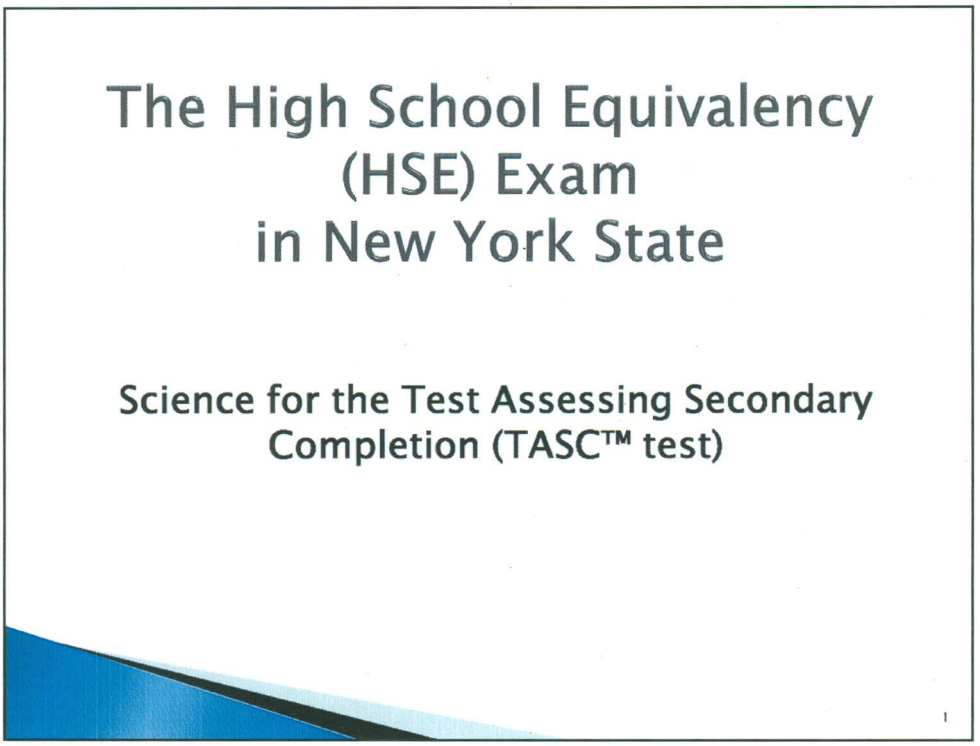
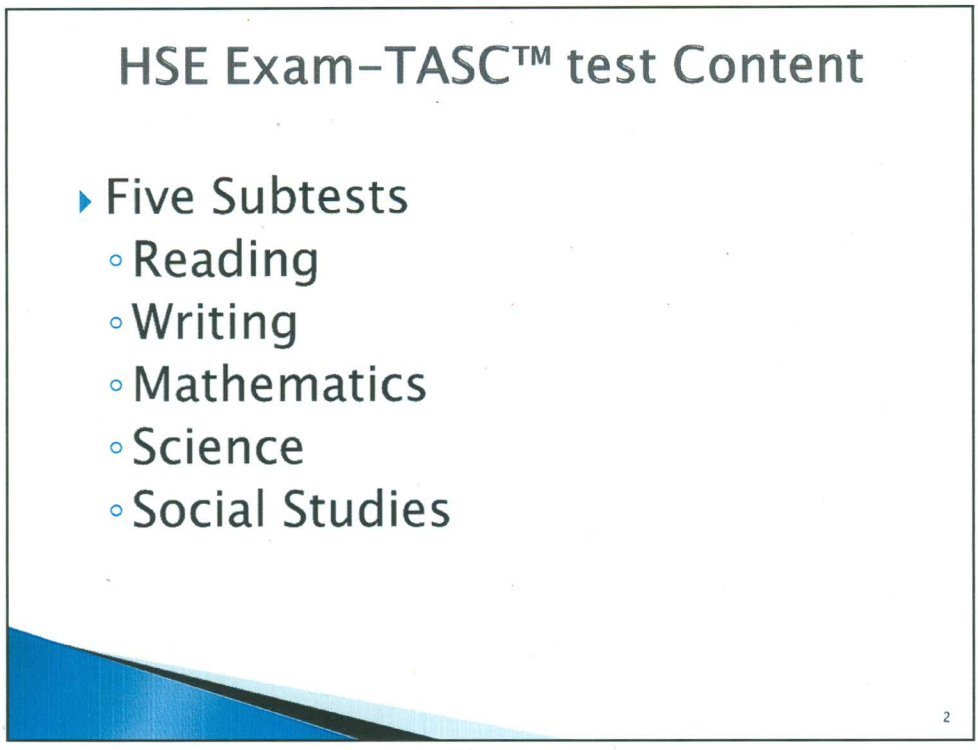
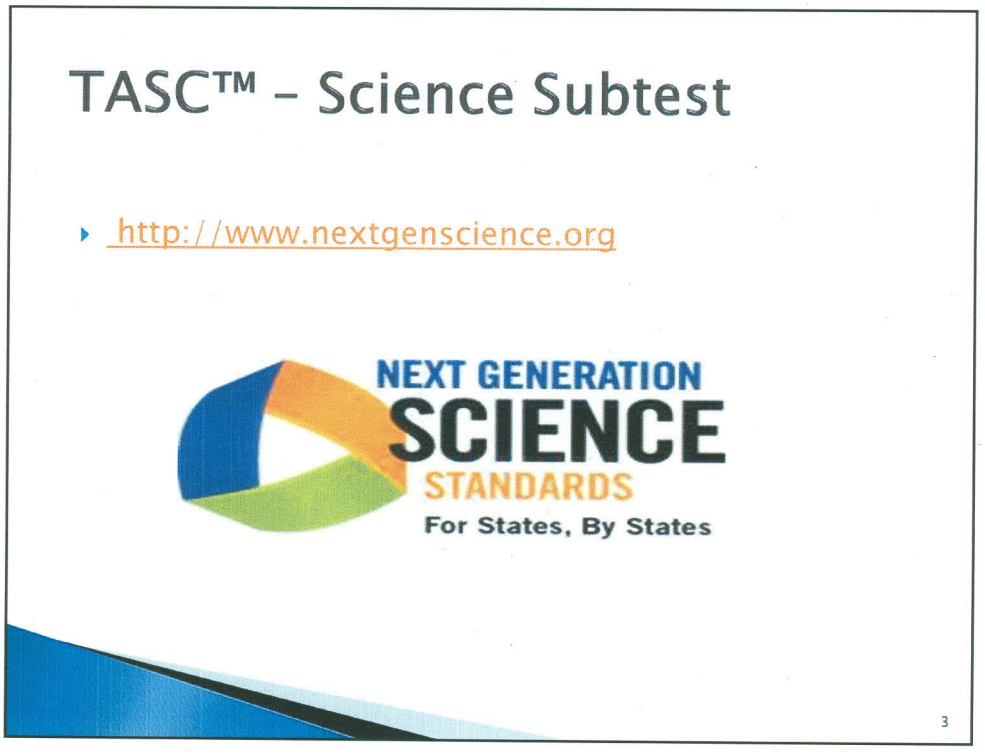



Hello, and welcome to an overview of the Science Subtest for the Test Assessing Secondary Completion, known as the TASC™ test. Beginning in 2014, the TASC™ test is the only examination leading to a high school equivalency (HSE) diploma in New York State (NYS).



