

**1** Several members of Tyrone’s family have problems with heart disease. To avoid developing heart problems, Tyrone should probably do all of the following **except**

- get plenty of cardiovascular exercise.
- restrict intake of fats and sugar.
- avoid contact with family members.
- find ways to reduce stress.

## EVAPORATION INVESTIGATION

Students in an Earth science class were studying the water cycle. Groups of students decided to design experiments to learn more about the process of evaporation.

One group of students was given four different containers by the teacher. The containers are shown below.



The students poured 100 milliliters of water at 20 °C into each container. The containers were then placed side by side on a table near the window for 24 hours. The next day the students used a graduated cylinder to measure the amount of water left in each container.

**2** Write **one** question the students were probably trying to answer in their investigation.

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**3** Explain why the students placed the containers side by side instead of placing each container in a different room.

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A second group of students decided to see if different liquids evaporate at the same rate. The students decided to test three liquids: fresh water, salt water, and rubbing alcohol. The students poured 50 mL of each liquid into a separate beaker at room temperature, and the beakers were placed next to one another on a shelf.



After two days, the students used a graduated cylinder to measure the amount of liquid remaining in each beaker. The table below shows the results from their experiment.

Type of Liquid	Amount of Liquid After Two Days
Fresh Water	35.3 mL
Salt Water	38.6 mL
Rubbing Alcohol	22.7 mL

- 4** Before the experiment, the students made the hypothesis that salt water would evaporate faster than the other liquids. Do the results of their experiment support their hypothesis? Explain your answer.

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The last group of students wanted to investigate the effect of temperature on the evaporation rate of water. To do this, the students obtained twelve beakers from their teacher and poured 100 milliliters of water at room temperature into each beaker. The beakers were then divided into four groups of three. Each group of beakers was placed on a separate hot plate, and the water temperatures were maintained at 30 °C, 45 °C, 60 °C, and 75 °C respectively. After four hours, the students measured the amount of water remaining in each beaker and calculated the amount of water that had evaporated.

**5**

Write a possible hypothesis for the students' experiment.

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**6**

Explain why the students used three beakers of water at each temperature rather than just one beaker.

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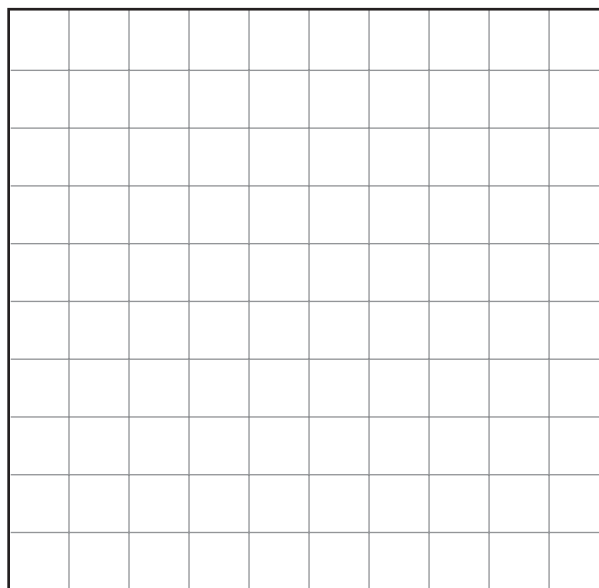
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The table below shows the results of this experiment.

### EVAPORATION

Temperature (°C)	Amount of Water Evaporated (mL)			Average Amount of Water Evaporated (mL)
30	1.8	2.1	2.1	2.0
45	6.3	5.6	6.1	6.0
60	11.5	11.0	10.5	11.0
75	21.1	21.2	19.7	21.0

- 7** Using the grid below, construct a **line graph** showing the relationship between the temperatures of the water and the average amount of water that evaporated. **Be sure to title your graph, label each axis, and indicate the appropriate units for each axis.**



**8**

Using the data table or your graph, predict the amount of water that would evaporate after 4 hours if 100 mL of water were kept at 90 °C. Explain your answer.

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**Item 2**

**Rubric**

**Key Element:**

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*one of the following:*

- Does container size have any effect on evaporation rate?
  - Does container shape have any effect on evaporation rate?
  - In what type/kind of container will water evaporate fastest?
  - Any question that relates containers' shape or size to evaporation rate.
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**Score Points:**

1 point      one key element  
0 points     other

Standard: 1.3      Asking questions and stating hypotheses that lead to different types of scientific investigations.

**Item 3**

**Rubric**

**Key Element:**

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*one of the following:*

- The containers are placed next to one another to reduce error.
  - The containers are placed next to one another to control for an extraneous variable.
  - The containers are placed next to one another to make the results more comparable/reliable.
  - The containers are placed next to one another so that experimental conditions are same for all the containers.
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**Score Points:**

1 point      one key element  
0 points     other

Standard: 1.1      Identifying and evaluating alternative explanations and procedures.

