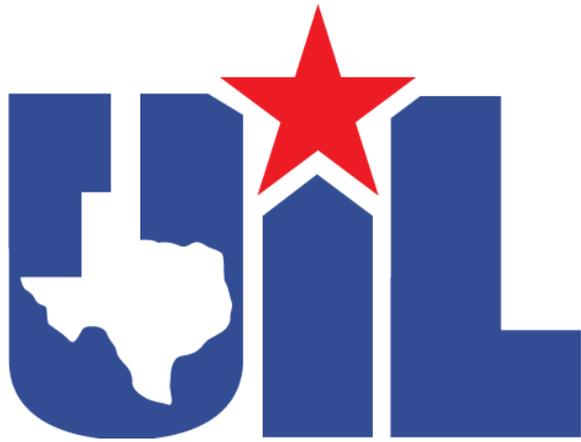


**Introduction to the UIL
Science Contest
2018-2019**



Science Directors

- Dr. Michelle McGehee
Biology
- Dr. Brian Anderson
Chemistry
- Dr. David Bixler
Physics



Purpose of UIL Exams

- to challenge students in the basic fundamental principles of science
- to promote learning in biology, chemistry, and physics
- to foster a sense of enthusiasm about advanced topics and courses in the sciences
- to help prepare students for the rigor of college level courses

The Science Contest

- Biology, Chemistry & Physics are all combined on one exam, and is both an individual and a team competition.
- The contest helps to promote a broad base of knowledge and better understanding.
- The contest models degree requirements at most Universities.
- Many current areas of research are in interdisciplinary fields.

Contest Structure

- 60 Multiple Choice Questions, which are divided into 20 of each topic Biology, Chemistry & Physics.
- Contestants are given 6 pts. for a correct answer, 0 pts. for unanswered questions, and lose 2 pts. for incorrect answers.
- The best possible answer is the correct answer.

A Few Details...

- At the state competition only, there is no limit on the number of answer choices given on a question, e.g. A through J, not just up to five answer options A through E.
- There is no restriction that numeric wrong answers must differ by $\pm 5\%$.

This will allow for more realistic pH problems in chemistry and will better model actual college-level exams.

Academic Meets 2019

- Invitational Meets (practice - not governed by UIL)
 - A: Jan 1 – Feb 9
 - B: Feb 15 – Mar 16
- District Meet : Mar 25 – 30
- Regional Meet: Apr 12 – 13
- State Meet: May 2 – 4

Advancement/Qualification

- Are done by division (1A-6A) and each HS may enter 6 contestants at their district meet, where a minimum of 3 contestants constitutes a team.
- 1st, 2nd & 3rd place overall scorers
- Top score in each subject area
- Top 4 member team by combined score
- Plus one alternate in each category

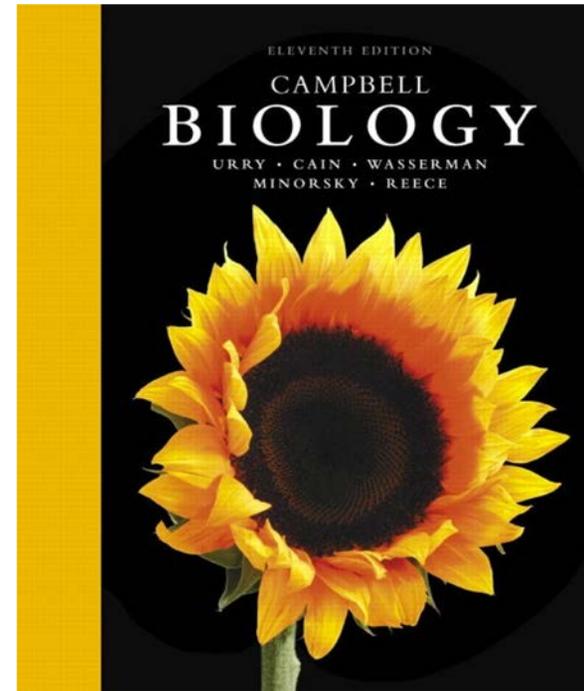
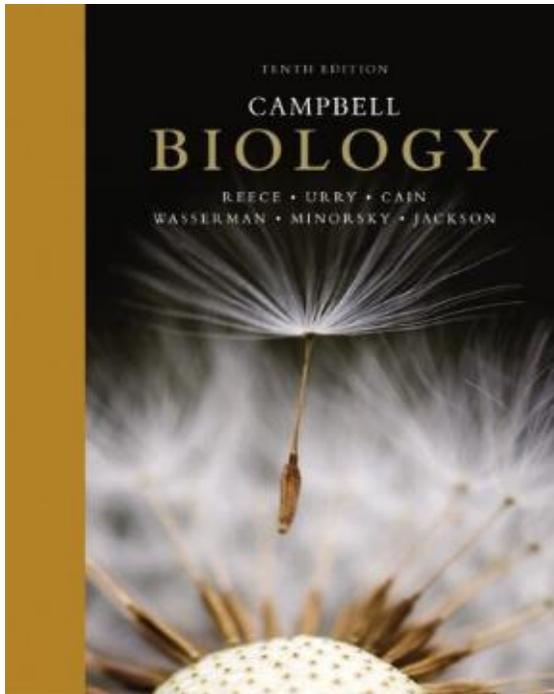
Things to keep in mind ...

