

*Page numbers with *f* indicate figures; page numbers with *t* indicate tables.

A

Abdominal thrusts, 170
 Accidental exposures, 104
 Accidental waste release, 136–137
 Accidents, 167–179. *See also Injuries*
 first aid kits, 177
 first aid principles, 169–177
 changing CPR guidelines in, 172
 clear airway, 170–171
 restoring breathing, 171
 restoring circulation, 171–172
 stopping bleeding, 172–173
 treating for shock, 173–174
 treating injury, 174–177
 near-miss events and, 2
 reports on, 167–168, 168t
 scenarios, 183–194
 Acetic acid, 52
 Acetone, flash points of, 21*f*
 Acids, 174
 Acquired immunodeficiency syndrome (AIDS),
 antiretroviral drugs to treat, 94
 Adenovirus, 155
 Administrative controls, 2
 Aerosols, 99–100, 102
 confinement of, 126
 Agriculture, U.S. Department of
 on animal pathogens, 89
 on bioterrorism standards, 12, 200
 Air circulation, 54
 Air flow, 42
 Air handling for laboratories, 42
 Air pollution from laboratories, 135
 Air turbulence, 43
 Airway, clearing, 170–171
 ALARA (as low as reasonably achievable)
 principle, 124–125, 125*f*
 Alarms
 auditory, 24
 central system, 24
 Alcohol-based hand gels, 155
 fires associated with, 22
 problems with, 155
 Alcohols, 155
 Allergy, latex, 151
 Alpha particles, 123, 123*f*
 American Heart Association, guidelines for
 community providers, 172
 American Hospital Association, on accidental
 needlesticks, 75
 American National Standards Institute
 (ANSI), 6, 195
 material safety data sheet (MSDS)
 specifications, 44
 specification for safety shower, 147

American Red Cross
 Check, Call, Care program of, 169–170
 CPR guidelines from, 172
 American Society for Testing and Materials
 (ASTM), on laboratory coats, 152
 American Society of Microbiology (ASM),
 responsibility for sentinel laboratory
 guidelines, 89
 Americans with Disabilities Act (1990)
 (ADA), 148
 Ammonium hydroxide, 52
 Amperes, 69, 70
 Animal Biosafety Levels (ABSL), 98
 Animal pathogens, 98
 Animals
 autopsies of, 98
 handling of wastes from, 134
 working with laboratory, 98–99
 Antiglare screens, 7
 Antiretroviral drugs to treat acquired
 immunodeficiency syndrome (AIDS), 94
 Antiseptic soap, 154–155
 Aprons, 59
 plastic, 152
 Asphyxia, 30
 Asphyxiating gas, 53
 Association of Professionals in Infection Control
 (APIC), guidelines of, 103
 Asthma, occupational, 55
 Auditory alarms, 24
 Autoclave safety, 78–79, 80*f*, 98, 134
 Automated external defibrillator (AED), 170, 171,
 172, 176–177, 177*f*
 Automatic pipetting devices, 52, 57
 Autopsy suites, 97–98
 chemicals in, 54

B

Bacillus stearothermophilus, 79
Bacillus anthracis, 155
 Bacillus-Calmette-Guerin (BCG) vaccine for
 tuberculosis, 93
Bacillus cereus, 155
 Backdraft hoods, 43
 Backdraft vents, 6
 Backfeed, 72
 Back strain, 7, 8*f*
 Baseline 2-step skin testing, 94
 Beard covers, 153
 Becquerels, 125
 Benchtop work shields, 152
 Beta particles, 123*f*, 124
 Biohazardous waste
 disposal of, 136
 sterilization of, 137
 Biological cabinets, 100*f*
 air circulation and, 100–101
 decontamination of, 104
 spills in, 102–103
 Biological hazards, 85–107
 categories of, 10–11

defined, 85
 disinfectants for, 153
 microbial sources and infection
 routes, 86–89, 93
 accidental exposures, 104
 aerosols and droplets, 99–100
 biological safety cabinets and air circulation,
 100–101, 100*f*
 biosafety level 2 laboratory practices,
 90–93*t*
 biosecurity, 88–89, 93
 Centers for Disease Control biosafety levels
 for infectious agents, 86–87, 86t, 88
 critical components of biosafety
 program, 86*f*
 disposal, 104–105
 fomites, 101–102
 histology laboratories and autopsy
 suites, 97–98
 infectious agents of note, 93–95
 risk assessment, 105
 signs and symptoms of HIV, hepatitis
 and TB, 88, 89*t*
 spills and decontamination, 102–104
 universal, standard, and transmission-based
 precautions, 95–97
 work with laboratory animals, 98–99
 symbol for, 85–86, 85*f*