**Item 4**

**Rubric**

**Key Element:**

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*one of the following:*

- No, the table shows that less of the fresh water and rubbing alcohol were left.
  - No, more liquid evaporated from the beakers containing fresh water and rubbing alcohol.
  - No, the amount of fresh water and rubbing alcohol left in the beakers was less than the salt water.
  - No, 11.4 mL of salt water evaporated which is less than the evaporated fresh water (14.7 mL) and rubbing alcohol (27.3 mL).
  - Any explanation that data does not support the hypothesis since more salt water was left or less salt water evaporated than the other two liquids.
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**NOTE:** Give credit if the answer is correct but the water and rubbing alcohol are transposed.

**Score Points:**

1 point      one key element  
0 points     other

Standard: 1.6      Interpreting and evaluating data in order to formulate conclusions.

**Item 5**

**Rubric**

**Key Elements:**

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*one of the following:*

- Temperature has no effect on the evaporation rate.
  - Evaporation will be maximum at 75 °C.
  - Evaporation will be maximum at 30 °C.
  - Evaporation will be same at different temperatures.
  - Any statement (not a question) relating temperature and evaporation rate.
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**Score Points:**

1 point      one key element  
0 points     other

Standard: 1.3      Asking questions and stating hypotheses that lead to different types of scientific investigations.



**Item 6**

**Rubric**

**Key Elements:**

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*one of the following:*

- A bigger sample size leads to reliable, more accurate, data.
  - Students used three beakers of water to reduce errors.
  - Students used three beakers of water to determine the average result for the experimental data.
  - any answer indicating larger sample sizes yield more reliable results
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**Score Points:**

1 point	one key element
0 points	other

Standard: 1.1      Identifying and evaluating alternative explanations and procedures.

**Item 7**

**Rubric (Total Score Points: 4)**

**Graph format**

Key Element	Acceptable examples	Unacceptable examples
Title	<ul style="list-style-type: none"> <li>• Temperature vs. Amount of Water Evaporated</li> <li>• Evaporation of Water at Different Temperatures</li> <li>• Degrees vs. mL Evaporated</li> </ul>	<ul style="list-style-type: none"> <li>• Graph</li> <li>• Data Table</li> <li>• Average evaporation</li> <li>• Averages</li> <li>• Evaporation Investigation</li> </ul>
Length of Line	Line may extend beyond points in either direction.	If the line begins at 0 and connects with the four points, it is incorrect.
Space Utilization	Scaled from 0–100 on <i>x</i> -axis (each line 10 ) and 0–25 on the <i>y</i> -axis (each line 2.5mL). Other scales that utilize a majority of graph space are acceptable.	Scaled less than 0–100 on the <i>x</i> -axis with each line being more than 10 or scaled less than 0–25 on the <i>y</i> -axis with each line being more than 2.5 mL.
Correct information on both <i>x</i> and <i>y</i> -axis	Temperature on the <i>x</i> -axis, Average Amount of Water Evaporated on the <i>y</i> -axis	Words such as trials, tests, or times are not acceptable.
<i>x</i> -axis labeled with units	Degrees C (mL if <i>x</i> -axis label is average amount of water evaporated)	Incorrect or no label.
<i>y</i> -axis labeled with units	mL (Degrees C if the <i>y</i> -axis is Temperature)	Incorrect or no label.
Data Plotted	Only the four average amounts of water evaporated may be plotted.	Any other information plotted on either axis.

**Score Points:**

- 2 points six or more key elements
- 1 point four or five key elements
- 0 points three or less key elements/irrelevant, unclear, or inaccurate information

**Graph accuracy**

**Score Points:**

- 2 points four data points plotted correctly with a line connecting the points
- 1 point three data points plotted correctly with a line connecting the points, or all data points plotted correctly but not connected with a line
- 0 points three data points plotted correctly but not connected with a line, or two or fewer data points plotted correctly with a line connecting the points, or irrelevant, unclear, or inaccurate information

Standard: 1.7 Communicating results of their investigation in appropriate ways.

**Item 8**

**Key Elements:**

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any amount between 27 and 50 mL.

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*one of the following:*

- As temperature increased from 60 to 75 °C, evaporation rate doubled.
  - Any explanation indicating extrapolation of the line/curve.
  - Any explanation indicating that evaporation rate is increasing with increasing temperature.
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**Score Points:**

2 points	two key elements
1 point	one key element
0 points	other

Standard: 1.6      Interpreting and evaluating data in order to formulate conclusions.

# CSAP Grade 8

## Science

### Directions

The table below shows how far away people can feel tremors from earthquakes of different magnitudes. The table also shows about how many times each year earthquakes of different magnitudes occur. Use the table to do Numbers 9 and 10.

