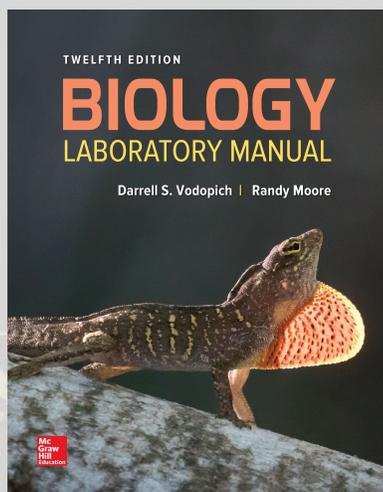


New Features You'll See in *Biology Laboratory Manual, 12e*

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New to This Edition —

- 1 Boxed readings titled Inquiry-Based Learning encourage students to apply what they've learned to independently answer questions about intriguing biological topics.
- 2 Updated health-related exercises help students better understand topics such as blood pressure, atherosclerosis, and their risk of cardiovascular disease.
- 3 Several illustrations have been replaced with photographs to provide more realistic images to support the Exercise content.
- 4 Approximately 60 illustrations and photos have been revised.
- 5 Questions within procedures now include lines for students to write in their answers.

Title: Biology Laboratory Manual, 12e

Authors: Darrell Vodopich and Randy Moore

ISBN: 1260200728/
9781260200720

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- 6** An assignable, updated library of videos and Connect® questions helps students prepare for lab and understand the instruments and techniques that will be important for their investigations. Instructors may assign these videos before class time to help ensure that students come prepared for lab.

Exercise-specific Changes

- 7** **Exercise 1:** Additional explanation provided on both the mean and standard deviation
- 8** **Exercise 2:** Mass, volume, and median are further defined; new illustration in figure 2.3 on measuring the volume of liquid; figure 2.4b has explanatory labels added
- 9** **Exercise 3:** Additional questions have been added to Procedure 3.6 Using a dissecting microscope
- 10** **Exercise 4:** Several illustrations have minor label revisions; a new photo is supplied for figure 4.6a Eodea cells; a question has been added to Procedure 4.7; figure 4.13 has been redrawn to more directly correlate to the associated photo; a new question is added to 'Questions for Further Study and Inquiry' to compare plant and animal cells
- 11** **Exercise 6:** Qualitative tests are defined; a new photo was added to figure 6.2 to explain Benedict's test
- 12** **Exercise 7:** Clarifying edits made to introductory material
- 13** **Exercise 9:** Explanation of hypotonic, hypertonic, and isotonic is expanded

- 14** **Exercise 10:** Steps of Procedures 10.1 and 10.2 are clarified; Questions for Further Study and Inquiry is expanded
- 15** **Exercise 13:** Figure 13.2 caption is expanded
- 16** **Exercise 14:** Explanation of the structure of chromatids is expanded
- 17** **Exercise 15:** Labels for figure 15.2 are added for paternal versus maternal chromosomes; description of the structure of replicated versus non-replicated chromosomes has been clarified; figure 15.6 is new; figure 15.7 is revised to clarify the state and number of chromosomes in first polar bodies and second polar bodies, and corpus albicans has been labeled and added as a defined term in the text
- 18** **Exercise 16:** Global prevalence of genetic transformation crops has been updated to 2017 statistics
- 19** **Exercise 17:** Figure 17.4 has a panel of 3 new photos on sickle cell anemia; figure 17.6 contains improved photos of hairlines
- 20** **Exercise 18:** Definition of evolution is revised to be more concise; questions about Hardy Weinberg genetics are expanded for clarity; Questions for Further Study and Inquiry are expanded
- 21** **Exercise 20:** Procedure 20.4 is expanded to help students design and implement experimental controls.