Biosafety

Centers for Disease Control levels of, 86–87,
 87*t*, 88
 critical components of program, 86*f*
 level 2 laboratory practices, 90–93*t*
 Biosecurity, 88–89, 93
 basic elements of plan, 89
 Bioterrorism
 events in, 89, 93
 global concern over, 88–89
 standards on, 12
 Bleach as disinfectant, 103
 Bleeding, stopping any, 172–173
 Bloodborne Pathogens, Post-Exposure Protocols
 for, 201–202
 Bloodborne Pathogens Exposure Control Plan, 75
 Bloodborne Pathogens Standard, 4, 5–6, 134
 Bomb Threat checklist, 12, 198
 Bone injuries, 174–175
 Borosilicate glass, 74
 Brachytherapy for prostate cancer, 127
 Brain cell death, 170–171
 Breathing, restoring, 171
 Bremstrahlung radiation, 124, 126
 Burns
 chemical, 174
 electrical, 69
 thermal, 174

C

Calicivirus, 155
 Canada, Workplace Hazardous Materials
 Information System (WHMIS), 38, 41*f*
 Canopy hoods, 43
 Capillary tubes, 75
 Carbon dioxide, 55–56
 Carbon dioxide extinguisher, 19

- Carcinogens, 53
 Cardiopulmonary resuscitation (CPR)
 course, 169
 Carpal tunnel syndrome, 7
 Cataract formation, 124
 Category A infectious substances, 11
 Category B infectious substances, 11
 Caustics, 52, 174
 Centers for Disease Control and Prevention (CDC), 6, 12–13, 195
 on accidental needlesticks, 75
 biosafety levels for infectious agents, 86–87, 87f, 88
 on biosecurity, 88–89, 93
 bioterrorism standards from, 12
 coordination of Laboratory Response Network by, 12–13
 on hand hygiene, 156
 on microbiology laboratories, 89
 on select agents and toxins, 89
 Central alarm system, 24
 Centrifuge safety, 77–78, 77f, 78f
 Chemical(s)
 highly reactive, 133
 in histology laboratories, 54
 toxic, 78, 133
 volatile, 150
 Chemical Abstracts Service (CAS), 37
 Chemical burns, 174
 Chemical fume hoods, 2, 6, 43, 54, 153
 schematic for, 43f
 Chemical health hazards, 52–53, 53t
 Chemical hygiene plan, 5
 Chemical neutralizers, 55
 Chemical safety, 37–62
 chemical spills, 60–61
 disposal in, 58–59
 handling and usage, 57
 hazards in, 52–57, 53t, 57t
 incompatible mixtures, 57, 58t
 labels in, 37–42
 material safety data sheet (MSDS)
 in, 44, 45–50f, 51–52
 protective wearing apparel in, 59–60
 storage and inventory in, 42–44, 43f
 Chemical spills, 60–61
 decontamination and, 102–104
 Chemical waste management, components of, 58
 Chimney effect, 20
 Circuit breakers, 70, 72
 Circuit protection devices, 70–71
 Circuits, 69
 Circulation, restoring, 171–172
 Class A fires, 19–20, 25, 30
 fire hoses for, 27
 Class B fires, 20–22, 22, 22f, 24, 30
 Class C fires, 22–23, 24, 30
 Class D fires, 23
 Class E fires, 23
 Class I solvents, 52, 78
 flash points of, 21
 Class II solvents, 52
 flash points of, 21
 Class III solvents, flash points of, 21
 Class K fire extinguishers, 27, 27f
 Clean to dirty direction, 42
 Clinical Laboratory Amendments (1988) (CLIA), 11–12
 Clinical Laboratory Managers Association, 195
 Clinical Laboratory Standards Institute (CLSI), 23, 195
 on autopsy suites, 98
Clostridium botulinum, 155
Clostridium difficile, 103, 155