- The contest is hard!
- However, the top scores at the State Contest will be nearly perfect in each subject.
- There needs to be a clear cut winner and this will require a selection of hard questions on the contest.
- All schools divisions 1A – 6A compete with the same contest, but the scores are only compared with schools in the same division.
- But there are benefits for all of that effort spent in preparing for the contest...

Some Contest Rules

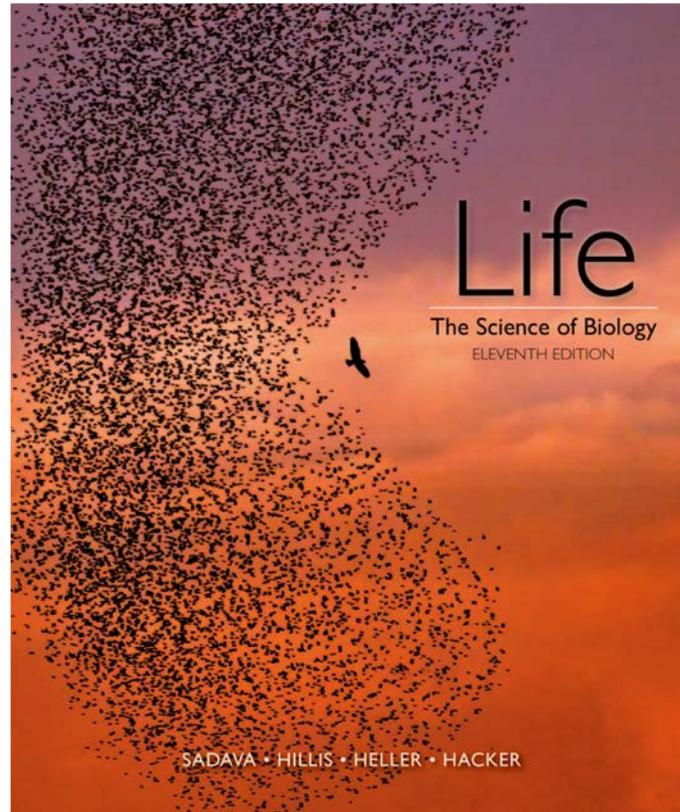
- Contestants have up to 2 hours, but must remain for at least 30 minutes.
- You may use additional scratch paper provided by the contest director.
- Simple Scientific Calculators
 - Casio FX-260Solar
 - Sharp EL-501X
 - TI-30Xa

Biology Texts



Pearson's *Biology*, 10th or 11th edition,
Campbell, et. al.

Biology Texts

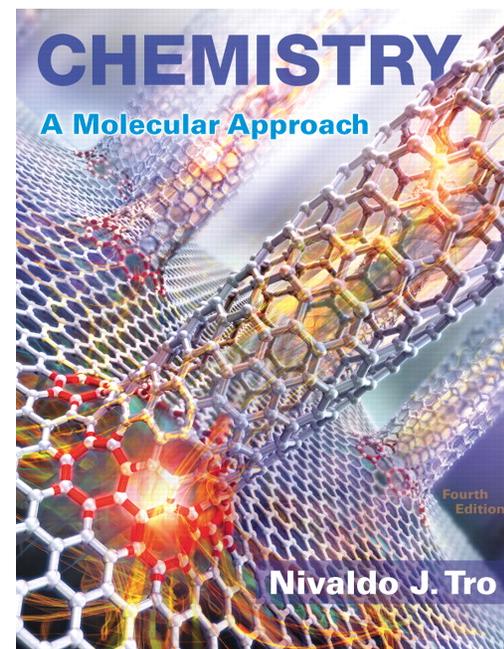
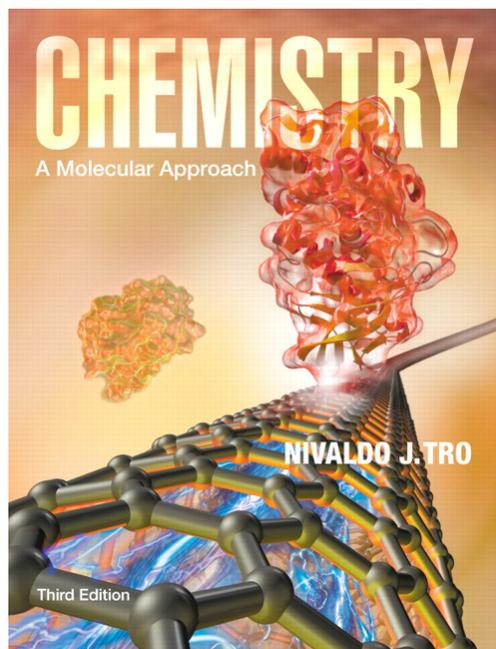
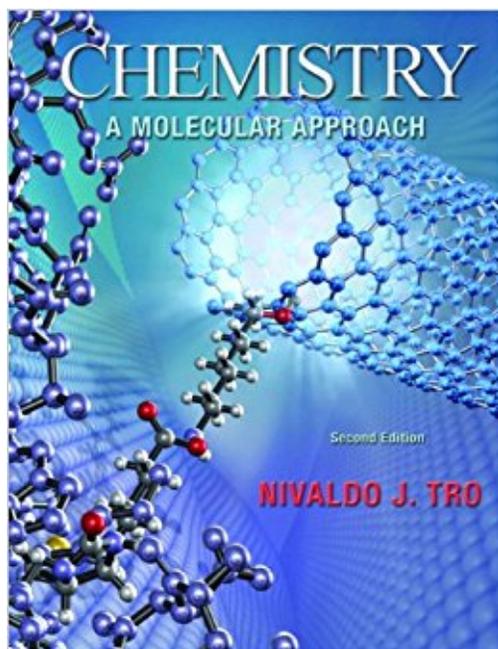