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- 22** **Exercise 22:** Formula for population growth is revised; data for Figure 22.4 is updated to reflect 2018 predictions; question 6 is expanded to include 2018 population values and growth rates
- 23** **Exercise 23:** Question 1 is revised to emphasize hypothesis testing; table 23.3 is reorganized to accept handwritten student data
- 24** **Exercise 24:** Organization of domains and kingdoms is updated to current taxonomy; table 24.1 of prokaryotic versus eukaryotic characteristics is modified for precision; figure 24.2 structure of a bacterial cell is revised and contains a new photo; explanation of binary fission is expanded to include protein FtsZ and its role in cell separation
- 25** **Exercise 25:** Explanations of Archaeplastida and the term protist are clarified; in Table 25.2 the list of chlorophylls diagnostic to each type of algae is updated; figure 25.4 is relabeled to clarify sexual versus asexual reproductive paths; figure 25.8 contains a new photo of *Volvox* colonies
- 26** **Exercise 26:** Photomicrograph and illustration of African sleeping sickness blood cells and parasites is revised to clarify their relationship
- 27** **Exercise 27:** Explanations of fungal sporangiophores and sporangia are expanded; figure 27.13 is modified to better show the diagnostic reproductive structure, ascus; Questions for Further Study and Inquiry has a new question to address the benefit of fungi to other organisms
- 28** **Exercise 31:** A learning objective is added on understanding flower structure and function; the explanation of sporogenesis is expanded; a Question for Further Study and Inquiry has been added on flower parts and their functions
- 29** **Exercise 32:** A new question is added to Questions for Further Study and Inquiry on commonly seen leaf morphologies
- 30** **Exercise 35:** The definition of bioassay is revised
- 31** **Exercise 36:** Introductions to terms animals, multicellular, ancient, and primitive have been clarified; description of intracellular versus extracellular digestion in proiferans has been clarified
- 32** **Exercise 37:** Taxonomic hierarchy of the classes and subphyla of flatworms is updated; the groups Neodermata and Turbellaria have been redefined and updated; taxonomy of tapeworms is updated
- 33** **Exercise 39:** Taxonomy of major arthropod classes has been updated and reorganized to include Chelicerata, Crustacea, Myriapoda, and Hexapoda; table 39.3 has been relabeled to reflect updated arthropod taxonomy
- 34** **Exercise 40:** The taxonomy of pre-vertebrate groups has been updated; class Actinopterygii has replaced Osteichthyes; figure 40.21 of amphibian transitional stages is revised

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- 35** **Exercise 41:** Figure 41.2 has revised labeling; figure 41.3 is relabeled to distinguish flat cuboidal and columnar cells more clearly; figure 41.4 is relabeled to show Bowman's capsule more clearly; figure 41.5 is relabeled to more clearly distinguish columnar cells; figure 41.7 has been replaced to better show stratified squamous epithelium; types of connective tissue have been separated into connective tissue proper and special connective tissue
- 36** **Exercise 42:** Descriptions of the appendicular skeleton and the axial skeleton are added; the number of skull, spine, and rib cage bones has been upgraded updated to conventional values; figure 42.2 is new; Figure 42.4 has been replaced with improved images of normal and osteoporotic bone; Questions for Further Study and Inquiry are modified
- 37** **Exercise 43:** A new learning objective is added to distinguish between isotonic and isometric contractions; explanations of muscle load, muscle tone, and muscle tension are expanded; figure 43.2 is relabeled to clearly distinguish between flexion and extension; Procedure 43.1 concerning flexion and extension of the forearm has been modified for clarity
- 38** **Exercise 44:** Descriptions of negative pressure and its roll in breathing has been expanded; procedures to distinguish the role of intercostal muscles and breathing are expanded and clarified; Procedure 44.1 has been modified for more consistent chest expansion measurements; typical values for tidal, expiratory, inspiratory, and residual volumes have been provided; directions for measuring breathing rate in Procedure 44.7 are clarified
- 39** **Exercise 46:** Figure 46.1 has been modified to illustrate fovea centralis; Procedure 46.3 has been modified to accommodate lab partners
- 40** **Exercise 47:** Question 2 has been expanded providing more examples and practice with terms such as cranial, caudal, lateral, distal, etc.; directions for the skinning and abdominal incision during rat dissection are expanded
- 41** **Exercise 48:** Descriptions of the thyroid gland and diaphragm are expanded; explanatory questions about the lung structure and heart musculature are expanded
- 42** **Exercise 49:** Figure 49.4 has been revised and enlarged to better show the structure and cross section of a kidney
- 43** **Exercise 50:** Distinction has been enhanced between the animal and vegetal poles
- 44** **Exercise 51:** Directions are enhanced for Procedure 51.1 to examine kinesis in pill bugs; directions are enhanced for Procedure 51.2 to study agonistic behavior in fighting fish, to encourage better creativity by the students in experimental design; a new question has been added to Questions for Further Study and Inquiry