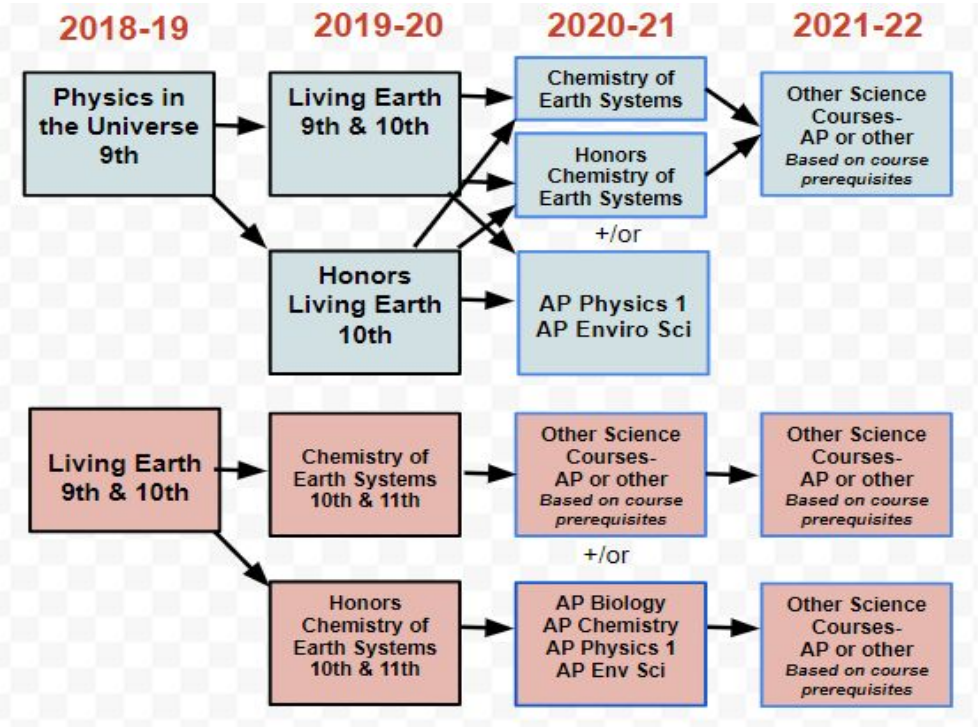
High School Science Freshman Course Decision Information

On March 28, 2018, the School Board finalized their decision to uphold the dual pathway for Science. This means that only Physics in the Universe and Living Earth are offered to incoming 9th grade students, without the Honors options for either of these courses. The course sequence options are below:



Students may choose to take either Physics in the Universe or Living Earth for their freshman science course. There are benefits and limitations for either sequence.

Which course is recommended by district science teachers, Science Curriculum Council and Instructional Services?

Physics in the Universe is the recommended course choice for all freshmen for a number of reasons:

- Physics is a natural progression of the concepts studied in 8th grade science. Many of the physical science concepts from 8th grade science are further developed in 9th grade Physics in the Universe.
- Physics is developmentally appropriate, accessible, and engaging for freshmen
- Conceptual physics classes offered in 9th grade provide foundational understanding for concepts taught in chemistry and biology.

- Conceptual Physics courses can provide relevant context to students' study of algebra. Consequently, early physics helps develop and reinforce mathematical proficiency.
- More information regarding Physics First for high school science course sequence:
    - **Physics First**
    - **Physics First: Information for Administrators**
    - **The Numbers Speak: Physics First Supports Math Performance**
- With a "Physics First" sequence, math is aligned for greater student success and less student stress. The prerequisite for chemistry strongly recommends concurrent enrollment in algebra 2-trig.

Science: Physics → Biology → Chemistry

Math: Alg 1 → Geometry → Algebra 2-Trig

Is 9th grade Physics in the Universe a repeat of 8th grade Honors Science? The answer is No. The NGSS require overlapping concepts between grade levels and this is evident in 8th grade science and 9th grade Physics in the Universe. However, the concepts in 9th grade Physics in the Universe build upon the concepts learned in 8th grade and ask students to apply their understanding. In other words, ***Physics in the Universe is designed to be a rigorous progression of content and advancement of science skills that promote a more successful academic transition between middle and high school***.