Clostridium perfringens, 155
Clostridium tetani, 155
 Clothing
 contaminated, 145
 fires of, 19–20
 Code Red, 28, 30, 31f
 College of American Pathologists (CAP), 13, 195
 Combustibles, 23, 52
 ordinary, 19–20
 Commercial spill kits, 54
 Compliance measures, 2
 Compressed Gas Association, 195
 on good practice with compressed gas cylinders, 117
 Compressed gases, 113–118, 118t
 defined, 113
 nature of, 113–114, 114f
 poster on, 203
 safe handling of, 114
 cryogenics, 117
 daily monitoring and shut-off, 117
 empty tanks, 117
 fittings, 116
 gases for medical use, 117–118, 117f
 inventory management, 114
 labeling, 115
 minimal amounts, 115
 no defective cylinders, 115–116
 no leaks, 116–117
 regulators, 116, 116f
 safe installation, 116
 safety shut-off valves, 114
 storage, 114
 transportation, 115
 valve protection, 115
 schematics of cylinders, 114f
 Computer workstations, ergonomics in use of, 7, 7f, 8, 8f
 Conductors, 69
 Contact lenses, 126
 in eye injuries, 175
 eye protection over, 153
 eye washes and, 149
 Contaminated sharps, 134
 Corrosives, 52, 133
 Cradle to grave principle, 9
 Creutzfeldt-Jakob disease (CJD), 5, 95, 97
 Cryogenics, 117
Cryptosporidium, 155
 Crystalline picric acid, 56
 Cumulative trauma disorders, 7, 8f
 Curies, 125
 Cuts, 176
 Cyanide, 58–59
- D**
- Dead-end doors, 23
 Decay pigs, 126
 Decontamination, 127
 classes of, 103
 Deluge showers, 148
 Deoxyribonucleic acid (DNA) mutations, 124
 Diabetic emergency, 176
 Disposable gloves, 126
 Disposal
 of biohazards, 104–105
 in chemical safety, 58–59
 of radioactive materials, 125–127
 of sharps, 76
 Distance in reducing radiation exposure, 124
 Doors
 dead-end, 23
 display of biological hazard symbol on, 85
 exit, 23
 Droplets, 99–100
 Dry chemical extinguishers, 22, 25, 27
 Dry ice, 55–56, 174
- E**
- Ear muffs, 153
 Ear plugs, 153
 Electrical equipment
 energized, 22–23
 generators and, 72
 use of, 72–73
 Electrical fires, 74
 Electrical hazards
 general management of, 70–71, 71f
 identification of, 73–74
 Electrical plugs, schematic of, 70, 71f
 Electrical shock, 69, 70t
 Electricity, nature of, 69, 70t
 Elevator, chemical spills in, 57
 Emergency generators, 72
 Emergency Preparedness and Community Right-to-Know Act, 60
 Employee retraining in emergency procedures, 167
 Employee scheduling, 2
 Energized electrical equipment, 22–23
 Engineering control, 2
 Environmental monitoring, 54
 radioactive materials and, 127
 Environmental Protection Agency (EPA), 8–10, 195
 concerns with chemical wastes, 134
 defining of hazardous wastes by, 133
 Hazardous Waste Manifest, 197
 regulation of disinfectants by, 103
 regulation of wastes by, 2, 8–9
 waste generator categories of, 134, 135t
 Equipment, display of biological hazard symbol on, 86
 Equipment and electrical safety, 69–81
 centrifuge safety, 77–78, 77f, 78f
 emergency generators, 72
 general management of electrical hazards, 70–71, 71f
 glassware safety, 74–75, 74f, 75f
 identification of electrical hazards, 73–74

