Developing Assessments for the NGSS

Stanford NGSS Assessment Project (SNAP)

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US DEPARTMENT FOR EDUCATION RECOMMENDATIONS OCT 2015

Principles for Fewer and Smarter Assessments

In the vital effort to ensure that all students in America are achieving at high levels, it is essential to ensure that tests are fair, are of high quality, take up the minimum necessary time, and reflect the expectation that students will be prepared for success in college and careers

Testing should be a part of good instruction, not a departure from it

- **COVER THE FULL RANGE OF THE RELEVANT STATE STANDARDS**
- **ELICIT COMPLEX STUDENT DEMONSTRATIONS OR APPLICATIONS OF KNOWLEDGE**
- **PROVIDE AN ACCURATE MEASURE OF STUDENT ACHIEVEMENT**
- **PROVIDES AN ACCURATE MEASURE OF STUDENT GROWTH**

Major Changes in Assessment of NGSS

- Assessment must be **3 Dimensional**
  - Disciplinary Core Ideas
  - Scientific Practices
  - Cross-Cutting Concepts
- Outcomes Specified as a **Performance Expectation**
- Delivery will be **computer-based**

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Stanford NGSS Assessment Project (SNAP)

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The charge of the Stanford NGSS Assessment Project is to envision a blueprint for California's future science standards. In this website you will find resources produced as part of our work. Our goal is to help states, local educational agencies, and teachers seeking to implement and assess the Next Generation Science Standards in their schools.

To navigate this site please explore the menu bar above. You will find links about what we do, who we are, sample work we've produced, and other resources that might be useful to the task of implementing and assessing the Next Generation Science Standards. We welcome you to browse through the pages of this website and to contact us with any insights or questions you might have.

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SNAP'S GOAL

SNAP'S Goal is to advance the conceptions of science assessment required to implement and support NGSS and science teaching and learning in California by:

a) constructing, validating, and disseminating exemplary tasks and assessment templates; and

b) developing a set of policy recommendations for a system of assessment that matches the aspirations of NGSS.

To use the policy recommendations and assessments as a basis for a sustained dialogue with policy makers, assessment developers, professional development providers, school/district administrators, teachers, and parents and community leaders.

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A "System of Science Assessments"

	PART 1: EXTERNAL FEDERALLY MANDATED ASSESSMENTS	
Grade	**Component A: Multi-item types** • Variety of item types including selected and constructed response • Computer scored • 30-40 min	**Component B: Performance Tasks** • Two short performance tasks • Scored by trained group of teachers • Matrix assigned • 40 in
1		
2		
3		
4		
5	Administered	Administered
6		
7		
8	Administered	Administered
9		
10		
11	Administered	Administered

Recommended "System of Science Assessments"

	PART 2: PERIODIC CLASSROOM PERFORMANCE ASSESSMENTS	
Grade	**Component C: Stand-alone Performance Tasks** • Shorter • Optional • State/District-developed? • Teacher scored • Use of tasks is reported, scores are not reported to state but may be used by districts	**Component D: Curriculum Embedded Performance Tasks (CEPT)** • Longer • Three options • Task bank, state curated and quality controlled (eventually includes consortium/district developed tasks) • Teacher scored • Scores & Use of Tasks Reported?
3	Administered?	Administered?
4	Administered?	Administered?
5	Administered?	Administered?
6	Administered?	Administered?
7	Administered?	Administered?
8	Administered?	Administered?
9	Administered?	Administered?
10	Administered?	Administered?
11	Administered?	Administered?

Classroom Based Extended Performance Task Options

Option 1: All tasks are voluntary

Option 2: Tasks only required for assessment in the federally mandated years

Option 3: Tasks required in each year from grade 3-8

Look at the data below showing the potential energy associated with different objects.