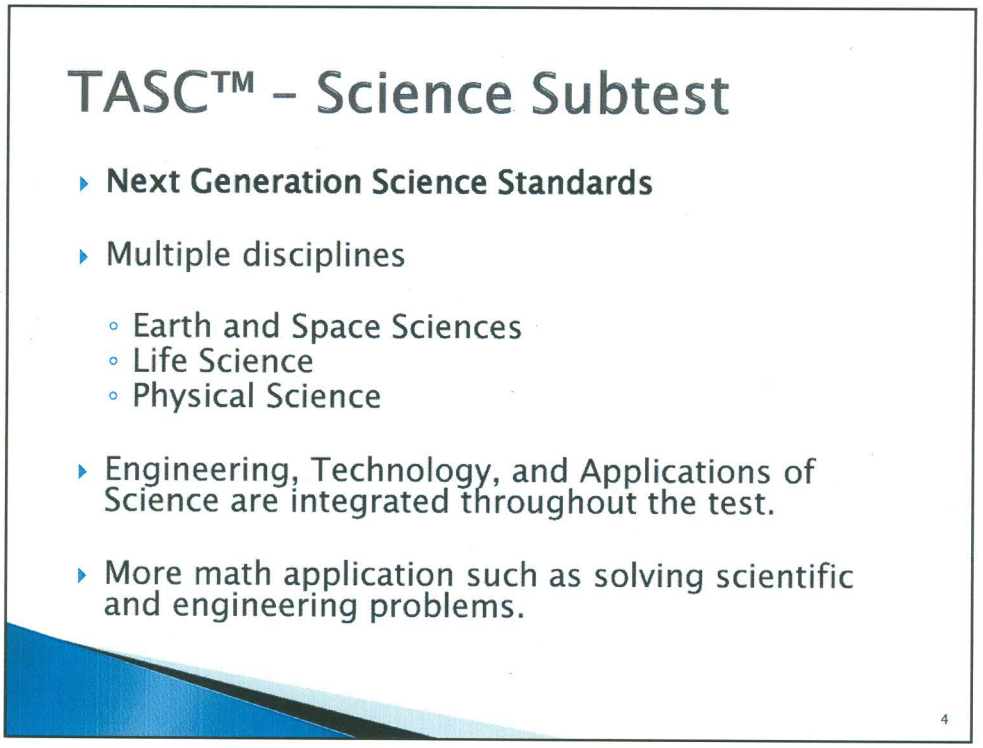

The TASC™ test is comprised of five subtests, one of which is the Science Subtest. Each of the five subtests must be passed to earn an HSE diploma. Any subtest that is not passed may be retaken. The TASC™ test may be taken up to three times per calendar year. Passing scores from previously taken GED® subtests may be used toward achieving an HSE diploma until 2016, but all examinees are required to take the entire battery of five TASC™ subtests the first time they take the TASC™ test.




The TASC™ test Science Subtest measures the Next Generation Science Standards (NGSS) at the high school level. The Standards are performance based and arranged by Topic or by Disciplinary Core Idea.

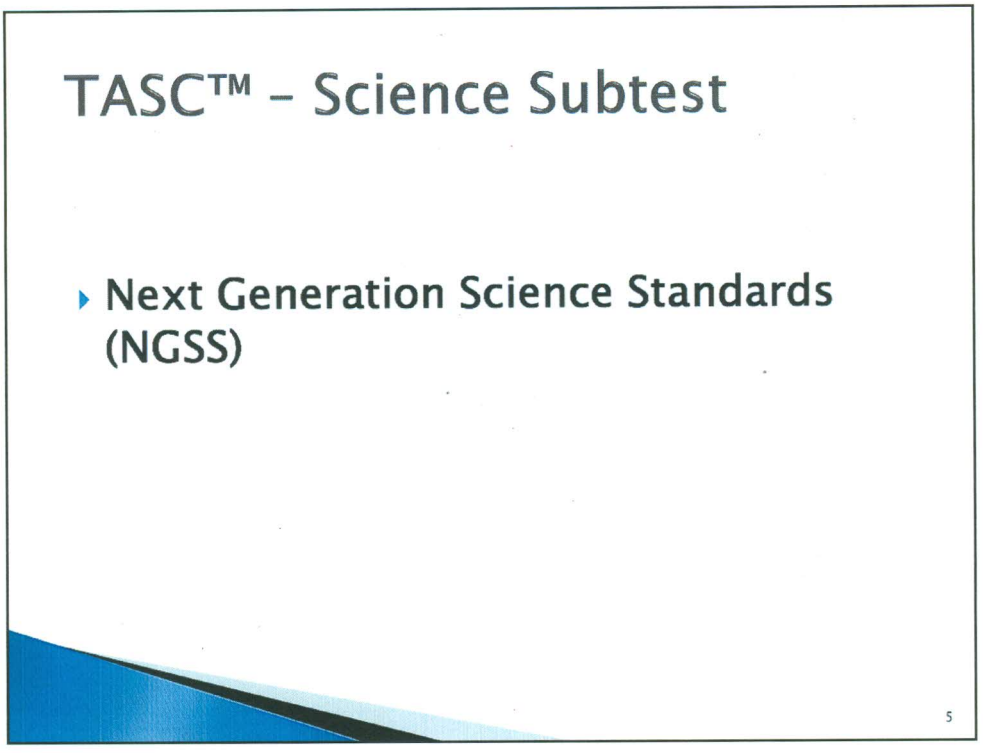
The NGSS, finalized in 2013, are K–12 Science standards that are rich in content and practice. They are arranged in a coherent manner across disciplines and grades to provide all students an internationally benchmarked science education. The NGSS are based on the *Framework for K-12 Science Education* produced by the National Research Council, which include the science topics and content that have been identified as the science that all kindergarten through twelfth grade students should know.

The NGSS website can be accessed by clicking on the hyperlink found on this slide, or by web searching "NGSS." Navigation of the NGSS web site is facilitated by a search function.