- lockout/tagout in, 71–72
 - nature of electricity, 69, 70**f**
 - safety with sharps, 75–77, 76**f**, 77**f**
 - steam sterilizer/autoclave safety, 78–79, 80**f**
 - use of electrical equipment, 72–73
 - Ergonomics, 7–8
 - OSHA definition of, 7
 - Ethanol, flash points of, 21**f**
 - Ethers, 56
 - Ethyl ether, flash points of, 21**f**
 - Evacuation routes, 23–24, 31**f**
 - Exit doors, 23
 - Exit signs, 23
 - Explosives, 56
 - Exposure control plan (ECP), 5
 - Exposure monitoring in radioactive exposure, 126
 - Extension cords, 73
 - Eyeglasses, 59
 - Eye goggles, 102, 149, 150
 - Eye injuries, 175
 - Eyewash, 2, 61, 148–149
- F**
- Face protection, 149–150, 149**f**, 150**f**
 - Face shields, 59, 149, 150
 - Falling, 8
 - FAST (Face, Arm, Speech, Time) acronym, 176
 - Film badge, in monitoring radiation exposure, 124, 126
 - Fire(s)
 - actions in case of, 29–30
 - Class A, 19–20, 25, 30
 - Class B, 20–22, 22, 22**f**, 24, 30
 - Class C, 22–23, 24, 30
 - Class D, 23
 - Class E, 23
 - clothing, 19–20
 - electrical, 74
 - reporting, 30
 - Fire alarms, 24, 147
 - Fire blankets, 19–20, 28, 28**f**, 147
 - symbol for, 28**f**
 - Fire brigade, 28
 - Fire drills, 24
 - Fire extinguishers, 25–27, 26**f**, 146–147
 - PASS process for, 26, 26**f**
 - schematic of, 26**f**
 - types of, 20**f**, 25**f**, 27
 - Fire hazards, 19. *See also* Fire(s)
 - classification of, 19
 - defined, 19
 - ordinary combustibles, 19–20
 - Fire hose, 27, 147
 - Fire plans, 24, 29
 - Fire quadrhedron, 19, 20
 - Fire-resistant construction materials, 24
 - Fire safety, 19–32
 - hazards in, 19–22
 - laboratory design and evacuation routes in, 23–24
 - personnel in, 28–30, 29**f**
 - Fire safety equipment, 24, 146–147
 - fire alarms as, 24
 - fire blankets as, 28, 28**f**
 - fire extinguishers as, 25–27, 25**f**, 26**f**
 - fire hoses as, 27
 - respirators as, 28
 - sand buckets as, 24
 - First aid, 153, 169–177
 - ABC in, 170
 - changes in CPR guidelines in, 172
 - clear airway, 170–171
 - kits for, 177
 - restoring breathing, 171
 - restoring circulation, 171–172
 - spill containment supplies and, 153
 - stopping any bleeding, 172–173
 - treating for shock, 173–174
 - treating injury, 174–177
 - First in, first out system of inventory management, 42
 - Fittings for compressed gas, 116
 - Flammables, 20–22, 22**f**, 52, 72, 78, 133
 - storage of, 21–22, 22**f**
 - Flash points of solvents, 20–21, 21**f**, 52
 - Fomites, 101–102
 - Food and Drug Administration (FDA), 195
 - on cylinder fittings, 116
 - on disinfectants by, 55
 - on glove defects, 152
 - on medical equipment malfunctions, 73
 - on sterilants and antiseptics, 103
 - Foot covers, 102, 152
 - Footwear, proper, 152
 - Formaldehyde, 6, 54
 - Formaldehyde Standard, 6, 54
 - Formalin, 54
 - Fuel, vaporization of, 20
 - Fume hoods, 42–43, 149, 150
 - chemical, 2, 6, 43, 54, 153
 - schematic for, 43**f**
 - Fuse, 71
 - schematic of, 71**f**
- G**
- Gamma rays, 123**f**, 124
 - effects of radiation, 124
 - Gas extinguishers, 25, 27
 - Geiger counter, 126, 127, 128**f**
 - Gel vapors, 22
 - Generators, emergency, 72
 - Giardia lamblia*, 155
 - Glass slides, 75
 - Glassware safety, 57, 74–75, 74**f**, 75**f**, 104
 - Global Harmonization System
 - chemical classes that pose physical hazards, 57**f**
 - hazard labeling in, 38, 40**f**
 - hazard symbols in, 115**f**
 - sample MSDS complaint with, 45–50**f**
 - Gloves, 55, 59–60, 150–152
 - disposable, 126
 - hand hygiene and, 154
 - for handling alpha particles, 123
 - for handling beta particles, 124
 - hypoallergenic, 151
 - latex, 55, 123, 124, 150, 151, 152
 - nitrile, 150
 - puncture-resistant, 150
 - removing, 154
 - rubber, 75
 - vinyl, 150
 - Glutaraldehyde, 55
 - Goggles, 59
 - Good laboratory practice in radioactive exposure, 123, 124, 126
 - Good Samaritan laws, 169
 - Ground fault circuit interrupters (GFCIs), 70–71, 72
 - Grounding, 70, 71**f**
 - Guarding, 70
- H**
- Half-life, 125, 126, 136
 - Hand hygiene, 154–156, 154**f**
 - Hand protection, 150–152
 - Hazard(s)
 - in chemical safety, 52–57, 53**t**, 57**t**
 - electrical, 70–71, 71**f**, 73–74
 - fire, 19–23, 22**f**
 - health, 52–53, 53**f**
 - identifying, 143**f**
 - physical, 57, 57**t**
 - Hazard Communication Standard, 5
 - Hazardous characteristics
 - chemicals in histology/autopsy, 54
 - corrosives, 52
 - dry ice/carbon dioxide, 55–56
 - explosives, 56
 - glutaraldehyde as, 55
 - health hazards, 52–53, 53**f**
 - hydrogen cyanide, 55
 - ignitables, 52
 - mercury, 53–54
 - nitrogen, 53
 - oxidizers, 56
 - physical hazards, 57, 57**t**
 - Hazardous Chemicals in Laboratories Standard, 5
 - Hazardous Materials Identification System (HMIS), 38
 - Hazardous substances, transport and shipping of, 10–11, 11**f**, 38
 - Hazardous waste
 - categories of, 133–134
 - defined, 133
 - regulations for, 134–136, 135**t**
 - Hazardous Waste Operations and Emergency Response (HAZWOPER), 60, 136–137
 - Head sets, 8
 - Head tilt/chin lift, 170
 - Health and Human Services, US Department of,
 - select agents and toxins, 89, 200
 - Health hazards, 52–53, 53**t**
 - Hearing loss, 7
 - Heart attacks, 176–177
 - signs and symptoms of, 176
 - Heimlich maneuver, 170
 - Hepatitis, signs and symptoms of, 88, 89**f**
 - Hepatitis A virus (HAV), 155
 - Hepatitis B virus (HBV), 5, 93, 155
 - prophylactic protocols for infections, 94
 - vaccination against, 5, 93
 - Hepatitis C virus (HCV), 5, 93, 155
 - Heptane, flash points of, 21**f**