OBJECT	POTENTIAL ENERGY
Peanut with a mass of 1 gram	1380 calories
Marshmallow with a mass of 1 gram	190 calories
Paper napkin with a mass of 1 gram	1000 calories
Soccer ball held 10 meters above the ground	10 calories
Rubber band stretched 10 centimeters	0.24 calories

1. Write three ***claims*** about potential energy based on this data.

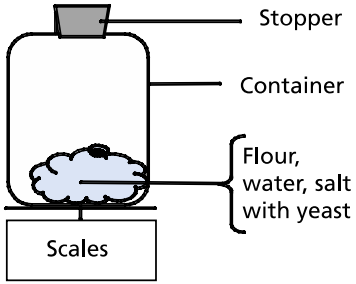
2. Choose one of your claims. _____
What ***evidence*** supports this claim? It's okay to use data from the table, along with other evidence you know about.

3. What is similar about the potential energy of a peanut and the potential energy of a stretched rubber band? What is different?

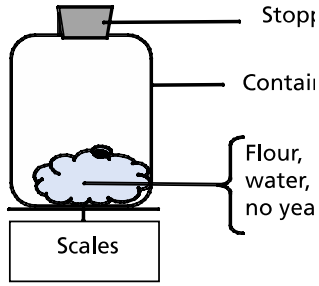
QUESTION 29.2

A few hours after mixing the dough, the cook weighs the dough and observes that its weight has decreased.

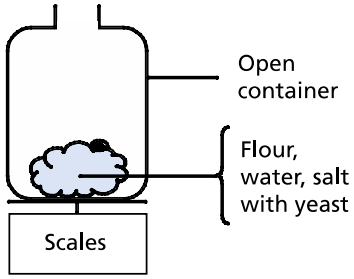
The weight of the dough is the same at the start of each of the four experiments shown below. Which *two* experiments should the cook compare to test if the *yeast* is the cause of the loss of weight?



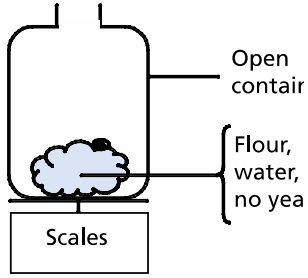
Experiment 1



Experiment 2



Experiment 3



Experiment 4

A. The cook should compare experiments 1 and 2.

B. The cook should compare experiments 1 and 3.

C. The cook should compare experiments 2 and 4.

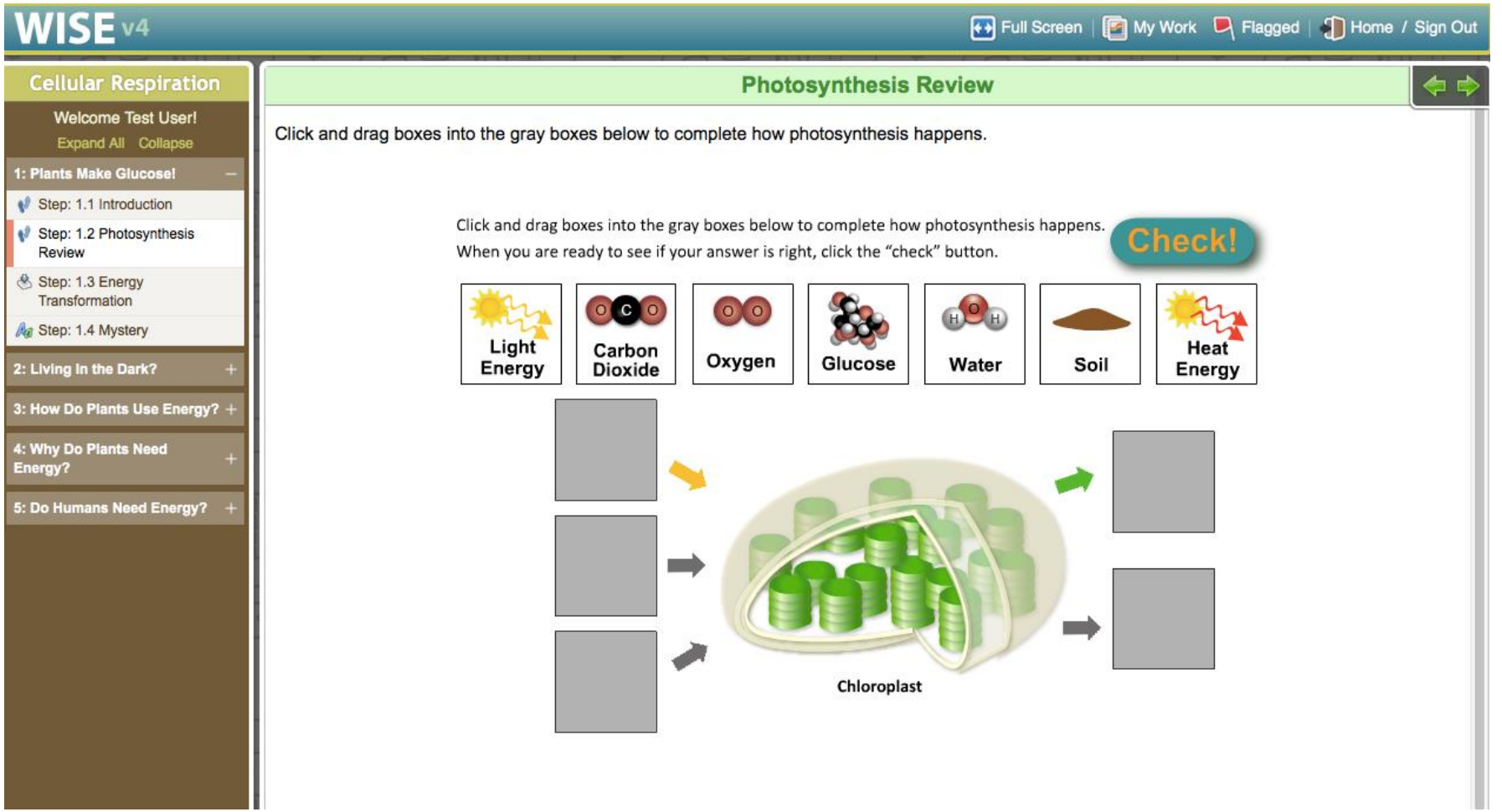
D. The cook should compare experiments 3 and 4.

