



CAST PRACTICE TEST

3-Dimensions of Science Learning Using NGSS

8TH GRADE
Teacher





8th Grade CAST Practice Test

SAMPLE

This sample only contains six questions with the answers

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A Science Teacher's Best Friend

We at Education4Equity recognized that throughout the state of California, science teachers are pondering how to best prepare their students for the CAST (California Science Test). The Next Generation Science Standards (NGSS) with the introduction of the 3-Dimensions of Science Learning (DCI – Disciplinary Core ideas; SEP – Science and Engineering Practices; and CCC – Crosscutting Concepts) have brought to the table a way of teaching science that is both inspiring, but at times overwhelming. A seven minute explanation of the new way of organizing the standards is given here: <https://www.youtube.com/watch?v=Q6eoRnrwL-A&t=9s> and links off of the NGSS website: <https://www.nextgenscience.org/standards/standards>.

Because science teachers all have their own way of introducing scientific concepts, we felt the best way to prepare a teacher and their students for the California Science Test (CAST), was to create a practice test that did the following:

1. It gave teachers, regardless of their background, a unified way to prepare students for the California specific test.
2. It allowed teachers to focus on helping students enter into the experience of dealing with various phenomenon.
3. It provided teachers the most flexibility in using various curriculum.
4. It has a proven record of raising student scores by as much as 30%.

In addition to using our practice test questions, we at Education4Equity highly encourage teachers to make use of these two resources for understanding the background of practice test questions and for creating your own test questions.

1. The CAASPP Online Practice and Training Tests Portal

<http://www.caaspp.org/practice-and-training/index.html>

2. Item Specifications

<https://www.cde.ca.gov/ta/tg/ca/castitemspecs.asp>

Don't hesitate to contact us if you need ideas for how to use the practice test questions to turn your classroom into a center of curiosity, innovation, and enlightenment. Simply email help@education4equity.com. We have tests for Elementary (which we mainly call the 5th grade test), for Middle school (which we call the 8th grade test) and for High School (which we call the High School test). The 3 books are listed on the next page, and each book comes in a student version and a teacher version with answers. We have not put all the answer in this book since this book is mainly a sample for teachers, principals and superintendents to get a "taste" of what we at Education4Equity are providing. See below for the front cover of our books.

We end on a note of comfort to all science teachers:

Be encouraged and please join us in the effort to make our students top critical thinkers in the world. We hope these practice questions will not be seen as a chore to burden you with added work, but as a "best friend" that lists "experiential opportunities" to stir up student curiosity.

In conclusion we'd like to give special thanks to the 40-member team who wrote the NGSS Standards, Jill Wertheim, Ph.D. (Stanford), Linda de Lucchi (Berkley), Ayele Dodoo, Ed.D. (WestEd), and the team that supports the CAASPP Web Portal. To all owner of our books, please take note that the way we deliver the answers to each practice question is highly instructive and helps teachers and students alike think like practitioners.

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Discrete Items—Section 1

1. Write your name.

First

Last

2. A molecule of methane (CH_4) reacts with two oxygen molecules (O_2) to form carbon dioxide (CO_2) and water (H_2O). The table shows models of the molecules.

CH_4	O_2	CO_2	H_2O
			

Some students are asked to create a model of the reaction. They model the first part of the reaction as shown below.



Select the image that correctly completes the model, showing that mass is conserved.



3. A class has a terrarium in their science classroom. The bottom of the terrarium is covered with light-colored sand. There are 30 of a certain species of small insect in the terrarium. About half of the insects are a tan color, and the rest are bright red.

The students add an insect-eating toad to the terrarium. The students count how many insects of each color there are before they add the toad. They count again two days after adding the toad. The table shows their results.

Insect Color	Before adding the toad	After adding the toad
Tan	14	13
Red	16	9

The students wonder why there are more tan insects left than red insects. Based on their data, circle the words in **BOLD** that **best** complete each of the sentences below.

The **tan / red** insects have a better chance of surviving than the **tan / red**. This is because the toad:

- A. knows where the red insects like to hide.
- B. cannot see the tan insects as well as the red insects.
- C. is larger than the insects.
- D. None of the above

4. A group of students wonders what variables affect the gravitational force between items in their classroom. First, they measure the mass of three items.