MacMillan's *Life*, 11th edition, Sadava, et. al.

Online Biology Resources

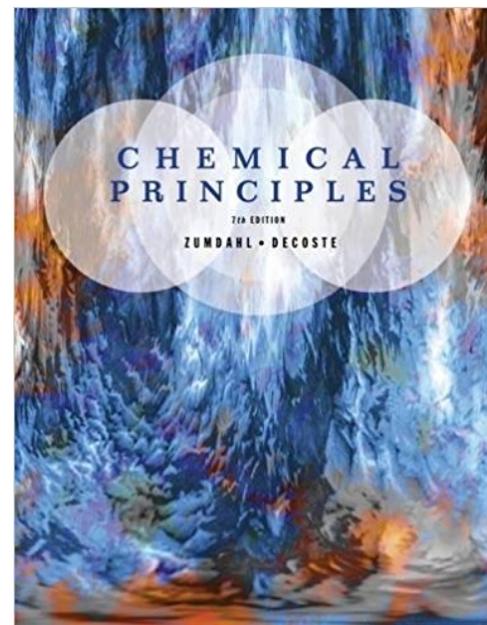
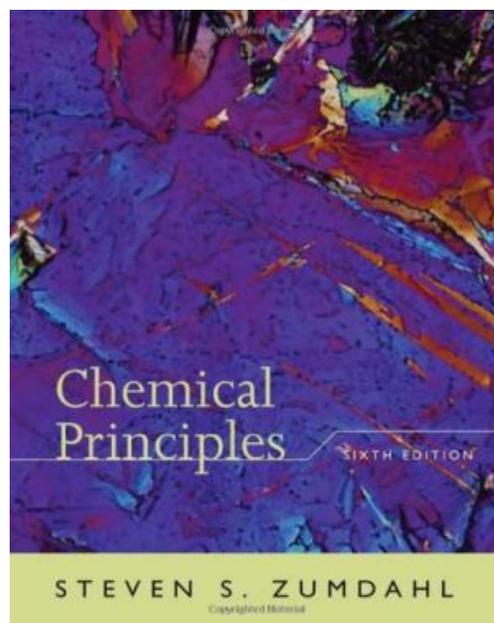
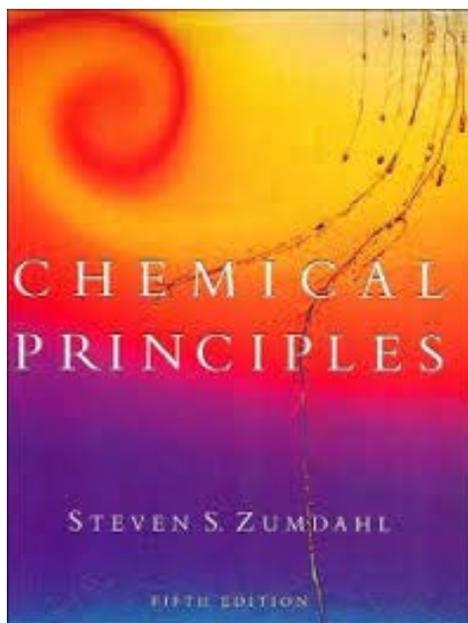
- University of Texas Bio 311C site
<http://bio311.biosci.utexas.edu/>
- Learn Genetics University of Utah
<http://learn.genetics.utah.edu/>
- Paul Anderson, Bozeman Science
<http://www.bozemanscience.com/about/>
- Centers for Disease Control and Prevention
<https://www.cdc.gov/>
- World Health Organization
<http://www.who.int/>