QUESTION 29.3

In the dough, yeast helps to transform starch and sugars in the flour. A chemical reaction occurs during which carbon dioxide and alcohol form.

Where do the *carbon atoms* that are present in carbon dioxide and alcohol come from? Circle "Yes" or "No" for each of the following possible explanations.

Is this a correct explanation of where the carbon atoms come from?	Yes or No?
Some carbon atoms come from the sugars.	Yes / No
Some carbon atoms are part of the salt molecules.	Yes / No
Some carbon atoms come from the water.	Yes / No


WISE v4
Full Screen
My Work
Flagged
Home / Sign Out
Cellular Respiration
Welcome Test User!
Expand All
Collapse
1: Plants Make Glucose!
Step: 1.1 Introduction
Step: 1.2 Photosynthesis Review
Step: 1.3 Energy Transformation
Step: 1.4 Mystery
2: Living In the Dark?
3: How Do Plants Use Energy?
4: Why Do Plants Need Energy?
5: Do Humans Need Energy?
Photosynthesis Review
Click and drag boxes into the gray boxes below to complete how photosynthesis happens.
Click and drag boxes into the gray boxes below to complete how photosynthesis happens.
When you are ready to see if your answer is right, click the "check" button.
Check!
Light Energy
Carbon Dioxide
Oxygen
Glucose
Water
Soil
Heat Energy
Chloroplast

