Before We Get Started

Remember to register your attendance and complete session evaluations.

Session numbers are in your program.

		
Attendance	**Online Handouts**	**Session Evaluations**


Introduction to the UIL
Science Contest
2022-2023

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, with awards given for each subject and for overall score.
- The exam is both an individual and a team competition.
- The contest covers a broad base of knowledge, and models STEM degree requirements at most Universities.

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 ±5%
  - This will allow for more realistic pH problems in chemistry and will better model actual college-level exams.

Academic Meets 2021

- Invitational Meets (practice - not governed by UIL)

  A: Jan 8 – Feb 6 **B**: Feb 12 – Mar 13

- District Meet : Mar 22 – 27
- Regional Meet: Apr 16 – 17
- State Meet: April 29 – May 1

Advancement/Qualification

- Competitions are separated by division (1A-6A)
- Each HS may enter 6 contestants at their district meet, where a minimum of 3 contestants constitutes a team.
- Advances to the next level:
  - 1st, 2nd & 3rd place overall scorers
  - Top scorer in each subject area
  - Top team by combined score*
  - One alternate in each category

*second place teams are eligible for possible advancement as a wildcard team

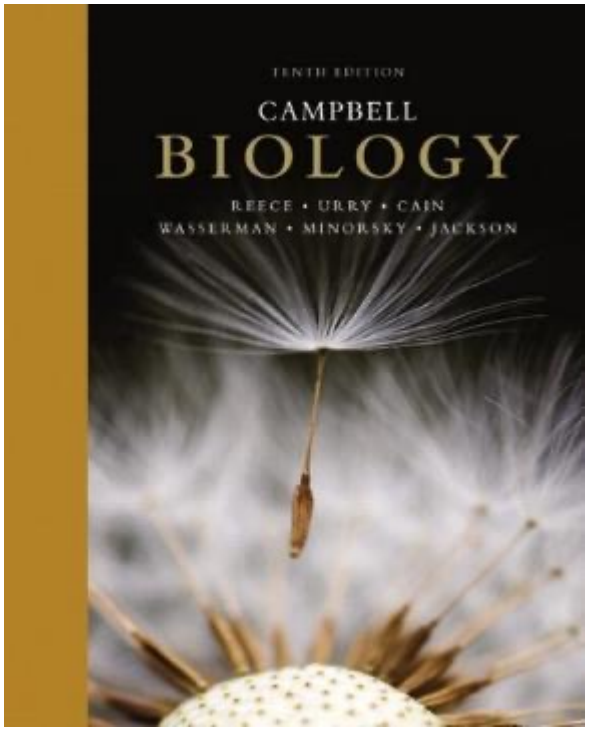
Things to keep in mind…

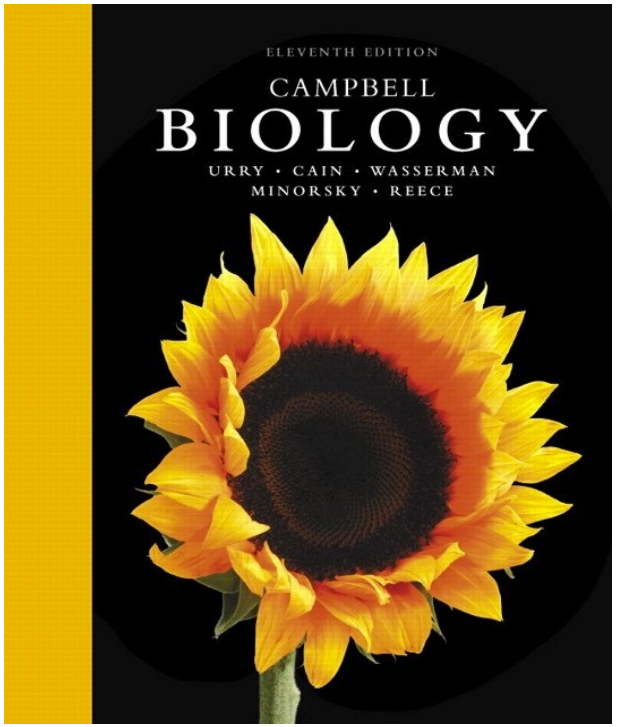
- The contest is hard!
- Top scores at the State Contest will be nearly perfect in each subject.
- There needs to be a clear cut winner and this will require a selection of hard questions on the contest.
- All schools divisions 1A – 6A compete with the same contest, but the scores are only compared with schools in the same division.
- Do not be discouraged: there are benefits for all of the 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
  - TI-30X II or TI-30X IIs