Herpes simplex virus, 155
 High-efficiency particulate air (HEPA) filter, 100
 Histology laboratories, 54, 97–98
 chemicals in, 54
 Homeland Security, US Department of
 (DHS), 12, 195
 Bomb Threat Checklist of, 12, 198
 Chemical Facility Anti-Terrorism Standards, 44
 chemicals of interest, 44
 Hoods, 153
 Housekeeping
 importance of good, 19
 in preventing combustible fire, 19
 Human blood, 134
 Human immunodeficiency virus (HIV), 5, 93, 155
 signs and symptoms of, 88, 89f
 Human tissue specimens, 136
 Hydrochloric acid, 52
 Hydrofluoric acid, 174
 Hydrogen cyanide, 55
 Hydrogen peroxide, 55
 Hypoallergenic gloves, 151

I
 Ignitables, 52
 Incineration, 59
 Infection, microbial sources and routes
 of, 86–89, 86f, 87t, 88t, 89t, 90–93t, 93
 Infectious agents/substances, 93–95
 Category A, 11
 Category B, 11
 Centers for Disease Control biosafety levels
 for, 86–87, 86t, 88
 live, 134
 packing and labeling of, 11
 Injuries. *See also* Accidents
 back, 7, 8f
 bone, 174–175
 eye, 175
 joint, 174–175
 muscle, 174–175
 repetitive task, 7
 sharps, 98
 from slips, trips, and falls, 8
 Insulation, 70
 Insulators, 69
 Internal bleeding, signs of, 173
 International Agency for Research on
 Cancer (IARC), 53
 International Air Transport Association (IATA), 10
 International Organization for Standardization
 standard ISO 15190, 133–139
 International Union of Pure and Applied
 Chemistry (IUPAC), 37
 Inventory management
 in chemical safety, 42–44, 43f
 compresses gas and, 114
 first in, first out system of, 42
 Isolation wastes, 134
 Isopropanol, 21
 flash points of, 21t
 Isotopes
 common, with laboratory
 applications, 125, 125t
 radioactive, 78

J
 Jewelry
 as electric conductor, 73
 safety and, 153
 Job-related accidents, defenses against, 1
 Joint Commission, 13
 Joint injuries, 174–175
 Justice, US Department of, biosecurity and, 89

L
 Labels
 in basic waste management, 137
 in chemical safety, 37–42
 for compressed gases, 115
 for gas cylinders, 115
 radioactive, 127
 reagent, 37
 for secondary containers, 37
 Labor, US Department of, 195
 Laboratories
 air handling for, 42
 area designations for, 146
 evacuation plan for, 23–24, 31f
 hazardous chemicals in, 5
 safety in, v, 1
 smoking in, 19
 Laboratory acids, 52
 Laboratory animals, working with, 98–99
 Laboratory chairs, design on, 8
 Laboratory coats, 59, 102, 126, 145
 as body protection, 152–153
 Laboratory director, responsibility for safety, 1
 Laboratory infections, primary causes of, 86
 Laboratory Response Network (LRN), 12–13
 Landfill or solid-waste disposal facilities, 59
 Laser hazard symbol, 150f
 Latex allergy, 151
 Latex gloves, 55, 123, 124, 150, 151, 152
 Laundry bags, display of biological hazard
 symbol on, 85
 Lead shielding, 124
 Learner objectives, vi–x
 Licensed waste handlers, 59
 Lithium, 23
 Lockout/tagout, 71–72
 Lower Explosion Limit (LEL), 21

M
 Mad-cow disease (bovine spongiform
 encephalitis), 95
 Magnesium, 23
 Masks, 149
 Material safety data sheet
 (MSDS), 5, 57, 136, 139, 150
 cover sheet for, 51, 51f
 sample compliant with UN Global Harmonized
 System, 45–50f
 Medical gases, 117–118
 NFPA guidelines for, 118
 standard colors for, 117f
 Medical wastes, 8
 Mercury, 53–54
 Methanol, 21
 flash points of, 21t