Chemistry Texts



Chemistry: A Molecular Approach
by Tro

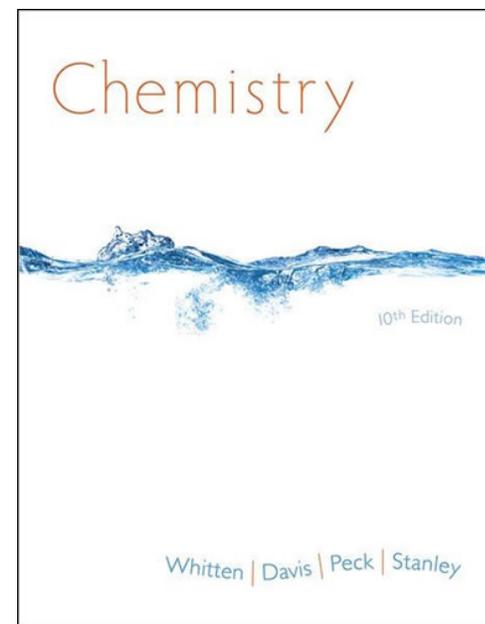
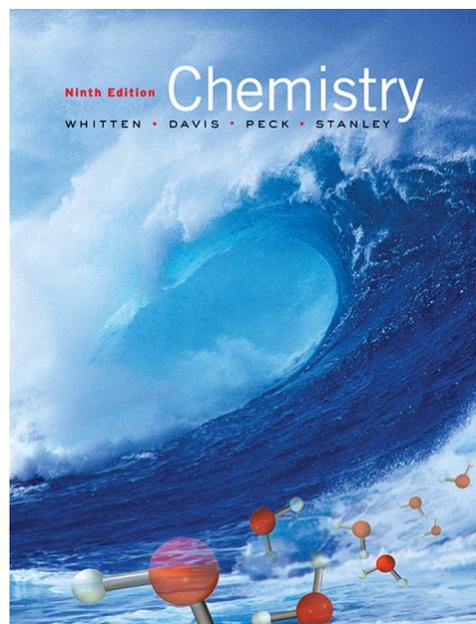
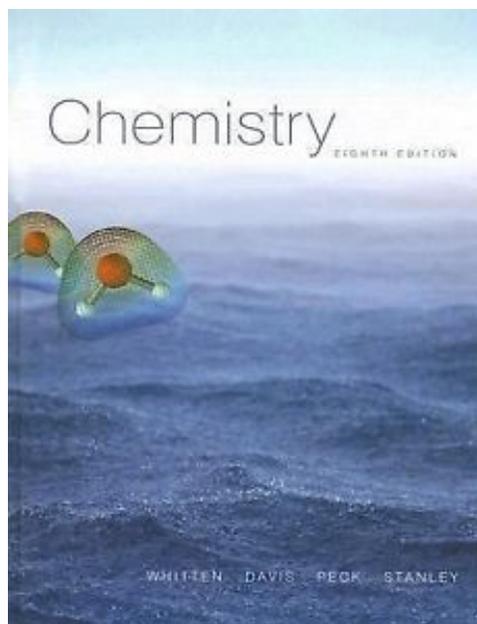
Chemistry Texts



Chemical Principles

by Zumdahl (& Decoste) 5th, 6th, and 7th editions

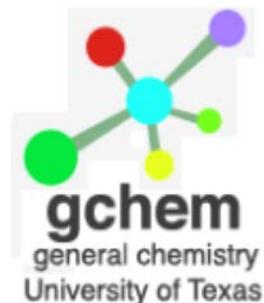
Chemistry Texts



Chemistry

by Whitten, Davis, Peck & Stanley

Online Chemistry Resources:



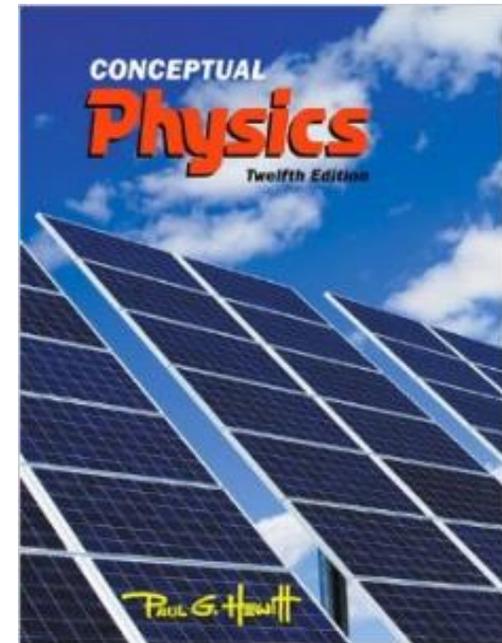
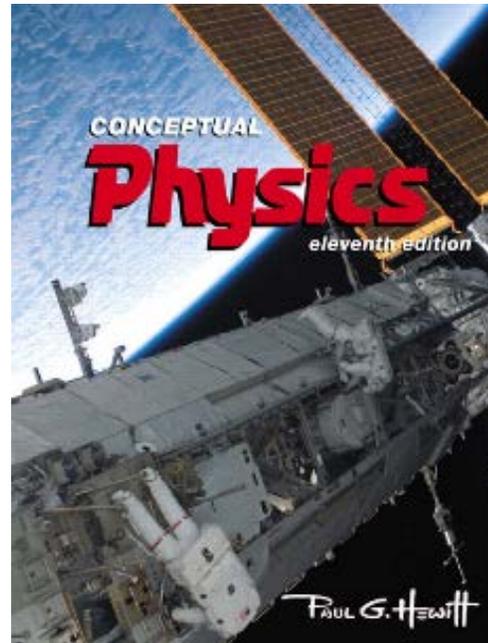
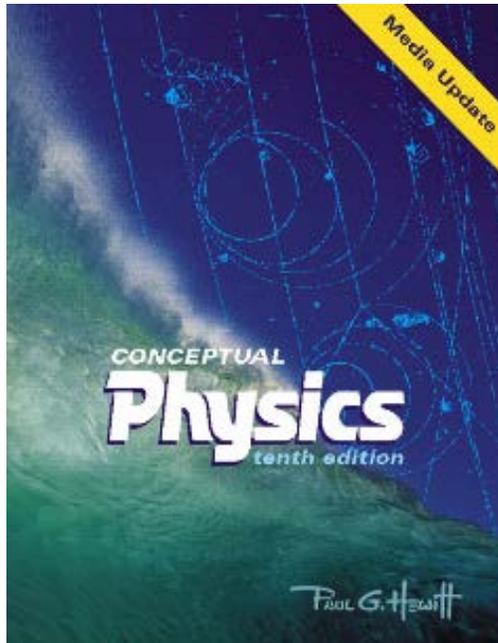
University of Texas “gchem” site:
<https://gchem.cm.utexas.edu/>



OpenStax College (Rice)
<https://openstaxcollege.org/textbooks/chemistry>

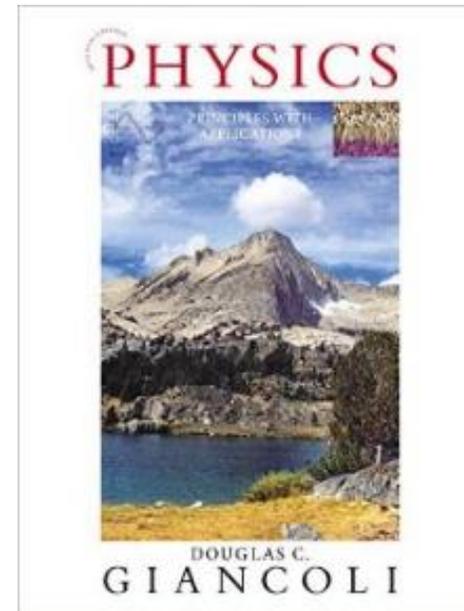
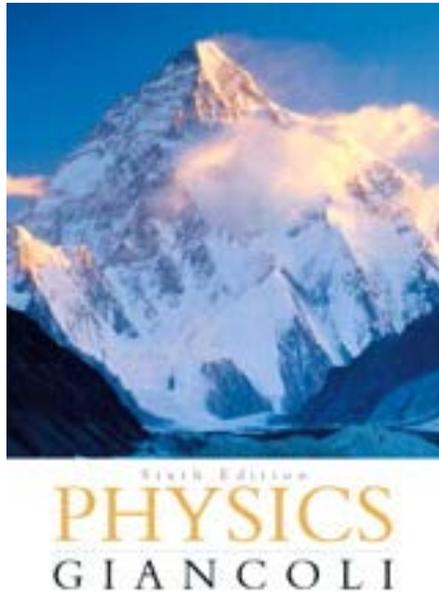
The department of chemistry at UT has developed an online general chemistry eBook. They also use the OpenStax eBook.
For now, both are open and free.