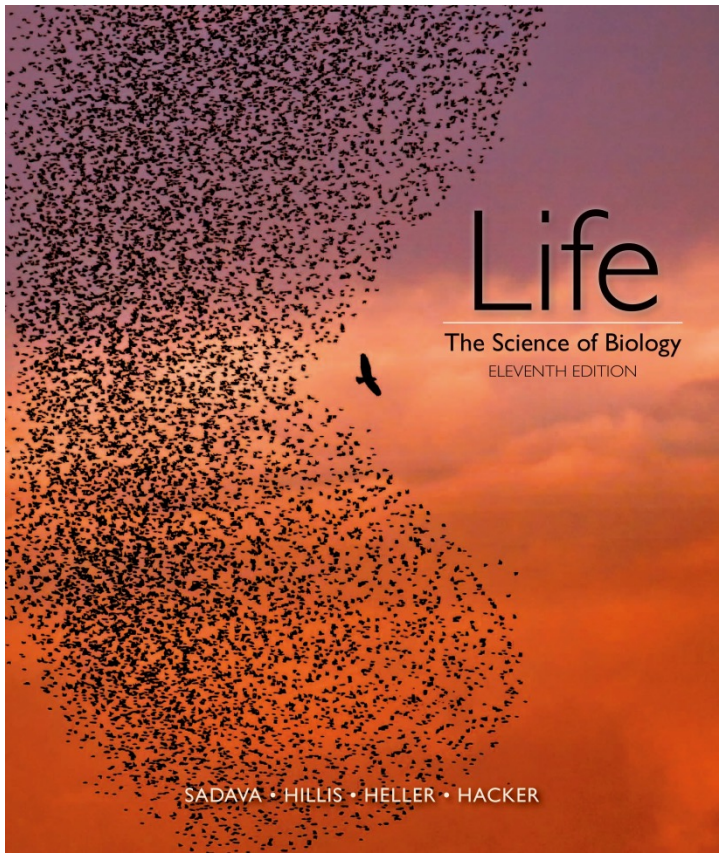
Biology Texts





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

Biology Texts

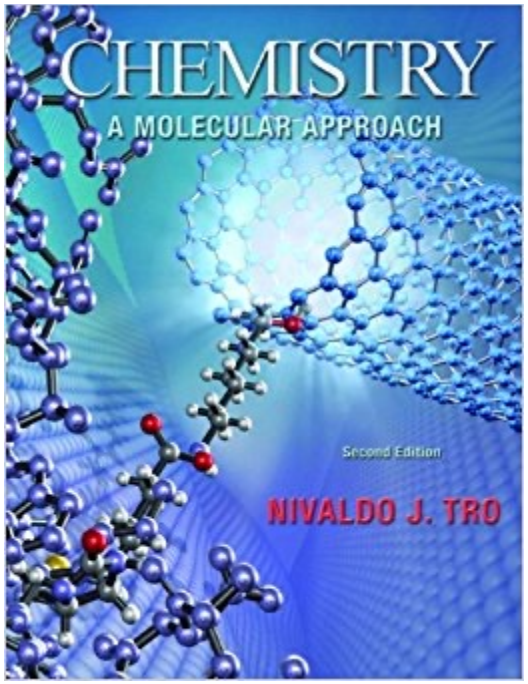


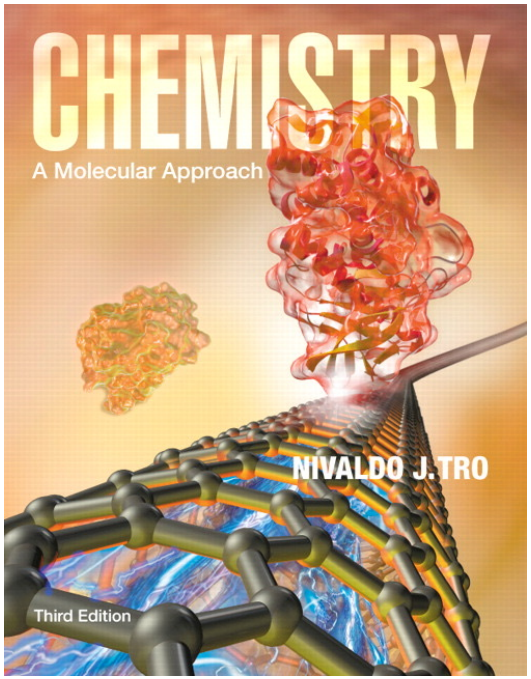
MacMillan's *Life*, 11th edition, Sadava, et. al.