Microbial infection, 86–89, 86f, 87t, 88t, 89t,
 90–93t, 93
 accidental exposures, 104
 aerosols and droplets, 99–100
 biological safety cabinets and air
 circulation, 100–101, 100f
 biosecurity, 88–89, 93
 disposal, 104–105
 fomites, 101–102
 histology laboratories and autopsy
 suites, 97–98
 infectious agents of note, 93–95
 risk assessment, 105
 spills and decontamination, 102–104
 universal, standard, and transmission-based
 precautions, 95–97
 working with laboratory animals, 98–99
 Microcuries, 125
 Mouth pipetting, 74
 Muscle injuries, 174–175
Mycobacterium tuberculosis, 93, 150, 155

N
 National Fire Protection Association
 (NFPA), 13, 22, 195
 diamond label for chemical, 38
 guidelines for medical gases, 118
 Hazard Communication Label, 39f
 need for exit access doors, 23
 recommendation for fire drills, 24
 Standard 45, 19
 Standard 99, 19
 National Institute for Occupational Safety and
 Health (NIOSH), 12–13, 195
 classification of masks by, 150
 on cylinder fittings, 116
 National Institutes of Health (NIH), 13, 195
 biohazard risk classification by, 86, 88t
 National Paint and Coatings Association, 38
 Hazardous Materials Information Systems
 (HMIS), 39f
 National Toxicology Program (NTP), 53
 Near-misses, 2
 documentation of, 167
 Needles
 covers for, 76, 76f, 77, 77f
 disposable, 76
 reusable, 76
 Needlesticks, 104
 Needlestick Safety and Prevention
 Act (2000), 6, 75
 New employees, fire safety and, 28
 Nitric acid, 52
 Nitrile gloves, 150
 Nitrogen, 53, 114f
 Norovirus, 103, 155
 Nuclear Regulatory Commission
 (NRC), 10, 125, 195
 on “ALARA” principle, 124, 125f
 on radioactive waste disposal, 127, 134

O
 Occupational asthma, 55
 Occupational Exposure to Tuberculosis
 Standard, 6

Occupational Safety and Health Act (1970),
 general duty clause, 3, 4
 Occupational Safety and Health Administration
 (OSHA), 3–8
 on electrical hazards, 70–71, 71f
 engineering controls and, 145
 on ergonomics, 7–8
 on labels, 37
 on laboratory coats, 152
 on material safety data sheets (MSDSs), 44
 poster 3165, 3, 196
 safety protocols from, 167
 on safe work practices, 71
 standards of
 Bloodborne Pathogens
 Standard, 4, 5–6, 134
 categories of, 4
 flammable liquids, 22
 Formaldehyde, 6, 54
 Hazard Communication, 5
 Hazardous Chemicals in Laboratories, 5
 Lockout/Tagout, 71–72
 Occupational Exposure to Tuberculosis, 6
 Personal Protective Equipment, 6
 Ordinary combustibles, 19–20
 Organic solvents, 21
 Oxidizers, 56, 74

P

Paraffin, 54
 Parvovirus, 155
 “PASS” process for fire extinguishers, 26, 26f
 Pasteur pipettes, 75
 Pathology waste, 134
 Peracetic acid, 55
 Perchloric acid, 56
 Permissible exposure limits (PELs), 54
 Peroxides, 56
 Personal protective clothing, 145
 Personal Protective Equipment Standard, 6
 Personnel in fire safety, 28–30, 29f
 Physical hazards, 57, 57f
 Picornavirus, 155
 Pipetting
 mouth, 74
 proper, in radioactive exposure, 126
 Pipetting acid, 2
 Pipetting devices, 126
 automatic, 52, 57
 repetitive use of, 7
 Planning in basic waste management, 137
 Plastic, in providing radiation
 protection, 123, 124
 Plastic aprons, 152
 Polio virus, 155
 Postal Service, US, 10–11, 11f, 195
 Mailability Standard 601, 10–11
 Post-Exposure Protocols for Bloodborne
 Pathogens, 201–202
 Potassium, 23
 Potassium hydroxide, 52
 Pressurized water extinguishers, 27
 Prion (proteinaceous infectious particle), 95
 Professional/Research Bodies for Voluntary
 Compliance