Item	Mass (kg)
A	1
B	1
C	2

Next, they use a computer program to calculate the gravitational force between the items. First, they compare the attraction between Item A and Item B when they are 10 meters apart and when they are only 5 meters apart. The computer program gives them the data in Table 1.

Table 1

Mass of Item A (kg)	Mass of Item B (kg)	Distance between the items (m)	Gravitational force of Item A on Item B (N)	Gravitational force of Item B on Item A (N)
1	1	5	2.67×10^{-12}	2.67×10^{-12}
1	1	10	6.67×10^{-13}	6.67×10^{-13}

Next, the students compare the attraction between Item A and Item C at the same two distances. The computer program gives them the data in Table 2.

Table 2

Mass of Item A (kg)	Mass of Item C (kg)	Distance between the items (m)	Gravitational force of Item A on Item C (N)	Gravitational force of Item C on Item A (N)
1	2	5	5.34×10^{-12}	5.34×10^{-12}
1	2	10	1.33×10^{-12}	1.33×10^{-12}

Part A

Select **two** options to complete the statement that are supported by the data the students gathered.

The gravitational force between objects:

- depends on the distance between the objects.
- does not depend on the distance between the objects.
- depends on the mass of the objects.
- does not depend on the mass of the objects.

Continued on next page.

Part B

Circle the phrases in **BOLD** that **best** complete the sentences.

When the distance between Item A and Item B increased, the gravitational force between them **increased / decreased**. When the items were 10 meters apart, the gravitational force between Item A and **Item B / Item C** was greater than the gravitational force between Item A and **Item B / Item C**.

5. A city's middle school has a large, flat roof. The city's leaders think that installing 100 solar panels on the roof should provide most or all of the electricity the school needs and help reduce air pollution in the city.

The leaders ask three companies to come up with plans for using the middle school's roof to provide solar energy. The plans must meet the following criteria and constraints:

- Provide most or all of the school's electricity
- Cost \$50 or less per solar panel
- Be installed within the 12 weeks of summer vacation

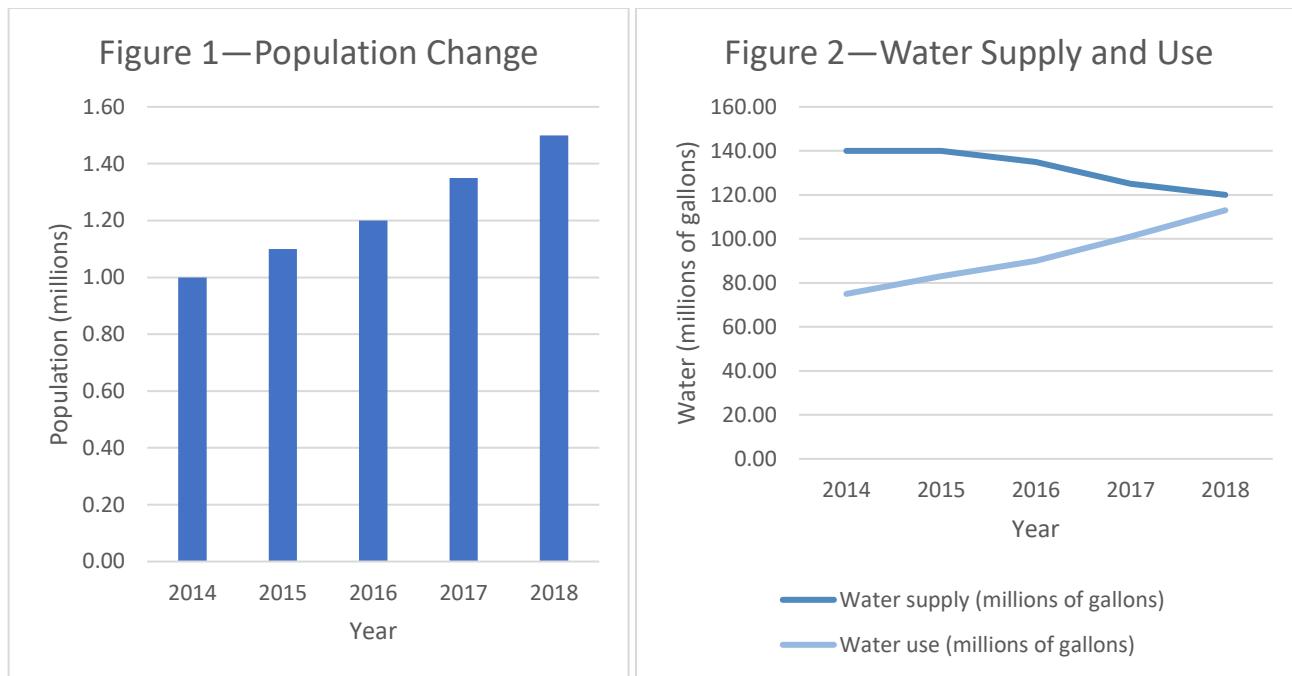
The three companies turn in their plans, and the city leaders make a chart to compare them.