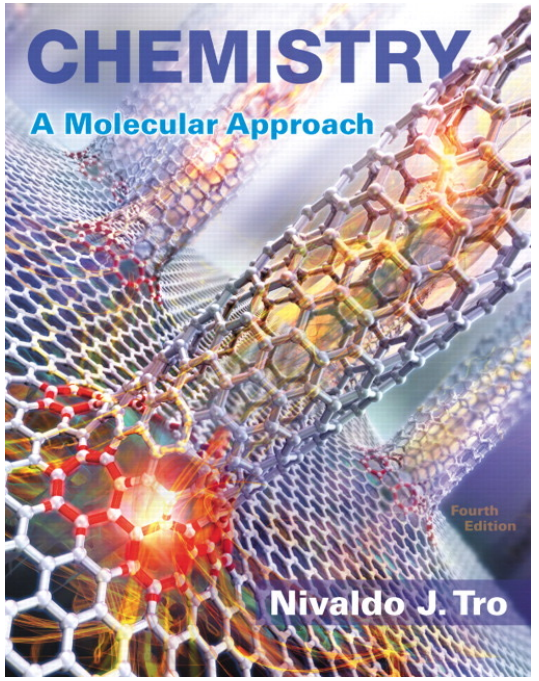
Online Biology Resources

- 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



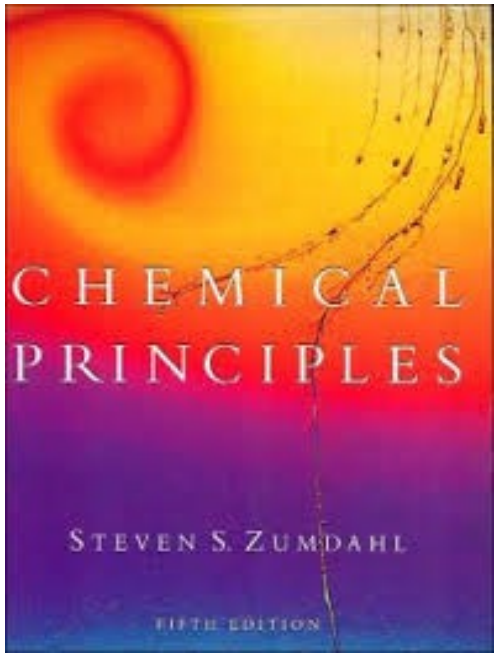


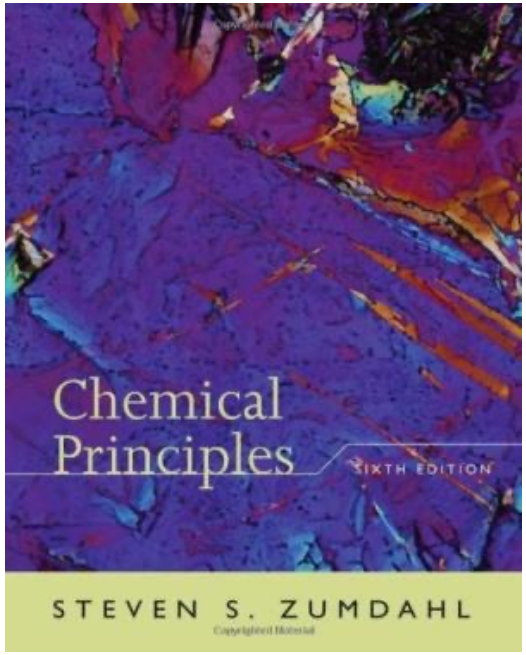


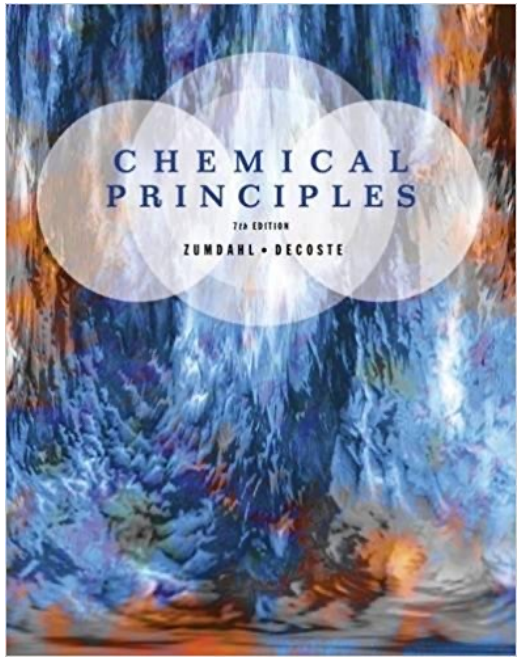
Chemistry: A Molecular Approach

by Nivaldo Tro

Chemistry Texts



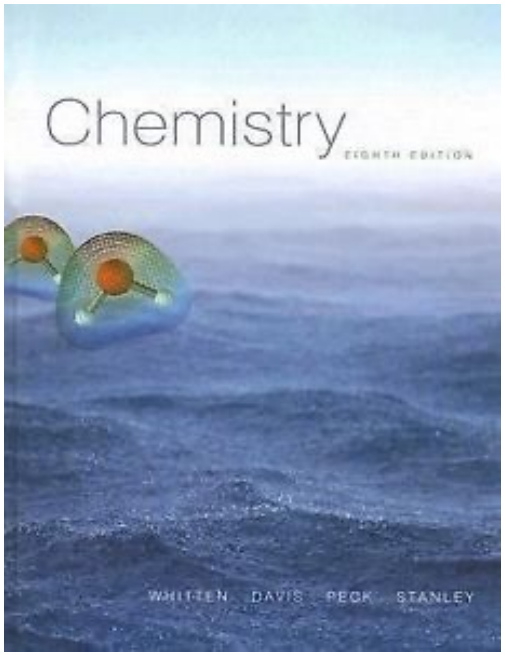


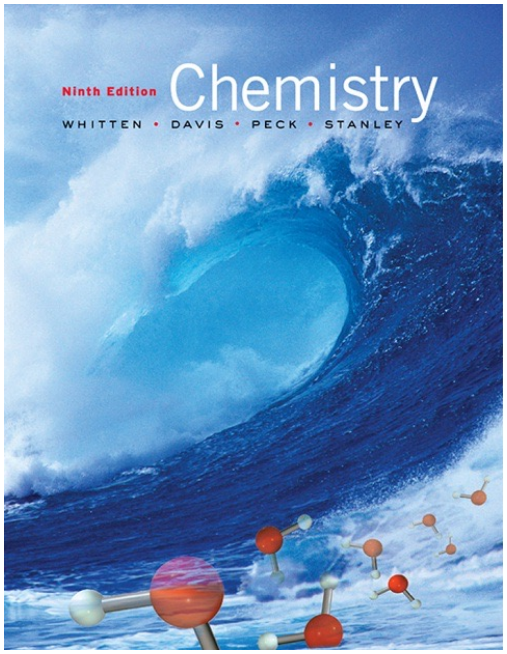