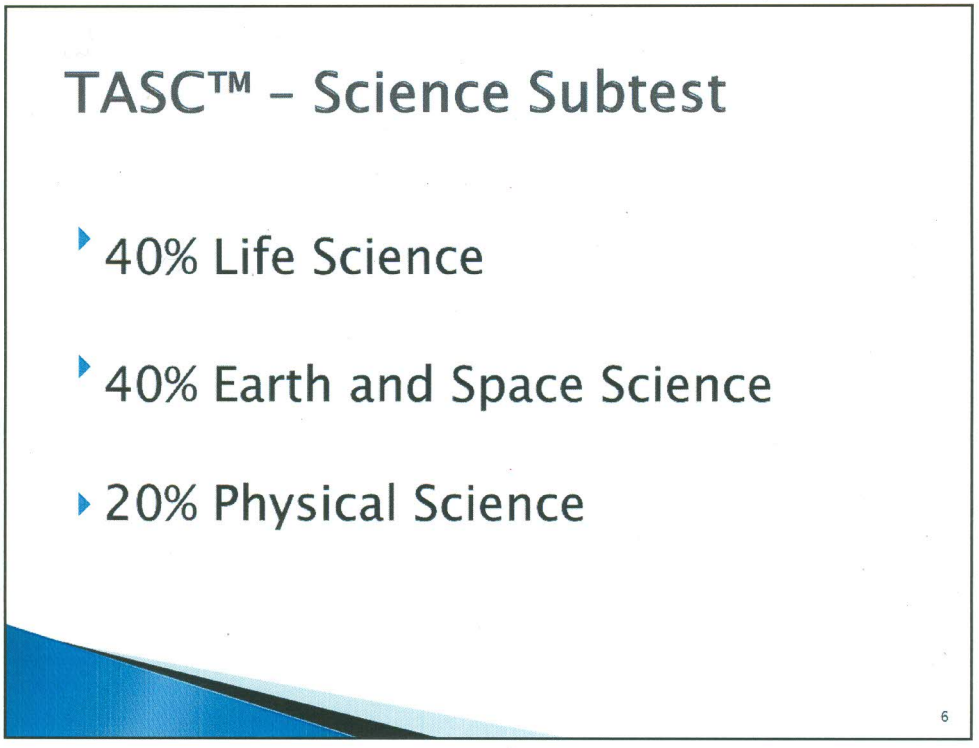

The NGSS address multiple disciplines including Life, Physical, Earth and Space Sciences, as well as Engineering, Technology and the Application of Sciences. Engineering, Technology, and Applications of Science are integrated throughout the test by assessing content knowledge and skills within the context of real world applications of science concepts.

The TASC™ test aligns with the NGSS' expectations for more math application while solving scientific and engineering problems.

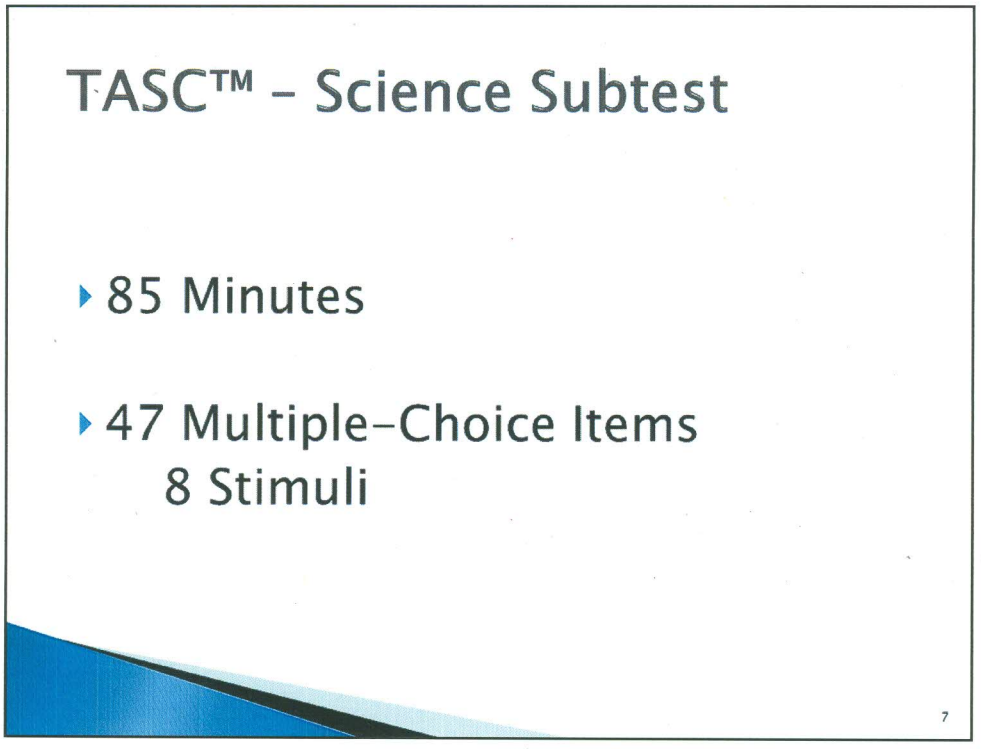



The TASC™ test assesses the performance expectations in the Next Generation Science Standards (NGSS).

Three dimensions- practices, cross-cutting concepts, and disciplinary core ideas combine to form each standard. The cross-cutting concepts bridge disciplinary boundaries. The Engineering Standards within NGSS represent this disciplinary boundary bridge. The Engineering Standards are not separately assessed, but are interwoven within the items addressing the Standards representing Core Ideas of the NGSS.



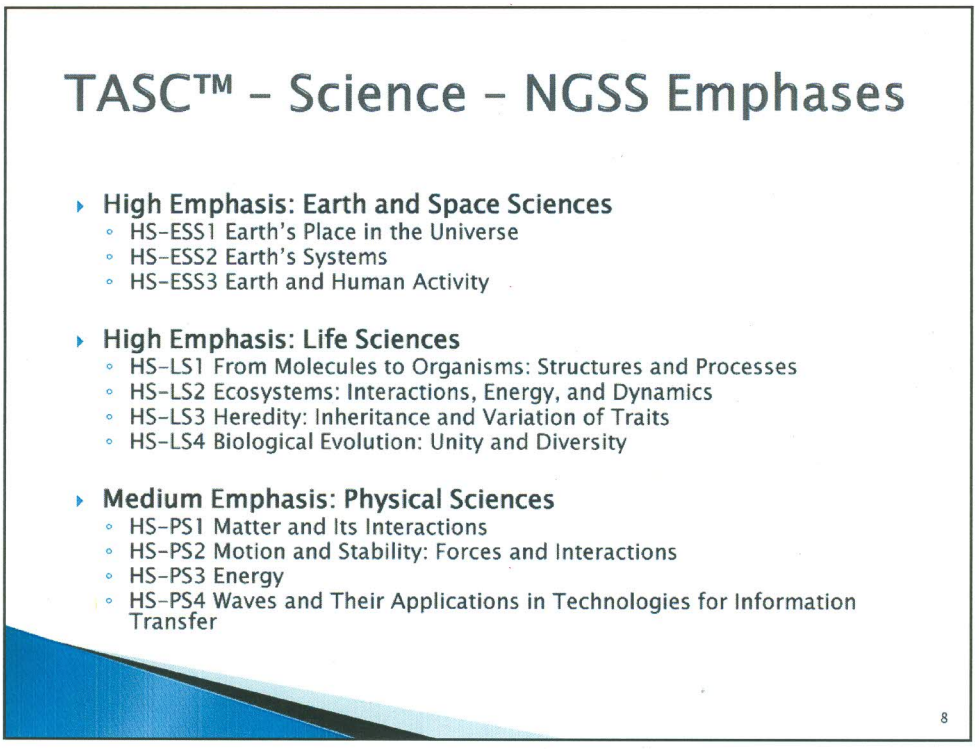

The TASC™ test Science Subtest assesses conceptual knowledge of core ideas in Physical Science, Life Science, and Earth and Space Sciences. Forty percent of the items address Life Science, another 40% are on Earth and Space Science, and the remaining 20% of the items measure Physical Science. Physical Science includes both physics and chemistry. Unlike the Math Subtest, there is no formula sheet for Science. Some formulas will be included with the individual test items.




For the TASC™ test Science Subtest examinees are given 85 minutes to complete 47 multiple-choice questions. Eight shared stimuli accompany the 47 items. These shared stimuli may include reading passages, diagrams, tables, or graphs. The examinees' science content knowledge, along with the information found in the shared stimuli are to be used to answer two or more questions.

In the 2002-2013 GED®, the Science Subtest was largely literacy based. Most of the knowledge required to answer the questions was found in the stimuli or the reading passages that accompanied the items. Examinees were expected to have an understanding of basic scientific principles and vocabulary, but very little specific content knowledge was required.