"To develop a thorough understanding of scientific explanations of the world, students need sustained opportunities to work with and develop the underlying ideas and to appreciate those ideas' interconnections over a period of years rather than weeks or months." (https://www.nextgenscience.org)

Comparison of Physics in the Universe and 8th Grade Science

How do I know which course is a better choice for my child? In addition to the information above, the bottom line comes down to which course is a best fit for *your child*:

- **Physics in the Universe is a better choice if your child:** has had success in 8th grade Science content (either honors or non-honors) and/or has a greater interest in physical science and/or responds better to lab activities and concepts requiring direct observation and measurement.
- **Living Earth is a better choice if your child:** has greater interest in life science and does well learning abstract concepts and phenomena through deductive reasoning (indirect observation).
- **Regarding math level concerns**, both courses will be instructed with the assumption that students are at least concurrently enrolled in Algebra 1.

How do the two options affect AP Course Enrollment?

Both course sequences offer access to AP Science courses in 11th and 12th grade.

Sequence	AP Courses available in grade 11	AP Courses available in grade 12
Physics→ Living Earth→ Chem	AP Environmental Science AP Physics 1	AP Bio AP Chem AP Environmental Science AP Physics 1 AP Physics C* depending on calculus enrollment
Living Earth→ Chem→ Physics	AP Bio AP Chem AP Environmental Science AP Physics 1	AP Bio AP Chem AP Environmental Science AP Physics 1 AP Physics C* depending on calculus enrollment

What topics will be covered in each course?

Physics in the Universe

- Forces and motion
- Types of interactions (i.e. gravity, Coulomb's Law)
- Energy conservation and transfer
- Waves and their properties
- Electromagnetic radiation
- History of Planet Earth
- Plate Tectonics and large scale system interactions
- Nuclear Processes
- Energy in chemical processes
- Link to Physics in the Universe Course

Living Earth

- Ecosystems
- Evolution
- History of Planet Earth
- Nuclear Processes
- Weather and Climate
- Structure and Function
- Inheritance and variation in traits (Genetics)
- Growth and development in organisms (Cell Biology)
- Cycles of matter and energy in ecosystems
- Biogeology
- Link to Living Earth Course

Do both courses have textbooks?
Neither course has an NGSS-aligned textbook. Both courses will assign students textbooks to use as a resource. Both courses will draw from additional resources to support student learning.

- Physics in the Universe: Physical Science Concepts in Action will be assigned to all students. Holt Physics and Hewitt's Conceptual Physics will also be used.
- Living Earth: Prentice Hall Biology

Additional Information:
From the California Science Framework regarding the order of courses:

> ***Physics of the Universe Early or Late in the Sequence?***
> Physics has traditionally been offered late in the sequence to a small population of students (it tends to be an elective course with most students electing not to take it). Many argue physics later in the course sequence allows concepts to be introduced through a more mathematically rigorous lens. Others argue physics earlier in the sequence is approachable to students as the concepts are concrete and relate to students' everyday life. Physics prior to chemistry means students bring an understanding of the mechanisms for much of the physical world to their studies. Physics after chemistry allows the opportunity to revisit ideas learned earlier. Physics early in the sequence, taken by all students, might attract more students to pursue the physical sciences – especially girls and underrepresented populations who traditionally avoid the physical sciences (Institute of Physics 2006).
>
> ***Living Earth Early or Late in the Sequence?***
> Biology has a better track record of interesting girls in science (AAUW 2010; Baram-Tsabari and Yarden 2011), some teachers are more comfortable with its earlier placement in the sequence, and kids are generally interested in themselves, so a course that helps them understand themselves could be a good starting point. However, modern biology requires understanding and applying chemistry and physics–much of biology today explores and explains things at the molecular or cellular level. How could topics in a high school biology course be taught differently if chemistry, for example, were taken prior to biology as opposed to afterwards?

Your 9th grade course choice might impact your future (10th-11th grade) plans. It is highly recommended that students who take Honors Chemistry of Earth Systems be concurrently enrolled in Algebra 2; students who are not at or above this math level are more likely to be recommended into CP Chemistry of Earth Systems.