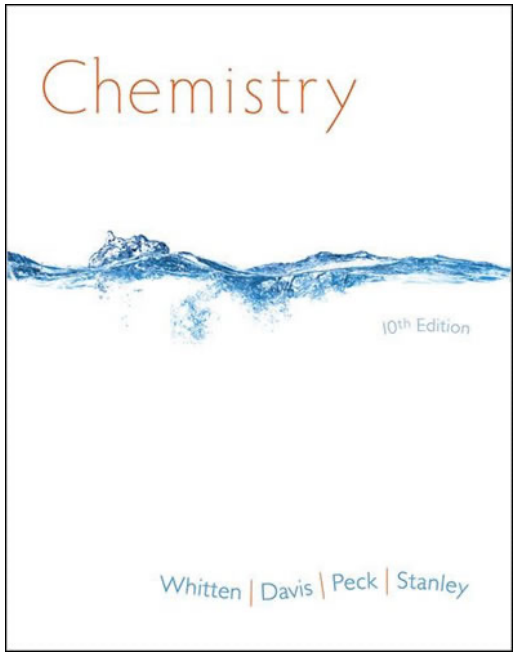
Chemical Principles

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

Chemistry Texts







Chemistry

by Whitten, Davis, Peck & Stanley

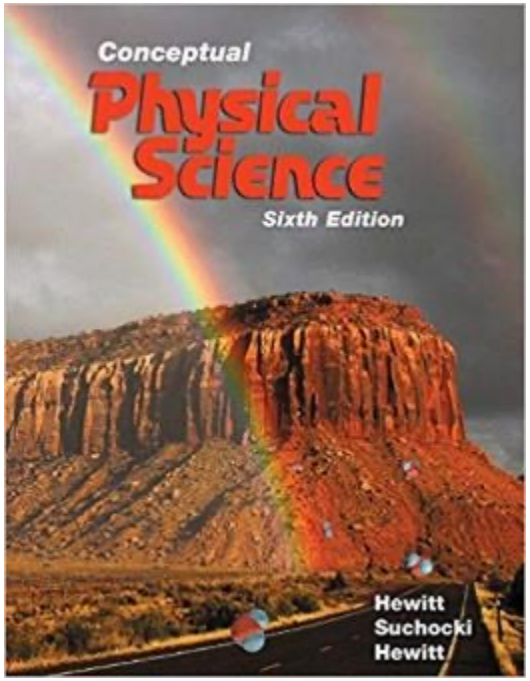
Online Chemistry Resources

University of Texas gchem site:
https://gchem.cm.utexas.edu/

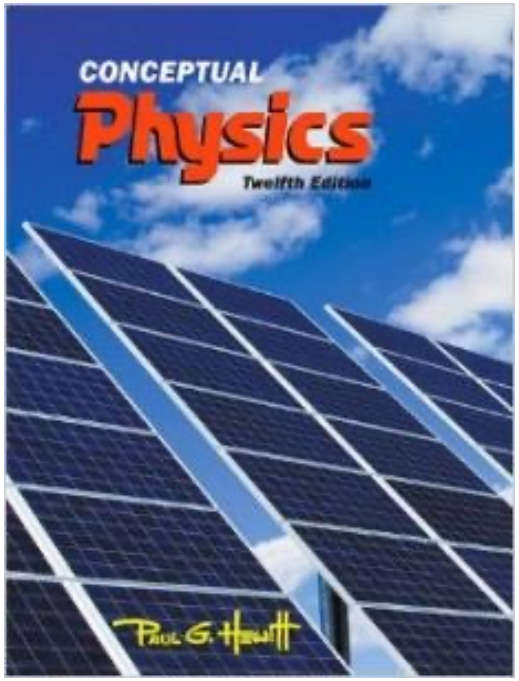
OpenStax Chemistry (Rice University)
https://openstaxcollege.org/textbooks/chemistry