Magnitude	Distance From Earthquake That Tremors Can Be Felt	Number Occurring Each Year
3	24 kilometers	49,000
4	48 kilometers	6,200
5	112 kilometers	800
6	200 kilometers	120
7	400 kilometers	18
8	720 kilometers	1

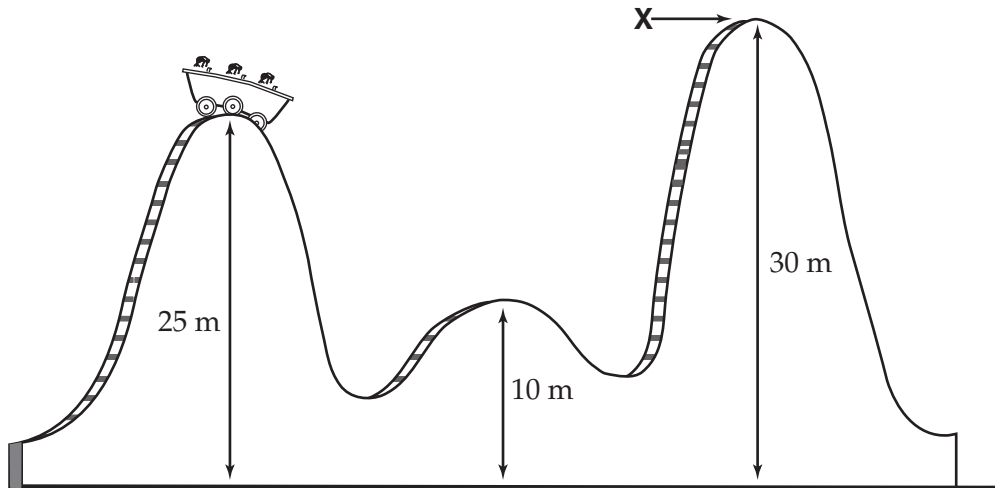
**9** According to the table, as the magnitude of earthquakes increases, the distance that tremors will be felt

- increases.
- decreases.
- increases and then decreases.
- remains the same.

**10** If an earthquake with a magnitude of 2 occurred, how far away from the earthquake would the tremors most likely be felt?

- more than 112 kilometers
- between 48 and 112 kilometers
- between 24 and 48 kilometers
- less than 24 kilometers

**11** Look at the picture of a roller coaster below.



The car on the roller coaster is released from the position shown and allowed to roll freely.

Name **two** of the forces that affect the motion of the car while it moves on the roller coaster.

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Describe how the potential and kinetic energy of the car change as the car rolls downhill.

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Explain why the car **cannot** reach point **X** on the third hill, as shown in the picture.

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**Item 11**

**Rubric**

**Key Elements:**

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*any two of the following:*

- gravity
  - air resistance/air/wind
  - friction
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The kinetic energy increases and the potential energy decreases.

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*one of the following:*

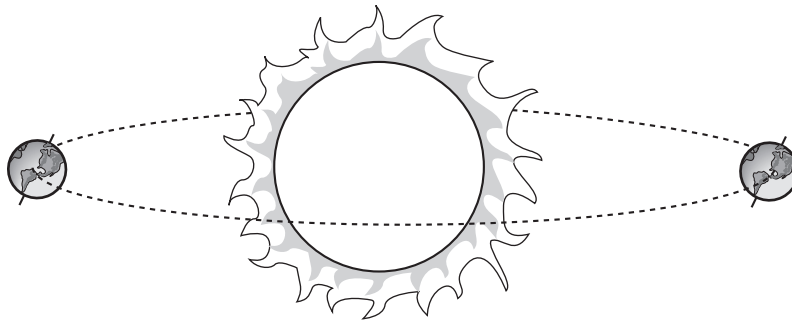
- The car loses energy due to friction/air resistance.
  - The car started from a point that is lower than **X**, hence it does not have the energy to reach **X**.
  - Any answer indicating that energy is lost **or** that the energy the car has at the starting point is less than the energy needed to reach **X**.
- 

**Score Points:**

3 points	three key elements
2 points	two key elements
1 point	one key element
0 points	other

Standard: 2.3.5      Describing, measuring, and calculating quantities that characterize moving objects and their interactions within a system.

- 12** Explain **two** main causes of seasons on Earth. Look at the diagram below to help with your written explanation.



Explanation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Item 12**

**Key Elements:**

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Earth revolves/goes around the sun.

**NOTE:** No credit if the student refers to changing distance between the sun and Earth.

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Earth's axis of rotation is tilted / directness of the sun's rays changes.