The TASC™ test is a national test and has been field-tested nationally, including in New York State. Each subtest is norm referenced. That means that no set percentage of correct answers is needed to pass. Instead, similar to the traditional way passing scores for the 2002-2013 GED® have been determined, passing is based on comparable scores of the majority of recent high school graduates. Thus, examinees should not become discouraged by the increased content knowledge expectations of the TASC™ Science Subtest. Fewer correct items than may be expected are required to pass and the passing rate should remain relatively consistent when compared to past HSE exams.




The TASC™ test producer, CTB/McGraw-Hill has identified some of NGSS's Disciplinary Core Ideas as High and Medium emphasis topics for 2014 and 2015. "High Emphasis" NGSSs for TASC™ Science Subtest are those that CTB considers the most relevant to College and Career Readiness. Emphasis refers to the relative number of items that the TASC™ test will assess. One may expect to see more questions with high emphasis content and relatively fewer, but still some, "medium emphasis" items.

A brief preview of the High Emphasis Standards for the TASC™ test, along with direct hyperlinks to the particular webpage for each High Emphasis Disciplinary Core Idea, follows on the next set of slides for this presentation. Subsequent to this examination of the NGSS, we will look at some questions from the official Sample Items as a way to become more familiar with the content and rigor of TASC™ Science Subtest.


Each Disciplinary Core Idea of the NGSS has its own webpage detailing the specific Standards. This hyperlink and those that follow are shortcuts linking directly to the Standards that have been designated High Emphasis for the TASC™ test. There are six Standards within the Disciplinary Core Idea "Earth's Place in the Universe." Examinees should know:

The life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation.

Astronomical evidence of the Big Bang Theory based on light spectra, motion of distant galaxies, and composition of matter in the universe.

The way stars, over their life cycle, produce elements.

How to predict the motion of orbiting objects in the solar system based on mathematical representations.

The past and current movements of continental and oceanic crust and how the theory of plate tectonics can help explain the ages of crustal rocks.

The formation and early history of Earth based on evidence from ancient Earth materials, meteorites, and other planetary surfaces.


There are seven Standards incorporated in the NGSS Disciplinary Core Idea "Earth's Systems."

Examinees should know:

How Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

That one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

How the thermal convection causes the cycling of matter in Earth's interior.

How variations in the flow of energy into and out of Earth's systems result in changes in climate.

The properties of water and its effects on Earth materials and surface processes.

The cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

The simultaneous coevolution of Earth's systems and life on Earth.


There are six Standards within the NGSS Disciplinary Core Idea "Earth and Human Activity."
Examinees should know:

How the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

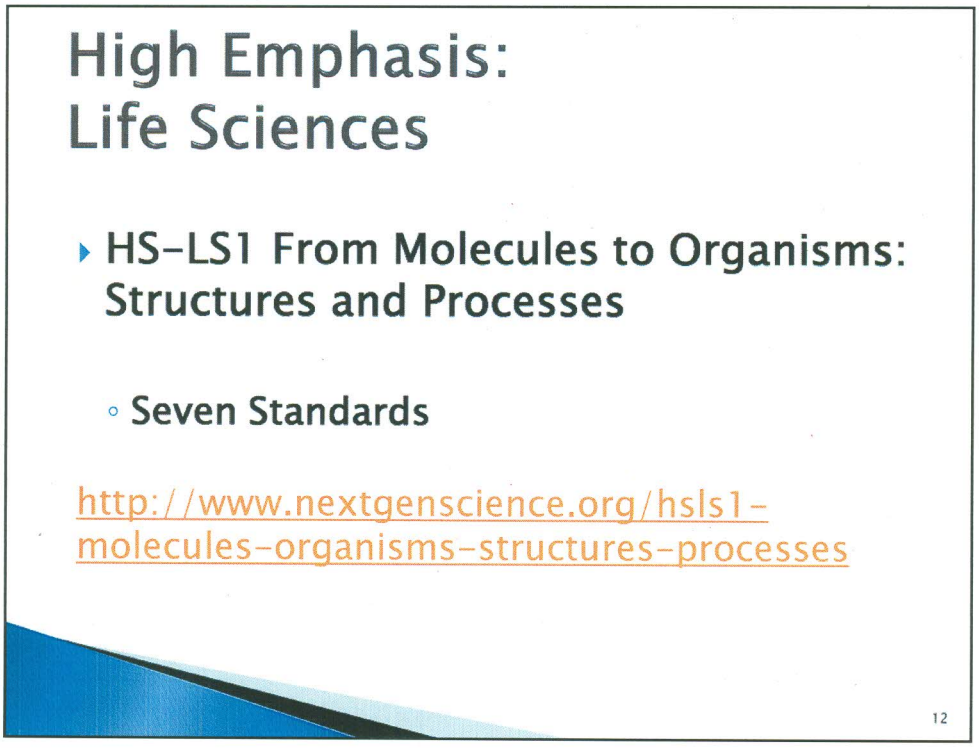
How to evaluate design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

The relationships among management of natural resources, the sustainability of human populations, and biodiversity.

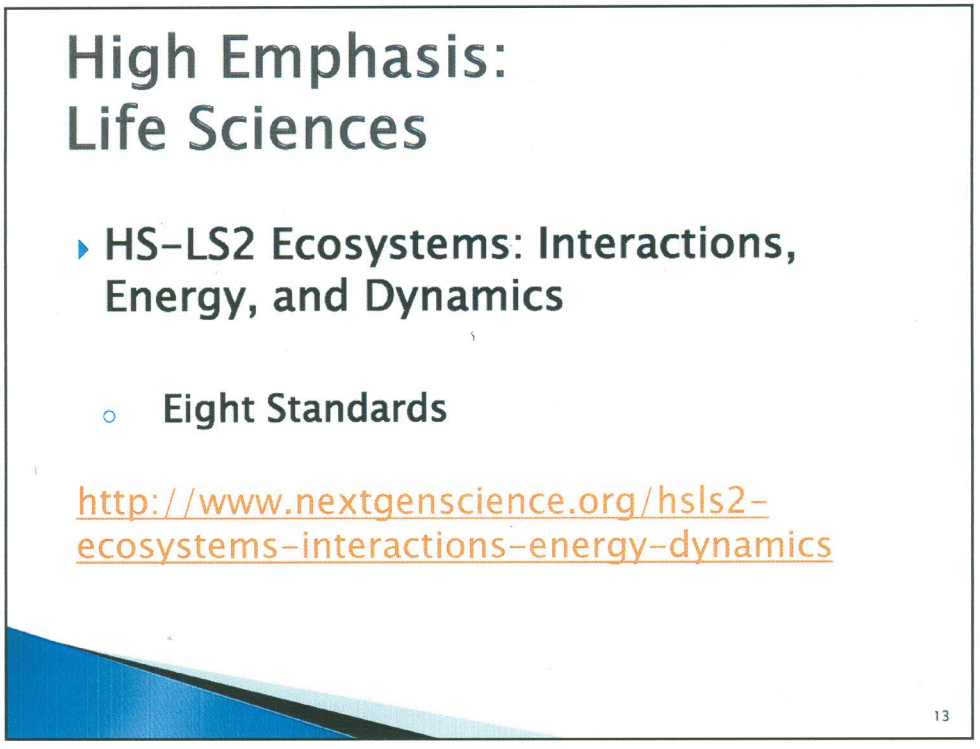
How to evaluate a technological solution that reduces impacts of human activities on natural systems.