Chemistry LibreTexts (UC Davis)
https://chem.libretexts.org/

Introductory Physics Texts



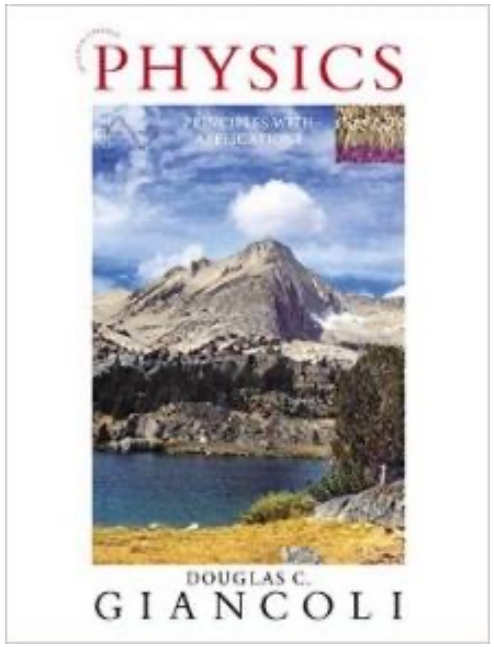
Conceptual Physical Science
by Hewitt



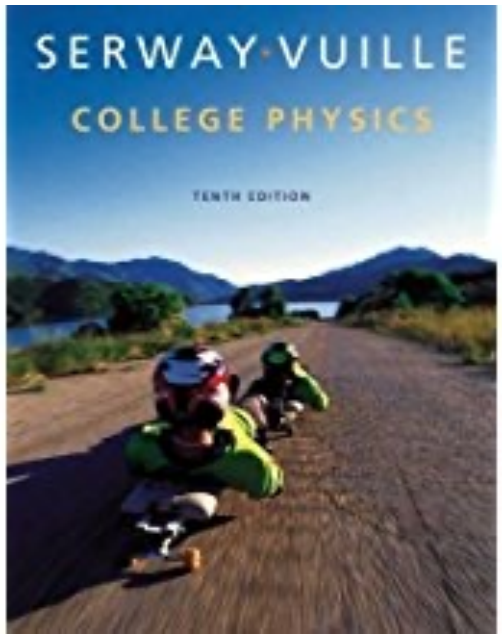
Conceptual Physics
by Hewitt

College Physics Texts

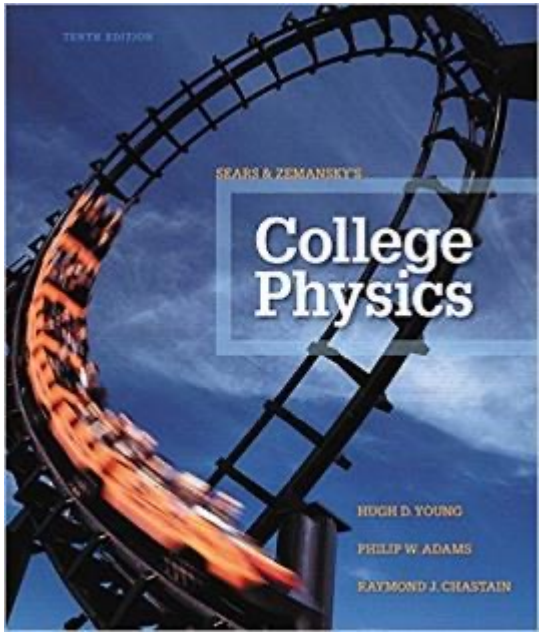
(algebra/trigonometry)



Physics
by Giancoli