Centers for Disease Control and Prevention
 (CDC), 12–13
 National Fire Protection Association (NFPA), 13
 National Institute for Occupational Safety and
 Health (NIOSH), 12–13
 National Institutes of Health (NIH), 13
 voluntary accrediting bodies, 13
 Prophylactic protocols for hepatitis B virus (HBV)
 infection, 94
 Prostate cancer, brachytherapy for, 127
 Protective gear in radioactive exposure, 126
 Protective respiratory devices, 149
 Protective wearing apparel, 55, 57, 149–153
 in chemical safety, 59–60
 face/respiratory protection, 149–150, 149f, 150f
 laboratory coats, 152–153
 personal, 153
 Public address systems, 24
 Pulse, checking for, 171
 Puncture-resistant gloves, 150
 Punctures, 104, 176
 Pyrex®, 74
 Pyrophoric chemicals, 52

R

RACE (Rescue, Alarm, Contain, Extinguish), 29
 Radiation, effects of, 124
 Radiation exposure, 124–128, 125f
 Radioactive emissions, types of, 123–124, 123f
 beta particles, 123f, 124
 Radioactive isotopes, 78
 Radioactive labeling, 127
 Radioactive materials, 123–129
 alpha particles, 123, 123f
 basic information on, 130f
 beta particles, 123f, 124
 defined, 123
 environmental monitoring and, 127
 gamma rays and, 123f, 124
 licensing and inspection of facilities
 handling, 10
 radiation exposure, 124–128, 125f
 safe handling and disposal of, 125–127
 safety protocols for, 129f
 types of emissions, 123–124, 123f
 Radioactive wastes, disposal of, 126–127
 Reactive metals, 23
 Reagent labels, information on, 37
 Records
 of radiation exposure, 127, 129
 safety training, 3–4
 Refrigerator information, 146
 Regulators, compressed gas and, 116, 116f
 Rem, 124
 Repetitive motion, 7
 Repetitive task injury, 7
 Reports, accident, 167–168, 168f
 Resource Conservation and Recovery Act
 (RCRA) (1976), 9, 135, 137
 Respiration protection, 53
 Respirators, 28, 150
 Respiratory protection, 149–150, 149f, 150f
 Respiratory syncytial virus, 155
 Rhinovirus, 155
 RICE (Rest, Immobilization, Cold, Elevation), 175

“Right to Know” standard, 5
 Risk assessment, 105
 rosebud, 229
 Rotavirus, 103, 155
 Rubber gloves, 75

S

Safety
 centrifuge, 77–78, 77f, 78f
 chemical, 37–62
 clinical laboratory, v, 1
 as continuous process, 2, 2f
 equipment and electrical, 69–81
 fire, 19–32
 glassware, 74–75, 74f, 75f
 in work environment, 1
 Safety agencies, addresses, phone numbers and
 websites for, 195
 Safety audits, 2
 Safety committee, 1–2
 Safety-engineered devices, 75, 76, 77
 Safety equipment and documents, 163–165
 locating, 163
 Safety equipment and safe work
 practices, 145–158
 basic, 145–146
 eyewash, 148–149
 fire, 146–147
 first aid and spill containment supplies, 153
 hand hygiene, 154–156, 154f
 hoods, 153
 protective wearing apparel, 149–153
 face/respiratory
 protection, 149–150, 149f, 150f
 laboratory coats as body
 protection, 152–153
 personal, 153
 sharps, 153
 shower, 147–148
 signage, 146
 telephone, 146
 Safety glasses, 4, 52, 59, 126, 149, 149f, 150f
 Safety goggles with side shields, 149f, 150f
 Safety instructions, 146
 Safety needle cover, 76, 76f
 Safety officers/committee, 2, 3, 44, 129
 Safety showers, 4, 61, 147–148
 drains of, 148
 Safety shut-off valves, compresses gas and, 114
 Safety training records, 3–4
 Safe work practices, 71. See also Safety
 equipment and safe work practices
 Sand buckets, 24, 147
 Sanitary sewer, 58–59
 Scalpels
 disposable, 77
 reusable, 77
 Secondary containers, labeling of, 37
 Segregation in basic waste management, 137
 Self-inoculation, 104
 Seroconversion, 93, 104
 Sharps, 153
 contaminated, 134
 disposal boxes for, 76
 injury logs for, 77