How to analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

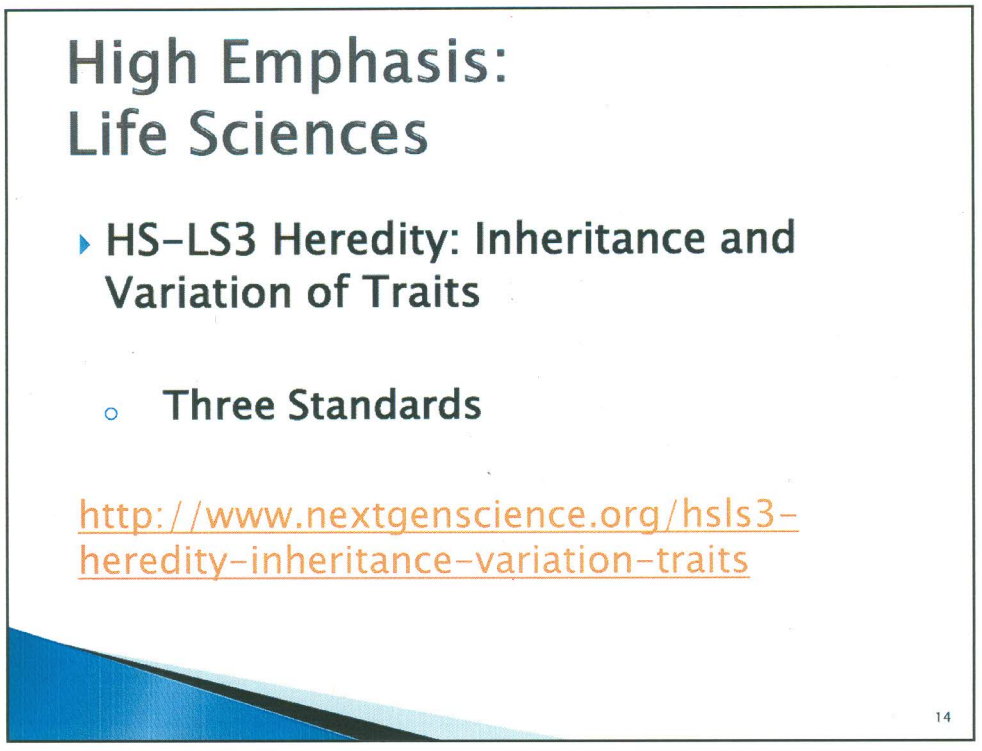
The relationships among Earth systems and how those relationships are being modified due to human activity.




The NGSS delineates the domain of Life Science into four Disciplinary Core Ideas, all of which are High Emphasis for the TASC™ test. There are seven Standards contained in the Disciplinary Core Idea "From Molecules to Organisms: Structures and Processes."
Examinees should know:
How the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
The hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
Feedback mechanisms maintain homeostasis.
The role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
How photosynthesis transforms light energy into stored chemical energy.
How carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.




There are eight Standards in the High Emphasis Disciplinary Core Idea "Ecosystems: Interactions, Energy, and Dynamics."
Examinees should know:
The factors that affect carrying capacity of ecosystems at different scales.
The factors affecting biodiversity and populations in ecosystems of different scales.
The cycling of matter and flow of energy in aerobic and anaerobic conditions.
The cycling of matter and flow of energy among organisms in an ecosystem.
The role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
The complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
How to evaluate a solution for reducing the impacts of human activities on the environment and biodiversity.
The role of group behavior on individual and species' chances to survive and reproduce.




The NGSS Disciplinary Core Idea "Heredity: Inheritance and Variation of Traits" contains three standards.

Examinees should know:

The role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

That inheritable genetic variations may result from:
(1) New genetic combinations through meiosis
(2) Viable errors occurring during replication
(3) Mutations caused by environmental factors

How to explain the variation and distribution of expressed traits in a population.


There are six Standards in the High Emphasis NGSS Disciplinary Core Idea "Biological Evolution: Unity and Diversity."

Examinees should know:

Common ancestry and biological evolution are supported by multiple lines of empirical evidence.

The process of evolution primarily results from four factors:
(1) The potential for a species to increase in number
(2) The heritable genetic variation of individuals in a species due to mutation and sexual reproduction
(3) Competition for limited resources
(4) The proliferation of those organisms that are better able to survive and reproduce in the environment.

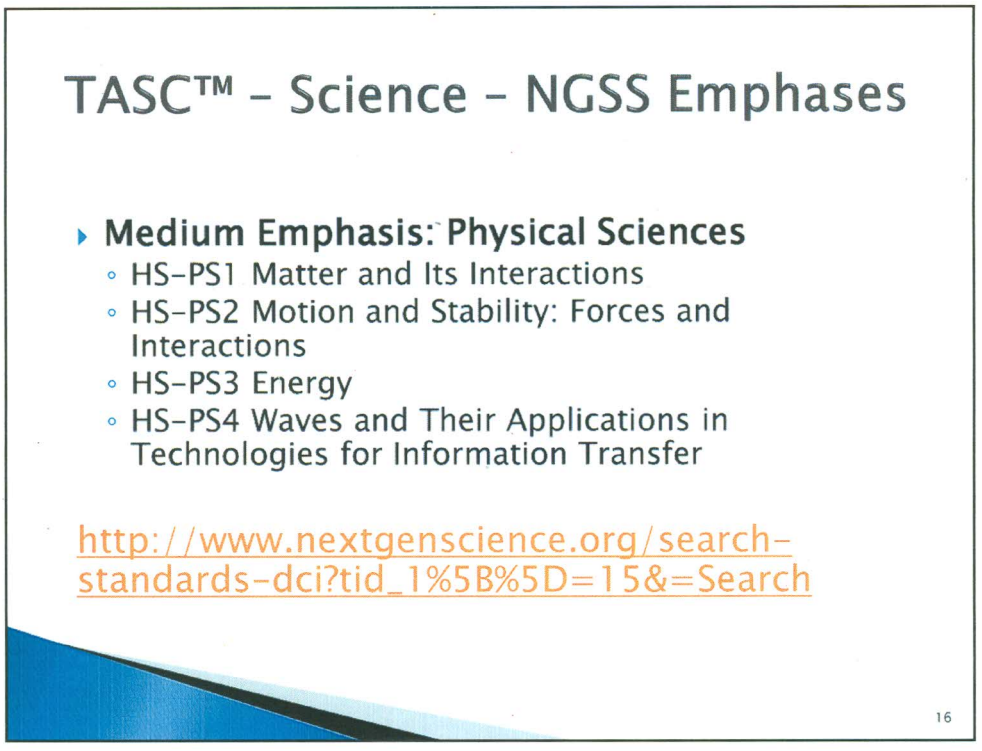
Organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Natural selection leads to adaptation of populations.