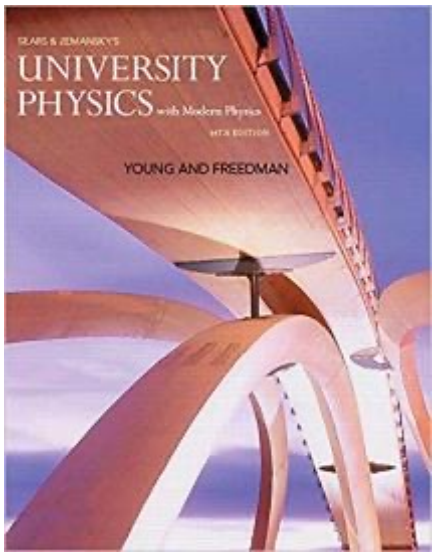
College Physics
by Serway & Vuille



College Physics
by Young

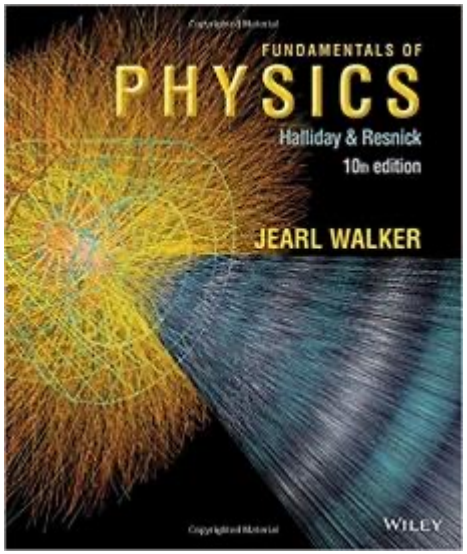
University Physics Texts

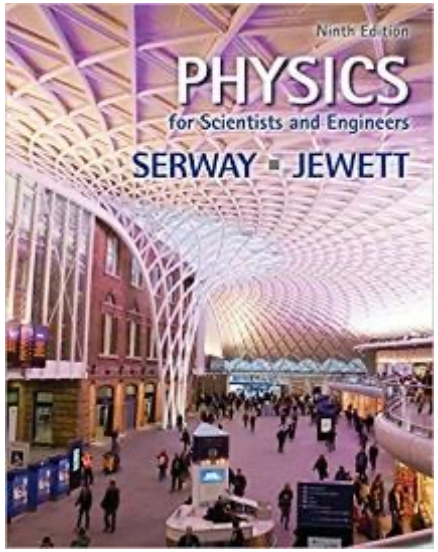
(Calculus)



University Physics
by Young and Freedman

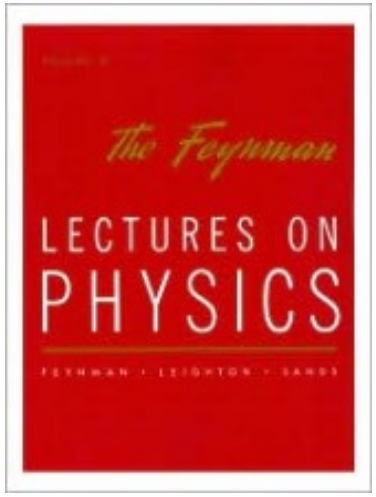
Fundamentals of Physics
by Halliday, Resnick, and Walker