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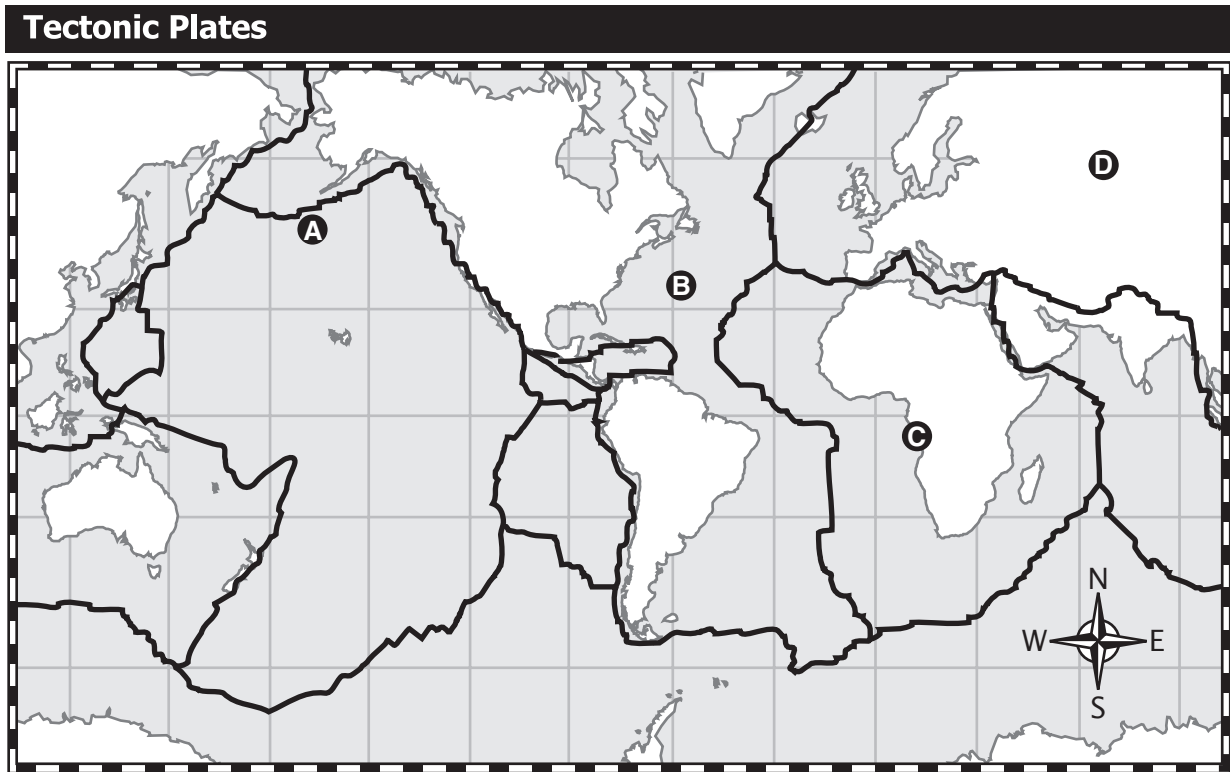
**Score Points:**

2 points	two key elements
1 point	one key element
0 points	other

Standard: 4.4.2      Explaining the effects of relative motion and positions of the sun, Earth, and moon.



**13** The map below shows many of Earth's tectonic plates.



At which labeled place (A, B, C, or D) on the map would the most earthquakes probably occur?

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Explain why.

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**Item 13**

**Rubric**

**Key Elements:**

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A

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Place A is closest to a tectonic plate boundary.

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**NOTE:** Give full credit even if ‘place A’ is not mentioned separately but is indicated in the explanation.

**Score Points:**

2 points	two key elements
1 point	one key element
0 points	other

Standard: 4.1.4      Explaining the distribution and causes of natural events.

**14** Choose **one** of the technologies listed below and describe one way scientists use it to study Earth.

- satellite
- seismograph

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**Item 14**

**Key Elements:**

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Satellite:

*one of the following:*

- map the earth
  - study weather
  - take photographs of Earth
  - any other way scientists use satellites
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Seismograph:

*one of the following:*

- study earthquakes
  - study the composition of the earth
  - any other way scientists use seismographs
- 

**NOTE:** Give credit if the student does not specifically list the technology but it can be inferred from the description.

**Score Points:**

1 point	one key element
0 points	other

Standard: 5.4      Describing how people use science and technology in their professions.

**15** Explain why it is practical to use solar energy as a resource in Colorado.

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Give **one** advantage of using solar energy instead of using natural gas.

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**Item 15**

**Rubric**

**Key Elements:**

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any response indicating the abundance of sunlight in Colorado

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*one of the following:*

- Solar energy is renewable/natural gas is nonrenewable.
  - Using solar energy does not give off any harmful substances/burning natural gas gives off harmful substances into the air.
  - Solar energy is cheaper.
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**Score Points:**

2 points	two key elements
1 point	one key element
0 points	other

Standard: 5.3      Describing how the use of technology can help solve an individual or community problem.