Physics Texts



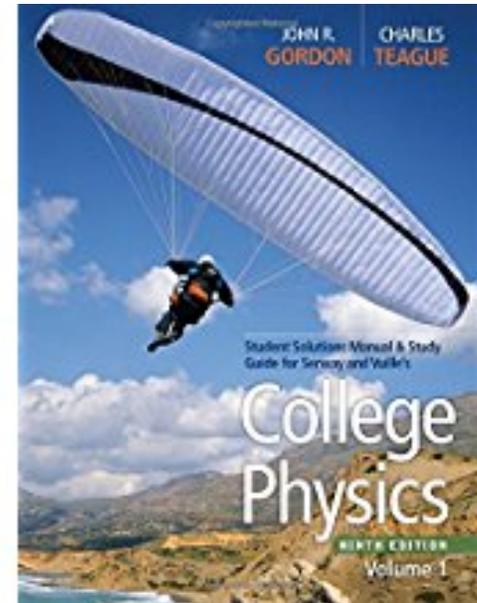
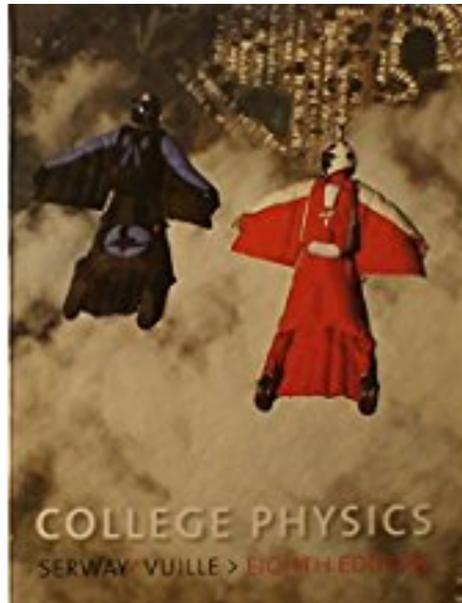
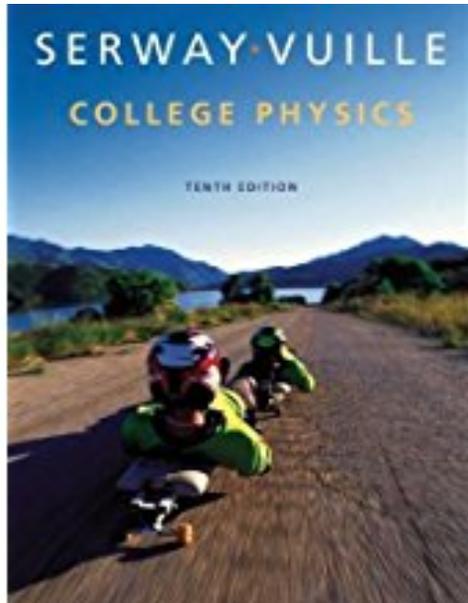
Conceptual Physics
by Hewitt

Physics Texts



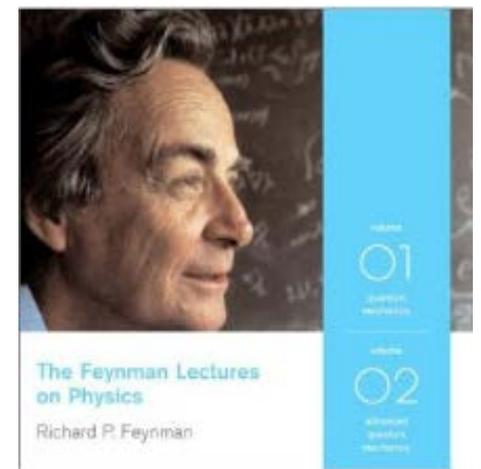
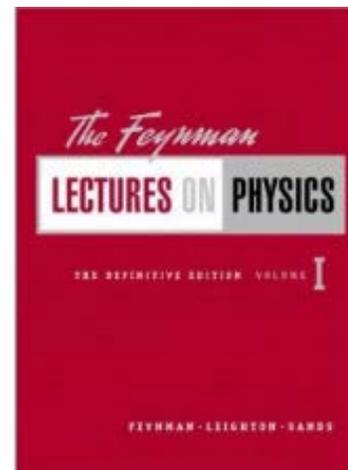
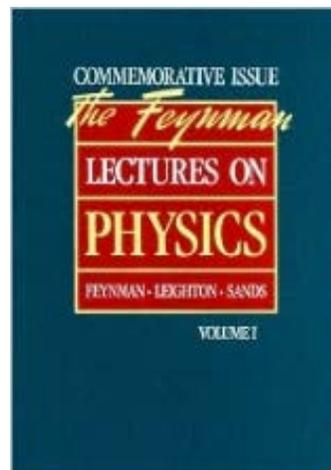
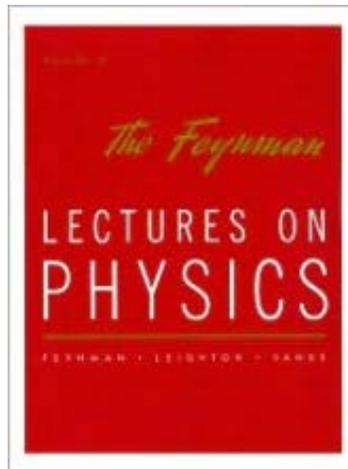
Physics
by Giancoli