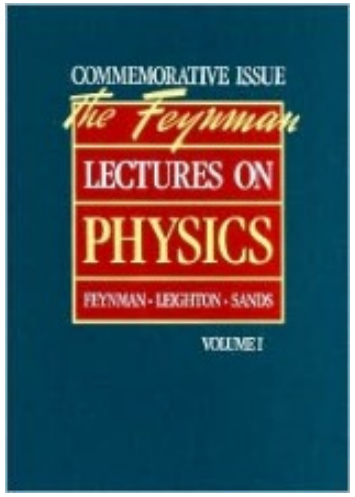


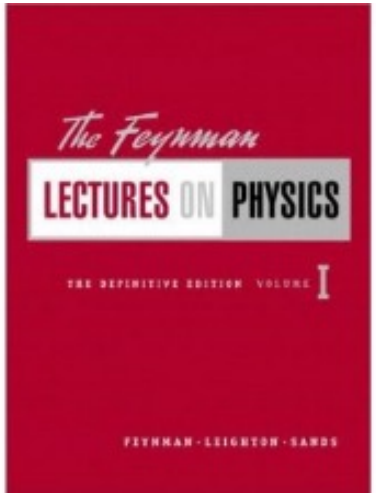


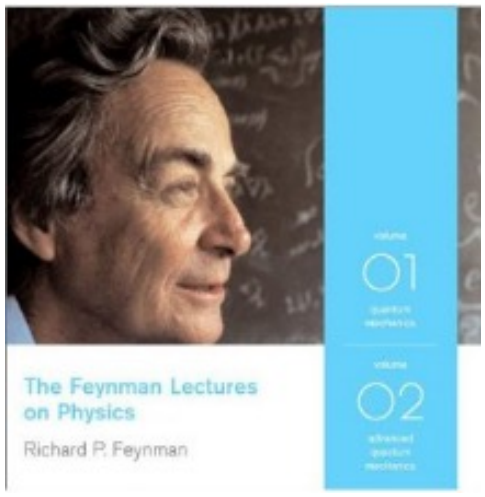
Physics for Scientists and Engineers
by Serway and Jewett

Advanced Physics Texts





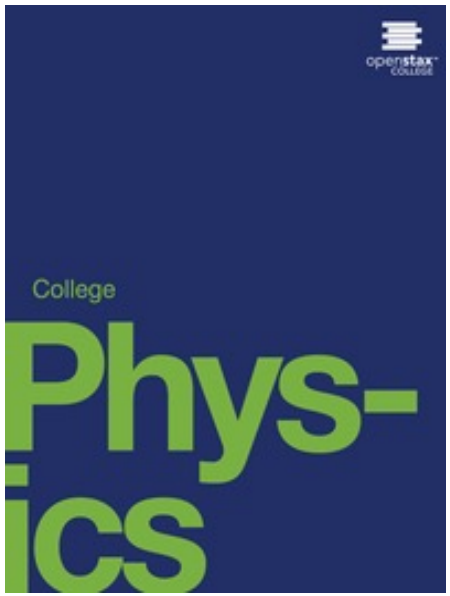




The Feynman Lectures on Physics

by Feynman, Leighton & Sands

Physics Online Resources



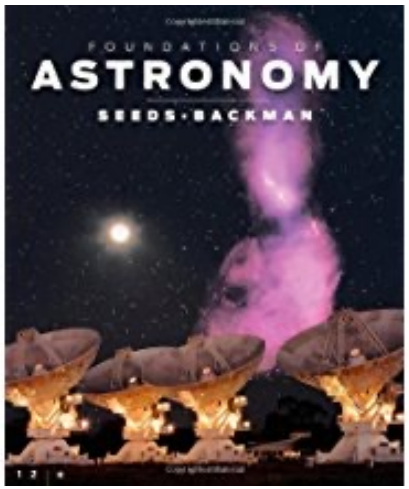
OpenStax Physics Text

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

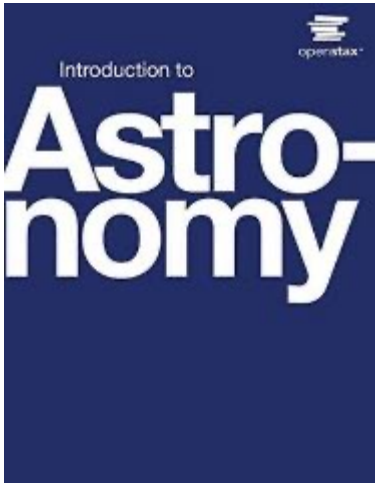
ComPadre Physlet Physics:
http://www.compadre.org/physlets/

