  
  oxygen, 37  
  pulmonary alveoli, 37  
  thoracic breathing, 40–41  
  thoracic cavity, 38–39

ventral (anterior) root, spinal nerves, 135  
ventricular fibrillation, 98  
vermiform appendix, 57  
vestibular system, 161–162  
vibration, 149  
visceral sensations, 150–151  
visual acuity, 159  
visual cortex, 132, 157  
vital capacity, lungs, 53  
vitamin D, 96, 97  
vitamins, reabsorption of, 89

## W

waste products, 83. *See also* kidneys and renal system  
water  
  extracellular fluid, 102, 104–105  
  interstitial fluid, 102, 103–105  
  intracellular fluid, 102, 104  
  intravascular fluid, 102  
  reabsorption of, 89, 93  
Wernicke's area, 132, 133  
white blood cells  
  B cells, 115  
  defense forces, 116  
  granulocytes, 115  
  lymphocytes, 115  
  monocytes, 115  
  types of, 115  
white matter, 131  
white muscle fibers, 171–172

## Z

zymogen (proenzyme), 60