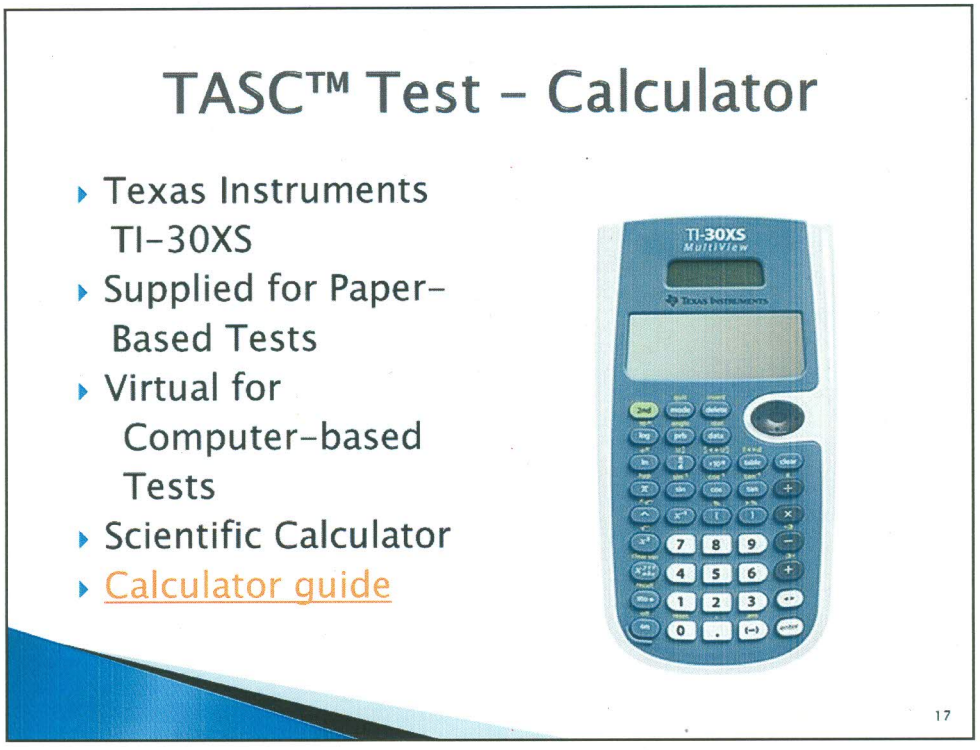
Changes in environmental conditions may result in:

(1) Increases in the number of individuals of some species
(2) The emergence of new species over time
(3) The extinction of other species

How to evaluate a solution to mitigate adverse impacts of human activity on biodiversity.



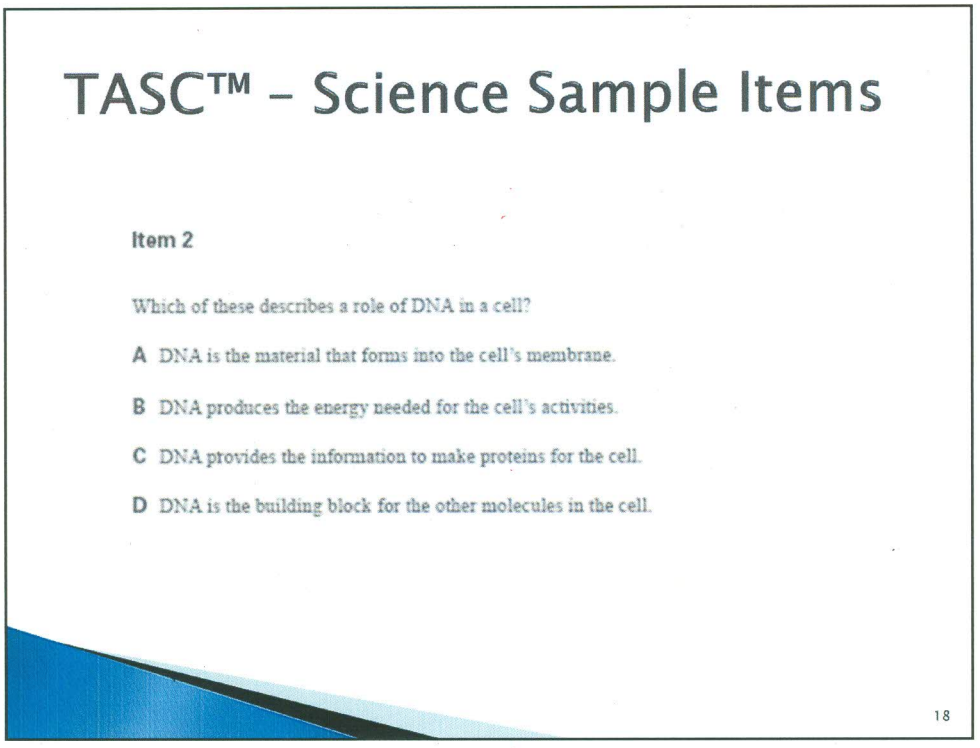

Let's look at the Medium Emphasis Disciplinary Core Ideas for Science. The Physical Sciences, physics and chemistry, account for 20% of the items on the TASC™ Science Subtest. Test producer CTB has designated all Physical Science NGSS Standards as Medium Emphasis. The Physical Sciences are divided into the four Disciplinary Core Ideas listed, each with a set of Standards. Please visit the NGSS website, which may be reached by the hyperlink on this slide, for more details on these Standards.




A change from the previous HSE exams is the use of the provided calculator for the entire Science Subtest. Examinees are not allowed to use their own calculators. The Texas Instruments TI-30XS calculator is provided for all examinees taking the paper-based test. For examinees taking the computer-based exam, a virtual version of this same calculator will be available on the screen.

The TI-30XS is a scientific calculator that has more functions than simpler four function calculators. This calculator does have a memory function, but does not have any graphing functionality and it is not programmable. This calculator will allow for calculations using numbers expressed in scientific notation. However, these calculations in scientific notation are difficult to negotiate without prior practice. The TASC™ Science Subtest may call for such calculations, and examinees should review the skills involved in working with quantities expressed in scientific notation and become familiar with the TI-30XS.

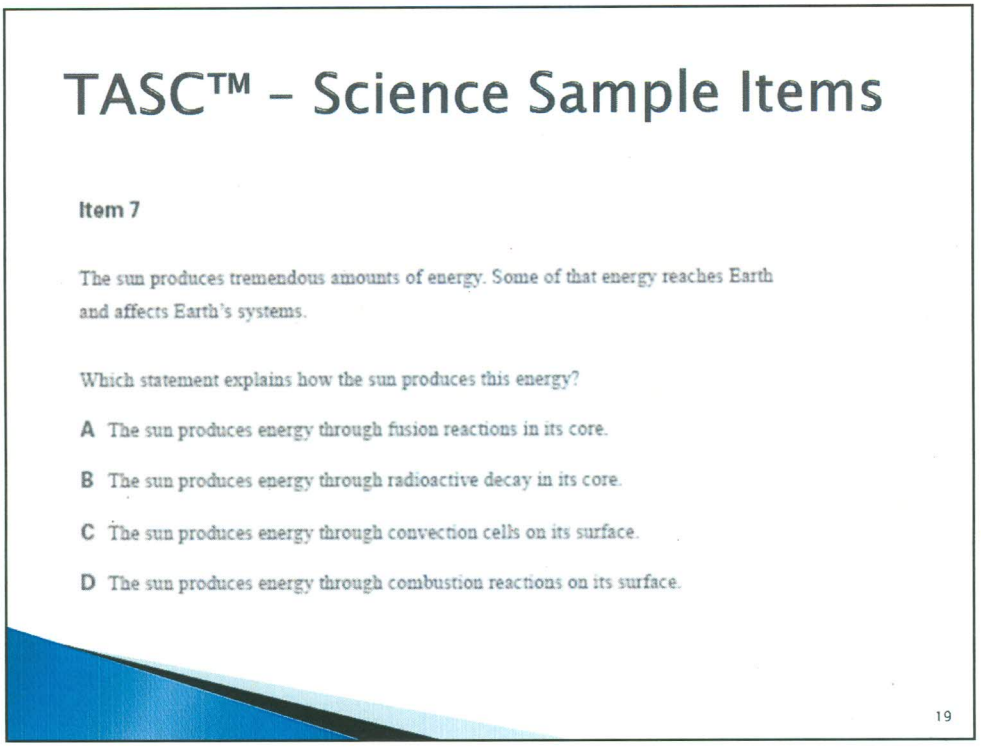
To assist with becoming familiar with this calculator, a Teacher's Guidebook, with learning resources for the TI-30XS Multi-view Scientific Calculator, can be found on the Texas Instruments website which may be reached by clicking on the hyperlink on this slide or by web searching "TI 30XS."