Physics Texts



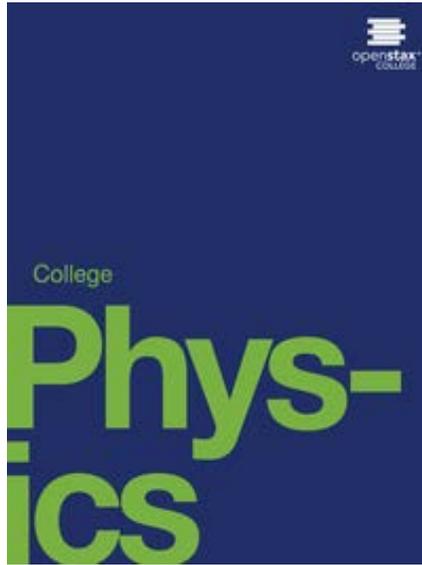
College Physics
by Serway & Vuille

Physics Texts



The Feynman Lectures on Physics
by Feynman, Leighton & Sands

Online Physics Resources



OpenStax Physics Text

<https://openstaxcollege.org/textbooks/college-physics>

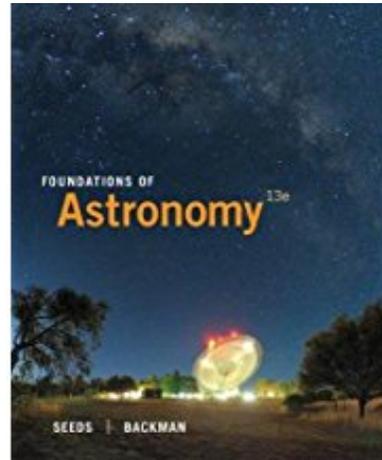
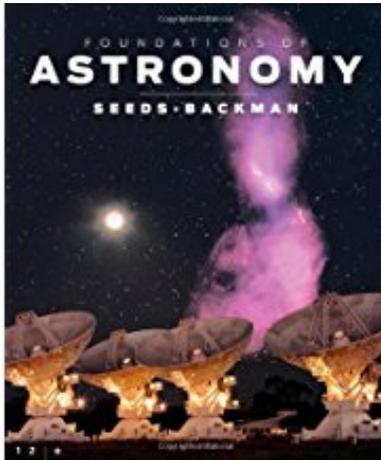
ComPadre Physlet Physics:

<http://www.compadre.org/physlets/>

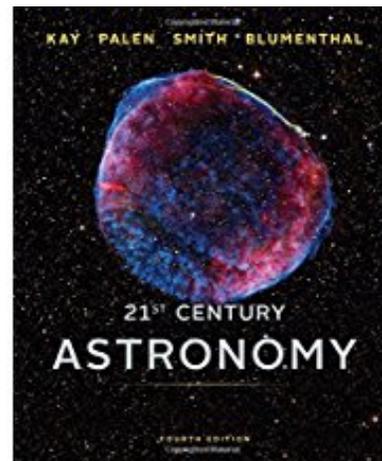
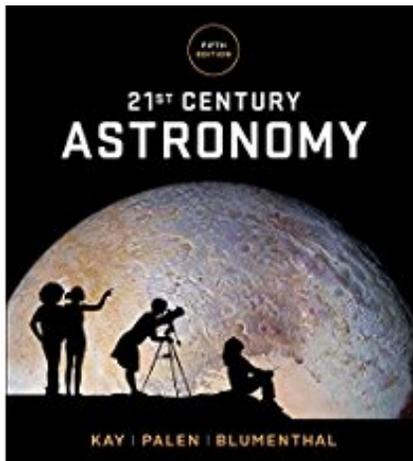
ComPadre Interactive Video Vignettes:

<http://www.compadre.org/ivv/>

Astronomy Texts



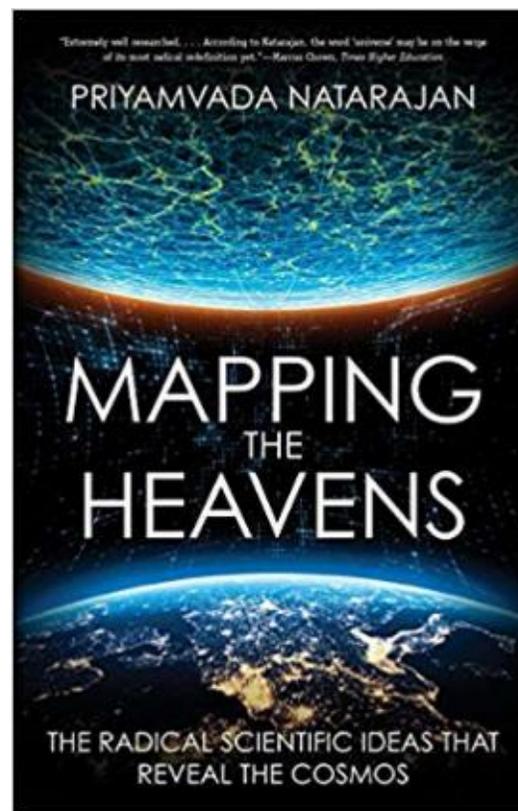
Foundations of Astronomy by Seeds and Backman



21st Century Astronomy by Kay and Palen

Physics Directed Study Text

Mapping the Heavens
by
Priyamvada Natarajan



Not in C&CR, but is posted on UIL site.