ComPadre Interactive Video Vignettes:
http://www.compadre.org/ivv/

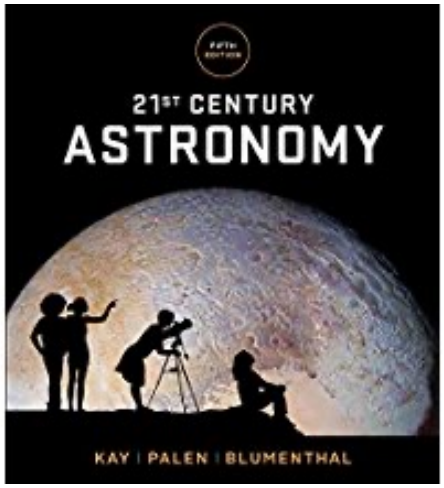
Astronomy Texts



Foundations of Astronomy by Seeds and Backman



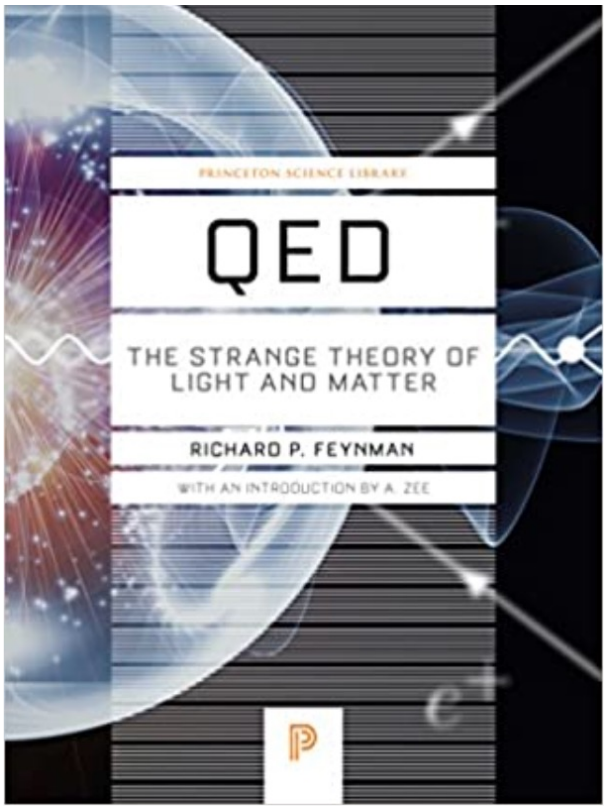
Openstax Astronomy



21st Century Astronomy by Kay and Palen

Physics Directed Study Text

QED: The Strange Theory of Light and Matter,
by Richard Feynman



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
  - Google “Free _____ textbook”

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
- Work backwards
- Problem identification…

  Quick/Easy, Moderate or Hard

- Use these identifiers to work on speed
- Recognize when to skip or 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

Each exam will have at least one question from each of the 13 topic areas.

Invitationals A & B
Generally these two exams have the easiest types of questions. Very straightforward information and calculations. Hint: if you see a definition question here, you're gonna need to know it later…

District
The questions go a little deeper into the subject matter. Some problems will be complex in nature but overall, this is a notch down in difficulty from the regional and state exams. Some problems present a situation where the pathway to the answer is not immediately apparent.

Regional and State
Problems will be more complex than on previous exams. More quantitative problems, with multi-step calculations required to get to the answer. Equilibrium problems will require more algebra to solve them. Some problems are designed to take more time. Sometimes the approach to solving the problem is not obvious, and some critical thinking is involved before the problem can be solved.

The 20 questions in Physics

- There will be 3 directed study questions from "QED" by Richard Feynman.
- 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.

"*Physics Reading Text*" **Directed Study Questions**

- Invitational A – Chapter 1
- Invitational B – Chapter 1
- District – Chapter 2
- Regional – Chapter 3
- State – Chapter 4

- **Physics Questions P1 – P3** will always be from the reading material. This year that is from "QED" by Richard Feynman.
- **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.


"That's all Folks!"