Let us use some of the TASC™ test official Sample Items as a way to explore the content and rigor of the TASC™ Science Subtest. The full set of TASC™ Sample Items may be accessed by going to the CTB TASC website. We will start with the second item from the Sample Item set. Please take a moment to read this item.

This Life Science question demands specific content knowledge. An understanding of biological inheritance is expected for the TASC™ test. This item measures NGSS HS-LS1-1 which states, "Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells." Examinees should be familiar with the process by which traits are inherited, and such vocabulary as *allele, genotype, phenotype, adaptive,* and *amino acids.* Also useful will be a basic understanding of *cell theory*, the process of *protein synthesis,* and the use of *Punnet Squares* to predict the relative frequency of traits in a set of offspring based on the genetic make-up (genotype) of the parents.

The answer to this item is choice "C." DNA provides the code by which amino acids are arranged and proteins are built.




Here is the seventh item from the TASC™ Science Sample Items, which is from the domain of Earth and Space Science. Please take a moment to read this item.

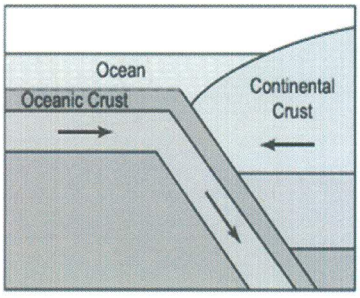
This item measures High Emphasis NGSS HS-ESS1-1, which reads, "Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation." Along with knowledge of how the sun and other stars produce energy, examinees should be familiar with *conservation of mass* and *conservation of energy*, and the various *forms of energy* and know how energy may be *transferred* and *transformed*. Important vocabulary includes *conduction, convection, radiation, fission, fusion, potential energy, kinetic energy, chemical energy, combustion,* and a formal understanding of *heat.*

The answer for this item is choice "A." Examinees should be aware that stars, such as our sun, produce by nuclear fusion, not only energy, but also new and heavier elements. The fundamentals of the *Big Bang Theory* are also among the content knowledge expectations for the TASC™ test. Examinees should know that shortly after the original expansion of our known universe all atoms were composed of the smallest and simplest element, hydrogen. All elements heavier than hydrogen were created by fusion reactions within earlier generations of stars. Our sun is comprised of mostly hydrogen which is undergoing fusion to form, at first, the second smallest atom, helium.

# TASC™ – Science Sample Items

**Use the following information to help answer questions 8-9.**

The diagram shows a cross-section of an area where two tectonic plates of Earth's surface are moving towards each other. The leading edge of one tectonic plate has oceanic crust, while the leading edge of the other tectonic plate has continental crust.




**Item 9**

Which of these could explain the motion of the tectonic plates shown in the diagram?

A rotation of Earth's axis

B currents within Earth's ocean

C convection of material within Earth's interior

D gravitational pull of the sun and moon on Earth's surface

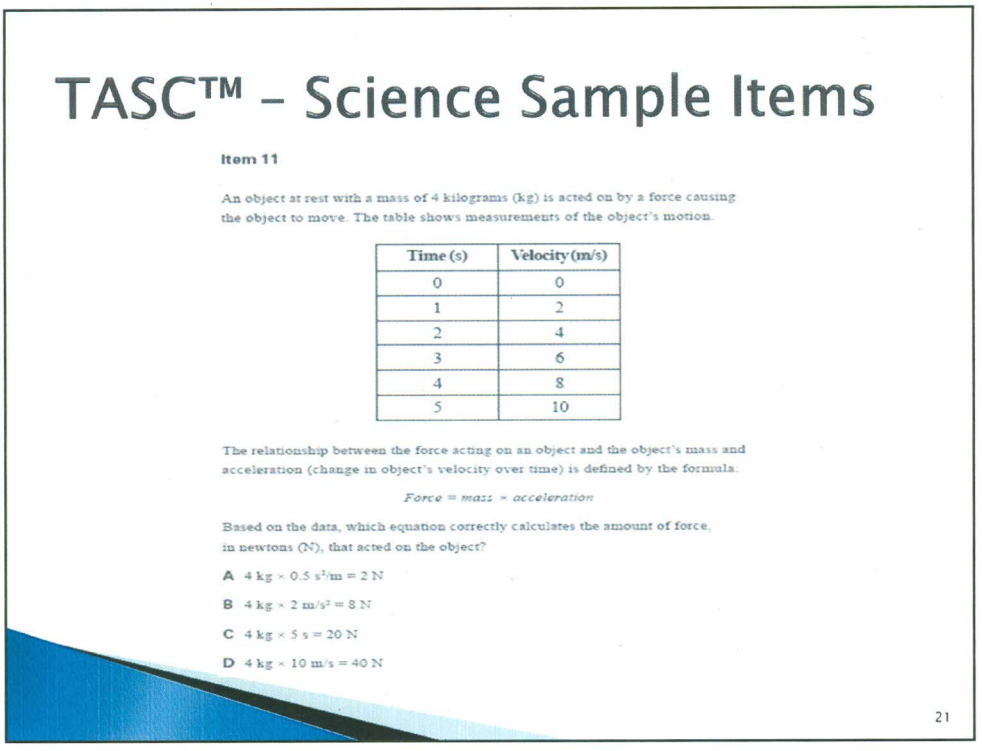
20

Here is another item from the area of Earth and Space Science. Please take a moment to read this item.

This is an example of a shared stimulus. The passage and the diagram are addressed by two items. The TASC™ Science Subtest has a number of these shared stimuli accompanying two or more items.

Plate tectonic theory is addressed in NGSS Standard "ESS2B –Plate Tectonics and Large-Scale Systems" which is High Emphasis for the TASC™ test for 2014-2015. This item asks for an explanation of the forces driving tectonic plate motion. The correct answer is choice "C," convection currents within Earth's molten mantle, caused by heat from radioactive decay at the core, drive the movement of large pieces of Earth's outer crust known as *tectonic plates*.

Examinees are encouraged to become familiar with the basics of Plate Tectonic theory such as *convergence, divergence, and subduction,* as well as what occurs at plate boundaries. The *formation of mountains, oceanic trenches, oceanic ridges, and volcanoes* should also be understood in the context of plate tectonic theory. An overarching principle of plate tectonics is that oceanic crust is generally heavier, or more dense, than continental crust.




Here is an item from the domain of Physical Science. Please take a moment to read this item.