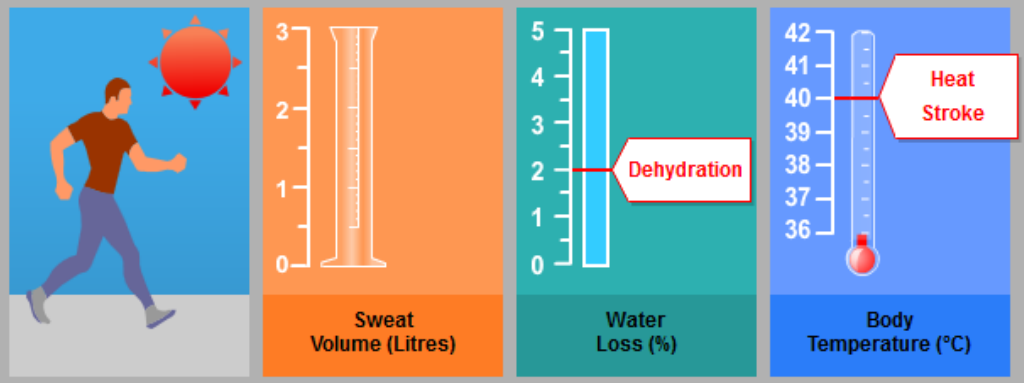
Running in Hot Weather
Introduction

This simulation is based on a model that calculates the volume of sweat, water loss, and body temperature of a runner after a one-hour run.

To see how all the controls in this simulation work, follow these steps:

1. Move the slider for **Air Temperature.**
2. Move the slider for **Air Humidity.**
3. Click on either "Yes" or "No" for **Drinking Water.**
4. Click on the "Run" button to see the results. Notice that a water loss of 2% and above causes dehydration, and that a body temperature of 40°C and above causes heat stroke. The results will also display in the table.

Note: The results shown in the simulation are based on a simplified mathematical model of how the body functions for a particular individual after running for one hour in different conditions.



Air Temperature (°C) 20 25 30 35 40

Air Humidity (%) 20 40 60

Drinking Water ◉ Yes ○ No

Run

Air Temperature (°C)	Air Humidity (%)	Drinking Water	Sweat Volume (Litres)	Water Loss (%)	Body Temperature (°C)

DRAFT Curriculum-embedded Performance Task

Introduction: A tiny grain of sand on this beach could be as much as ***billions*** of years old. Some of these grains of sand could have been around for all of the major events on Earth….in this assessment, you are going to choose a grain of sand and create a story describing the "life" it might lead over the next billion years.

Gather information: **Individually** students record their path as they move station to station (see right)

Construct a model: **in groups** students combine their paths to construct one comprehensive concept map that shows all the transformations their sand experienced

Identify processes: Students label the processes that could have caused the transformations and the ways energy drove those processes

Construct an argument: **Individually** students provide evidence and reasoning using their concept map to support an answer to the question: at what point in the cycle do you think your grain changed so much that it was no longer the same grain of sand?