Criteria and Constraints	Plan A	Plan B	Plan C
Percent of the school's electricity that will be generated by the solar panels	85%	98%	100%
Cost per solar panel	\$41	\$46	\$51
Time needed to install	11 weeks	18 weeks	12 weeks

Which plan **best** satisfies the criteria and constraints given by the city's leaders?

<input type="checkbox"/>	Plan A
<input type="checkbox"/>	Plan B
<input type="checkbox"/>	Plan C

6. Figure 1 shows the changes in a city's population over the past 5 years. Figure 2 shows the changes in the city's water supply, which has been declining over the past 3 years because of a drought, and changes in its water use. During the drought, the average amount of water that each person living in the city uses every day has remained the same.



Some scientists claim that if the city's population continues to grow, there will soon be a water shortage. Based on the data, circle the words or phrases in **BOLD** that **best** complete the sentence.

The data **supports / does not support** the scientists' claim because, as the population grows, the amount of water used will most likely **increase / decrease**, which would leave **enough / not enough** water for the city's population.

Standards and Answers

Standard:	MS-PS1	Matter and Its Interactions		
Performance Expectation:	PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.		
	Clarification Statement	Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.		
	Assessment Boundary	Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.		
	SEP	DCI	CCC	
	Developing and Using Models	PS1.B—Chemical Reactions	Energy and Matter	
	Develop a model to describe unobservable mechanisms.	Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	Matter is conserved because atoms are conserved in physical and chemical processes.	
		The total number of each type of atom is conserved, and thus the mass does not change.		

Item	Answer	Notes
2	B	

Standard:	MS-LS4	Biological Evolution: Unity and Diversity		
Performance Expectation:	LS4-4	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.		
	Clarification Statement	Emphasis is on using simple probability statements and proportional reasoning to construct explanations.		
	Assessment Boundary	None provided.		
	SEP	DCI	CCC	
	Constructing Explanations and Designing Solutions	LS4.B—Natural Selection	Cause and Effect	
	Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.	

Item	Answer	Notes
3	“tan” “red” “cannot see the tan insects as well as the red insects”	

Standard:	MS-PS2	Motion and Stability: Forces and Interactions		
Performance Expectation:	PS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.		
	Clarification Statement	Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.		
	Assessment Boundary	Assessment does not include Newton's Law of Gravitation or Kepler's Laws.		
	SEP	DCI	CCC	
	Engaging in Argument from Evidence	PS2.B—Types of Interactions	Systems and System Models	
	Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.	Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.	

Item	Answer	Notes
4a	“depends on the distance between the objects.” “depends on the mass of the objects.”	
4b	“decreased” “Item C” “Item B”	

Standard:	MS-ETS1	Engineering Design		
Performance Expectation:	ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.		
	Clarification Statement	None provided.		
	Assessment Boundary	None provided.		
	SEP	DCI	CCC	
	Engaging in Argument from Evidence	ETS1.B—Developing Possible Solutions	None provided.	
	Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.		

Item	Answer	Notes
5	C	

Standard:	MS-ESS3	Earth and Human Activity		
Performance Expectation:	ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.		
	Clarification Statement	Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.		
	Assessment Boundary	None provided.		
	SEP	DCI	CCC	
	Engaging in Argument from Evidence	ESS3.C—Human Impacts on Earth Systems	Cause and Effect	
	Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	Cause and effect relationships may be used to predict phenomena in natural or designed systems.	

Item	Answer	Notes
6	“support” “increase” “not enough”	