Physical science, including both Physics and Chemistry, is approximately 20% of the items on the TASC™ Science Subtest. The TASC™ Mathematics Subtest includes a reference sheet of formulas. There is no similar TASC™ science reference sheet. Instead, some items will have necessary formulas included. However, there will be some formulas that will not be supplied. This item illustrates this point. The formula for Newton's Second Law, F=ma, is given. The formula for calculating acceleration is not, although it is inferred in the supplied definition of acceleration, "change in object's velocity over time."

Note that some of the abbreviations, or variables, are defined. Kilograms are keyed as "kg", and newtons as "N". Keys are not included for "m" for meters, and "s" for seconds. The TASC™ Science Subtest may include formulas that employ the triangular Greek letter "Δ" (delta) to represent "the change in" a quantity. A "Δ" (delta) indicates that the initial value should be subtracted from the final value. The formula for acceleration, an understanding of which is necessary for this sample item, is often written with a delta, $a = \Delta v/t$.

Here picking any two data points for velocity from the table, subtracting them to find the change in velocity, and then dividing by the corresponding time

between the data points will yield the acceleration. For instance, the velocity increased from 0 to 10 meters per second over a 5 second time period. Dividing the change in velocity ($\Delta v$), 10 meters per second, by the time interval, 5 seconds, yields an acceleration of 2 meters per second per second, or 2 $m/s^2$.

Substituting the given mass, 4 kilograms, and the calculated acceleration, 2 meters per second squared, into the supplied force formula yields the answer, choice "B."

# TASC™ – Science Sample Items

**Use the following information to help answer questions 12-13.**

Potassium chlorate ($KClO_3$) is a crystalline solid that can undergo thermal decomposition to form solid potassium chloride (KCl) and gaseous oxygen ($O_2$) when heat is added. The chemical equation for this reaction is shown.

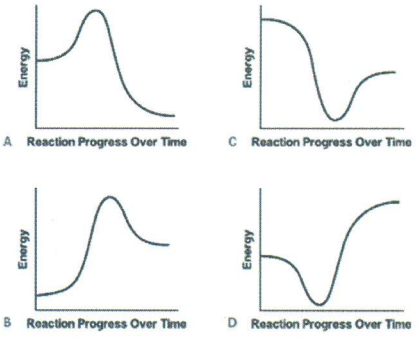
$$2\ KClO_3 + \text{heat} \rightarrow 2\ KCl + 3\ O_2$$

The table lists the molar masses of the elements involved in this reaction.

| Element | Symbol | Molar Mass (grams/mole) |
|---|---|---|
| Potassium | K | 39.10 |
| Chlorine | Cl | 35.45 |
| Oxygen | O | 16.00 |

Item 13

Which diagram best represents the change in energy that results from the decomposition reaction of potassium chlorate?




22

Here is a chemistry item also from the domain of Physical Science. This is another example of a shared stimulus. The information on the left of the slide is to be used to assist in answering more than one question. Please take a moment to read this item.

A secondary goal of the TASC™ test is to gauge college and career readiness, therefore some items measuring higher level knowledge are included. This item calls for the interpretation of a potential energy diagram for a given chemical reaction. In NYS this topic is included in Regents level chemistry.

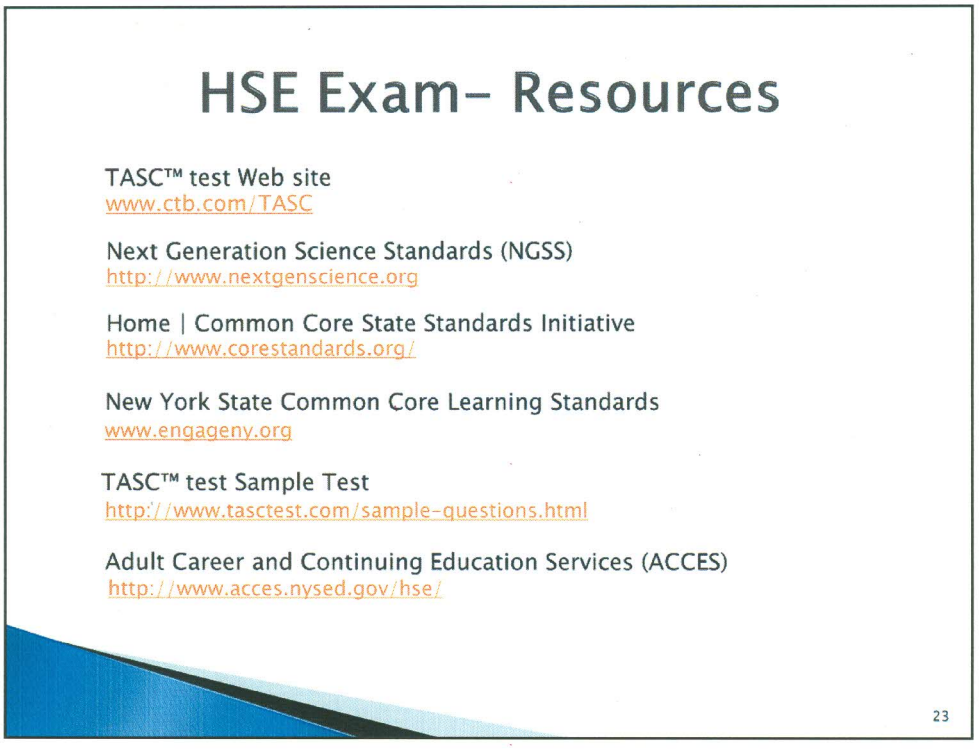
Heat is a form of energy. Notice that there are two places within the stimulus, the reading passage and the equation of the chemical reaction, that refer to heat being added. The theory of conservation of energy states that energy can neither be created nor destroyed. Energy can only be transferred or transformed. The added heat must result in more energy stored in the system in the end.

Now look at the diagrams representing the alternatives. Take a moment to determine which two choices have a higher amount of energy after the reaction. Both choice "B" and choice "D" start at a lower energy level than the energy level displayed at the end of the "reaction progress over time."

Generally, chemical reactions go faster at higher temperatures. This is true partly because chemical reactions require a certain amount of "activation energy" to get

started. This activation energy can be thought of as similar to the energy it takes to roll a ball up a hill. Once over the "hump" or top of the hill, the ball will roll down on its own.

Similarly, once enough heat energy has been added to achieve the activation energy the chemical reaction will go forward. Chemical bonds will be broken and reformed making new compounds. This is the definition of a chemical reaction. Thus, all correctly drawn potential energy diagrams for chemical reactions will show a "hump" representing the activation energy. Therefore, the correct answer is choice "B."




More information about the TASC™ test can be found on the TASC™ test web site. The Science Standards on which the TASC™ test is based may be explored at the NGSS web site. Also listed are web sites for ELA and Math national and state standards.

Probably the best starting point for either HSE instructors or candidates to begin preparation for the TASC™ test is to visit the web site containing the official TASC™ test Sample Test. Similar to the actual TASC™ test, the Sample Test is broken into five Subtests and features items indicative of the rigor and scope of the TASC™ test. Also available at the TASC™ test web site is information about the TASC™ test Readiness Test which may be useful both to gauge a person's preparedness to take the TASC™ test and to inform the HSE examinee about the TASC™ test.

For more information, visit NYSED's Adult Career and Continuing Education Services web site. A printable brochure on HSE in NYS can also be found there.

Thank you for listening.