Destination: bedrock

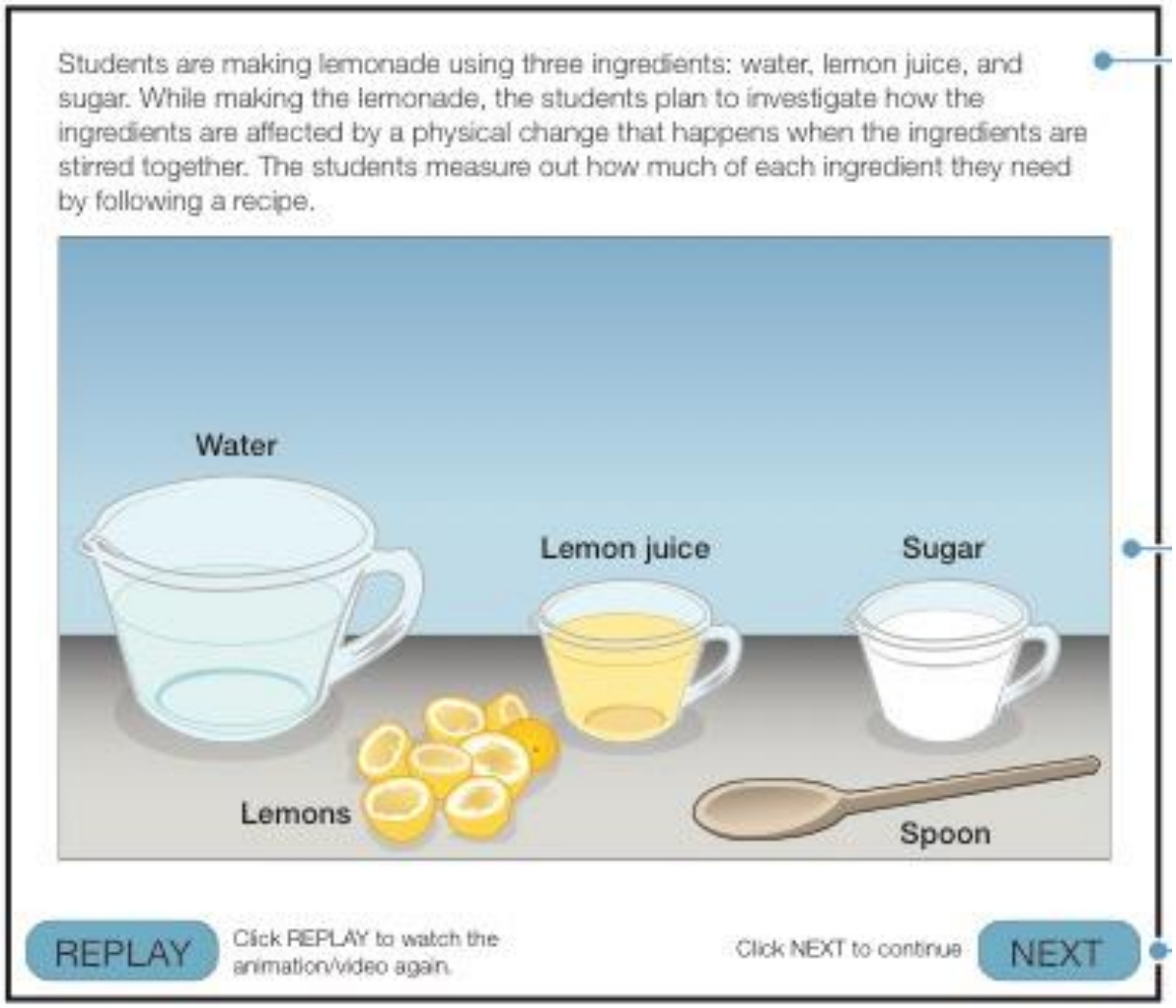
Potential routes from here:

If the die reads 1 or 2: you become part of a **mountain**

If the die reads 3 or 4: you become **soil**

If the die reads 5 or 6: you become a grain of **sand**

West ED/CSSO


Students are making lemonade using three ingredients: water, lemon juice, and sugar. While making the lemonade, the students plan to investigate how the ingredients are affected by a physical change that happens when the ingredients are stirred together. The students measure out how much of each ingredient they need by following a recipe.
Water
Lemon juice
Sugar
Lemons
Spoon
REPLAY
Click REPLAY to watch the animation/video again.
Click NEXT to continue
NEXT

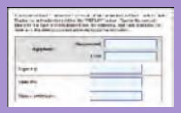
5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.

5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

Others are thinking about this too

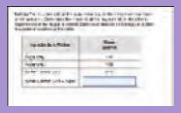
ITEM CLUSTER

Stimulus



Item 1: Text Entry / Table Fill-In

5-PS1-2 SEP CCC

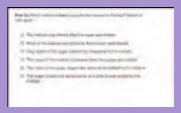


Item 2a: Computation

Item 2b: Graphing (TEI)

5-PS1-2 DCI SEP CCC

Item 2c: Short Answer



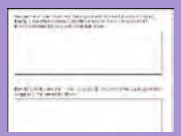
Item 3(a–b): Multiple Choice / Multiple Select

5-PS1-2 DCI SEP CCC

Item 4a: Short Answer

Item 4b: Building a Model (Drag-and-Drop, TEI)

5-PS1-1 DCI SEP CCC



Item 5(a–b): Constructed Response

5-PS1-1 DCI SEP CCC

Other Projects

- Concord Consortium
- PISA
- NAEP
- ONPAR Science Tasks

Some challenges with assessing NGSS

Some issues that have arisen:

- How to integrate 3 dimensions?
- What counts as assessing all 3 dimensions?
- Use of videos and simulations
- Equity/reliability issues including familiarity with phenomena, models and diagrams, imagery, etc.
- Translating the performance expectations into assessable items
- Leveling of the three dimensions
- Scoring: 1 dimension or scoring all 3?
- Reliability and validity of performance tasks
- Technological capacity