FAQs on Texts

- Do I need to get these exact texts?
- Does it need to be the same edition?
- Does the text matter?
- What about other texts?
- Options:
 - Half-price books / Online book sellers
 - Interlibrary loan

UIL Online Resources

- <http://www.uiltexas.org/academics>
 - UIL Academics home page
- go to STEM > SCIENCE
 - Information from the Contest Directors will be posted here.
 - The new Physics directed study information is posted here.

Some Contest Strategies

- Watch units!
- Make diagrams with labels
- Look for order of magnitude answers
- Problem identification...
 - Quick/Easy, Moderate or Hard
- Use these identifiers to work on speed
- Recognize when to come back later

Coaches/Team Suggestions

- Goal setting for student morale is very, very important!
- Have students solve old contests UIL or TMSCA exams & help out other students.
- Practice contests as posted on UIL invitational meet site or attend TMSCA contests.
- If possible coordinate with other teachers to arrange for help when needed.
- Positive reinforcement & food are good motivators.

Specific Topics

Biology

Chemistry

Physics

Main Topics in Biology

1. Structure and Function
2. Cellular and Acellular Replication
3. Energy Transformations
4. Gene Expression
5. Genetics and Inheritance
6. Evolution
7. Origin and Diversity of Life
8. Ecology and the Environment
9. Basic Human Anatomy and Physiology
10. Diseases

Three Levels of Questions

- 1. Knowledge and Comprehension:** Advanced recall and identification of subject matter.
- 2. Application and Analysis:** Demonstration of quantitative reasoning using and generating graphs and data.
- 3. Synthesis and Evaluation:** Using information and prior content knowledge to formulate conclusions and generate hypotheses.

Biology Contest Structure

- Participants should expect questions from all topics on all exams.
- Approximately 75% of questions from levels 1 and 2; 25% from level 3.
- The relative level of difficulty will increase with each contest.

Topics in Chemistry

1. Fundamentals
2. Stoichiometry
3. Atomic Theory
4. Chemical Bonding and Structure
5. Gases
6. Liquids and Solids
7. Thermodynamics
8. Physical Equilibria
9. Chemical Equilibria
10. Acids and Bases
11. Solubility Equilibria
12. Electrochemistry
13. Chemical Kinetics

Questions in Chemistry

- New for this year, all 13 topics are on all tests. Previously the Invitational exams did not include electrochemistry and kinetics (topics 12 & 13).
- Many questions fit into more than one topic area.
- I try to write "the same test, only harder," using scalable problems.
- As a student progresses through the contest, problems get more difficult and more demanding mathematically, and take longer to solve.
- Some problems present a situation and ask a question, and the pathway for solving the problem is not immediately apparent. These require some critical thinking.
- Some problems may include information that is not necessary for solving the problem.

The 20 questions in Physics:

- There will be 3 directed study questions from “Mapping the Heavens” by Natarajan.
- Variety of question types: conceptual, symbolic, and numeric questions. Most will be numerical.
- There is a range of difficulty on each contest and over the contest season.
- Problems that require vector operations expressed in unit vector notation & calculus will be included on the state contest to help better differentiate the scores for the top students.

“Mapping the Heavens”
Directed Study Questions

- Invitational A – chapters 1-3
- Invitational B – chapters 1-3
- District – chapters 1-4
- Regional – chapters 5-7
- State – chapters 1-7

- **Physics Questions P1 – P3** will always be from the reading material. This year that is from “Mapping the Heavens” by Priyamvada Natarajan.
- **Physics Question P4** will always be from the field of Astronomy.
- **Physics Question P5** will always be about Measurement/Dimensional Analysis/Significant Figures/Order of Magnitude.
- **Physics Question P6** will always be about Uniformly Accelerated Motion.
- **Physics Question P7** will always be about Forces.
- **Physics Question P8** will always be about Work/Energy/Power/Momentum.
- **Physics Question P9** will always be about Circular and Rotational Motion/Equilibrium.

- **Physics Question P10** will always be about Waves/Sound/Harmonic Motion.
- **Physics Question P11** will always be about Fluid Statics and Dynamics/ Thermodynamics.
- **Physics Question P12** will always be about DC Circuits/Resistors/Capacitors.
- **Physics Question P13** will always be about Electric Fields and Forces/Electric Potential/Gauss' Law.
- **Physics Question P14** will always be about Magnetic Fields and Forces/Magnetic Materials/Ampere's Law.
- **Physics Question P15** will always be about Faraday's Law/Induction/EM Oscillation and Waves/AC Circuits.
- **Physics Question P16** will always be about Geometric Optics/Wave Optics.

- **Physics Question P17** will always be about Modern Physics/Quantum Physics.
- **Physics Question P18** will always be about Nuclear Physics/Particle Physics.
- **Physics Question P19** will always be a wildcard question from the topics traditionally covered in a Physics 1 course. That is from the topics covered in questions P5-P11.
- **Physics Question P20** will always be a wildcard question from the topics traditionally covered in a Physics 2 course. That is from the topics covered in questions P12-P18.

end of presentation