

RNA translation, 46  
 Root mats, 416  
 Rotary-drum driers, 379  
 Rotary-drum fermenters, 277-78  
 Rotary vacuum precoat filter, 332  
 Rotating biological contactors (RBC), 498-99  
 RPMI 1640, 394  
*r*-RNA, 46  
 Runaway replication, 438  
 Rupture with ice crystals, 342  
 Rushton impeller, 287-90

## S

S phase, eucaryote cell division, 20  
 Sail-type agitators, 398  
 Salting-out, 349-50  
 Saturated zone, 353  
 Saturation kinetics, *See* Michaelis-Menten kinetics  
 Scale-down, 301-2, 323  
 Scale-up, 303-6, 323  
 Scarce enzymes, 96  
 Secondary biological waste treatment, 491  
 Secondary metabolites, 163  
 Secondary structure, proteins, 26, 30, 53  
 Secretion, and *E. coli*, 425  
 Segregational loss (segregational instability), 433-36, 458  
 Selectable mutations, 222  
 Selective pressure, 437  
 Selenium (Se), 51  
 Semiconservative replication, 107  
 Senescence, 389  
 Sense strand, 110  
 Sephadex, 80, 386  
 Sequential feedback inhibition, 124  
 Serum-containing/serum-free media, examples of composition of, 392-93  
 Sex pilus, 229  
 Shear protecting agents, 398  
 Sheet structure, 30  
 Shine-Delgarno box, 115  
 Shock loading, 492  
 Shotgun cloning, 230  
 Sigma factor, 110  
 Signal sequence, 426  
   proteins, 116-17  
 Simple glycoforms, 119  
 Single-cell protein (SCP), 247, 488  
 Single chromatographic separation process, 367

Site-directed mutagenesis, 456  
 Sludge, 491  
 Sodium (Na), 51  
 Solid-state fermentations (SSF), 276-78, 285  
   koji process in, 276-77  
     major industrial use of, 277  
     rotary-drum type of koji fermenter, 277-78  
     rotary-tray chamber for koji fermentations, 278  
   major advantages of, 276  
   major process variables in, 277-78  
 Soluble products, separation of, 343-78  
   adsorption, 351-55  
   aqueous two-phase extraction, 348-49  
   chromatography, 365-75  
   cross-flow microfiltration, 360-65  
   cross-flow ultrafiltration, 360-65  
   dialysis, 355-56  
   electrodialysis (ED), 376-78  
   electrophoresis, 375-76  
   liquid extraction, 343-48  
   microfiltration, 358-60  
   precipitation, 349-51  
   reverse osmosis, 356-58  
   ultrafiltration, 358-60  
 Solvent precipitation, 350  
 Sonicators, 341  
 Sparger, 286, 293-94  
 Specialized transduction, 227, 241  
 Species, 12  
 Specific growth rate:  
   microbial growth, 155-56  
   using unstructured nonsegregated models to predict, 176-83  
 Spirillum, 12  
 Spontaneous rates of mutation, 221  
 Spores, 17  
 Sporozoans, 25  
 Spray dryers, 379  
 Squibb, 5  
 Standard operating procedures (SOPs), 9  
 Steady-state method, 295  
 Stem cells:  
   defined, 471  
   and hematopoiesis, 472  
 Sterility, maintenance of, 247  
 Sterilization, 314-23, 323  
   continuous, 318-19, 323  
   death, 314  
   disinfection, 314