safety with, 75–77, 76f, 77f
sealed, 76
Shielding, in reducing radiation exposure, 124, 126
Shock
 electrical, 69, 70f
 signs and symptoms of, 173
 treating for, 173–174
Sievert, 124
Signage, 146
Skeletomuscular disorders, 7–8, 8f, 9f
Slipping, 8, 54
Smoking
 in laboratory, 19
 policies of, 28–29
Snoop®, 116
Sodium, 23
Sodium hydroxide, 52
Solvents
 Class I, 52, 78
 Class II, 52
 flammable, 72, 78
 flash point of, 20–21, 21f
 organic, 21
Sonicators, 153
Specimen containers, display of biological hazard symbol on, 85
Specimens, display of biological hazard symbol on, 85
Spills
 in biological safety cabinets, 102–103
 confinement of, in radioactive exposure, 126
 containment supplies for, 153
Sprinkler systems, 22, 24
Standard Occupational Safety and Health Administration (OSHA) danger signs, 146
Standard Precautions, 95
Staphylococcus aureus, 156
Steam sterilizers, 78–79, 80f
Sterilization, 103, 134
Stop, drop, and roll technique, 20, 28
Storage
 areas of, 24
 in basic waste management, 137
 in chemical safety, 42–44, 43f
 of compressed gas, 114
 of flammables, 21–22, 22f
 labeled, 127
 secured, 127
Strokes, 176–177
Sudden illness, 176–177
Sulfuric acid, 52
SUPERFUND Amendments and Reauthorization Act (SARA, Title III), 60
Surge protectors, 72, 73
Symbols
 biohazard, 85–86, 85f
 chemical hazard, 147f
 Class K fire extinguisher, 27, 27f
 DOT gas hazard, 115f
 eyewash, 147f
 fire blanket, 28f
 Globally Harmonized Hazard, 115f
 Globally Harmonized System Chemical Transportation, 40f

laser hazard, 150f
radiation hazards, 125f
safety shower, 147f
universal biohazard, 147f
universal hazard, 146, 147f
Workplace Hazardous Materials Information System, 41f
Syringes, accident rates from, 76

T

Target organ poster, 53, 199
Telephone, 146
Tetanus shot, 176
Thermal burns, 174
Thermoluminescent dosimetry device, 124
Thyroid monitoring, 124
Time in reducing radiation exposure, 124
Tissue homogenizers, 153
Toluene, flash points of, 21f
Tourniquets, 173
Toxic chemicals, 78
Training, 3, 13
Transmission-Based Precautions, 95
Transportation
 of compressed gas, 115
 of hazardous substances, 38
Transportation, US Department of, 10–11, 11f, 195
 Hazardous Waste Manifest, 197
 hazard symbols of, 115f
 on transportation of hazardous substances, 38
Trash cans, display of biological hazard symbol on, 85
Trichloroacetic acid, 52
Tripping, 8
Tuberculosis (TB), 94–95
 Bacillus-Calmette-Guerin (BCG) vaccine for, 93
 disinfectants and, 103
 occupational exposure to, 6
 signs and symptoms of, 88, 89f

U

Underwriters Laboratories Inc., 72
Uninterruptible power supplies (UPS), 72
United Nations, Global Harmonization System
 chemical classes that pose physical hazards, 57f
 hazard labeling in, 38, 40f
 hazard symbols in, 115f
 sample MSDS complaint with, 45–50f
Universal hazard symbols, 146, 147f
Universal Precautions, 6, 95–97
Upper Explosion Limit (UEL), 21

V

Vaccines
 Bacillus-Calmette-Guerin (BCG) for tuberculosis, 93
 for hepatitis B virus (HBV), 93
 for zoonoses, 98
Vapor confinement, 126
Vapor confinement of radioactive materials in radioactive exposure, 126
Vaporization of fuel, 20
Video display, effects of long-term use of, 7

Vinyl gloves, 150
Volatile chemicals, 150
Volatile liquids, storage of, 21–22, 22f
Voltage, 69, 70
Voluntary Accrediting Bodies, 13

W

Waste(s)
 biohazardous
 disposal of, 136
 sterilization of, 137
 disposal of radioactive, 126–127
Environmental Protection Agency (EPA)
 regulation of, 8–9
 hazardous
 categories of, 133–134
 defined, 133
 regulations for, 134–136, 135f
 isolation, 134
 medical, 8
 pathology, 134
 reduction in basic waste management, 137–138
 regulation of, by Environmental Protection Agency (EPA), 2
 reuse and recycling, 138–139
Waste and waste management, 133–139, 138f
 accidental release, 136–137
 basic, 137–139, 138f
 hazardous categories, 133–134
 hazardous regulations, 134–136, 135f
Waste handlers, licensed, 59
Waste receptacles, display of biological hazard symbol on, 85
Water extinguishers, 25
Wipe test, 127, 128f
Work environment, safety in, 1
Work practices, 2, 145–146
Work spaces, 23
Work stations, rotation of, 124
Work surfaces, decontamination of, 104
World Health Organization (WHO), biohazard risk classification by, 86, 88f
Wounds, puncture, 104

X

Xylene, 54
 flash points of, 21f

Z

Zoonoses, 98