

## Sample Test Questions Grades 7 and 8

Below are sample questions from the Third International Mathematics and Science Study (TIMSS) achievement tests in Science administered to twenty-six countries. TIMSS is a research project sponsored by the International Association for the Evaluation of Educational Achievement (IEA). These questions may be used in the classroom, as a tool for evaluation, or to provide examples of test-question writing.



### **Sample Questions from Earth Science, Life Science, Physics, Chemistry, and The Environment**

#### **Earth Science**

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1. The source of energy for the Earth's water cycle is the
  - A. wind
  - B. sun's radiation
  - C. Earth's radiation
  - D. sun's gravity

Answer: B

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2. Which BEST describes the surface of the Earth over billions of years?
  - A. A flat surface is gradually pushed up into higher and higher mountains until the Earth is covered with mountains.
  - B. High mountains gradually wear down until most of the Earth is at sea level.
  - C. High mountains gradually wear down as new mountains are continually being formed.
  - D. High mountains and flat plains stay side by side for billions of years with little change.

Answer: C

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3. Fossil fuels were formed from
  - A. uranium
  - B. sea water
  - C. sand and gravel

D. dead plants and animals

Answer: D

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4. Air is made up of many gases. Which gas is found in the greatest amount?

- A. Nitrogen
- B. Oxygen
- C. Carbon dioxide
- D. Hydrogen

Answer: A

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5. The sun is bigger than the moon, but they appear to be about the same size when you look at them from the Earth. Why is this?

Answer: Should mention that the sun is farther away than the moon.

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6. Jane and Mario were discussing what it might be like to live on other planets. Their science teacher gave them data about the Earth and an imaginary planet, Athena. The table shows these data.

	EARTH	ATHENA
Atmospheric Conditions	21% oxygen	10% oxygen
	0.03% carbon dioxide	80% carbon dioxide
	78% nitrogen	5% nitrogen
	ozone layer	no ozone layer
Distance from a star like the sun	148,640,000 km	103,600,000 km
Rotation on axis	1 day	200 days
Revolution around the sun	365 1/4 days	200 days

Write down one important reason why it would be difficult for humans to live on Athena if it existed.

Answer: The answer should include that it would be too hot on Athena because of the greenhouse effect caused by the high percentage of carbon dioxide.

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7. Which statement explains why daylight and darkness occur on Earth?

- A. The Earth rotates on its axis.
- B. The sun rotates on its axis.
- C. The Earth's axis is tilted.
- D. The Earth revolves around the sun.

Answer: A

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8. How long does it take light from the nearest star other than the sun to reach the

Earth?

- A. Less than 1 second
- B. About 1 hour
- C. About 1 month
- D. About 4 years

Answer: D

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9. Write down one reason why the ozone layer is important for all living things on Earth.

Answer: Should refer to protection against the UV rays of the sun.

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### Life Science

1. What is the BEST reason for including fruits and leafy vegetables in a healthy diet?

- A. They have a high water content.
- B. They are the best source of protein.
- C. They are rich in minerals and vitamins.
- D. They are the best source of carbohydrates.

Answer: C

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2. What features do all insects have?

	Number of Legs	Number of Body Parts
A.	2	4
B.	4	2
C.	6	3
D.	8	3

Answer: C

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3. When you bend your arm at the elbow, the bones and muscles in your arm are acting as a system. What simple machine does this system represent?

- A. Inclined plane
- B. Pulley
- C. Wedge
- D. Lever

Answer: D

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4. AMOUNT OF OXYGEN PRODUCED IN A POND

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Location	Oxygen Produced
Top Meter	4 grams/cubic meter
Second Meter	3 grams/cubic meter
Third Meter	1 gram/cubic meter
Bottom Meter	0 grams/cubic meter

Which statement is consistent with the data in the table?

- A. More oxygen production occurs near the surface because there is more light there.
- B. More oxygen production occurs near the bottom because there are more plants there.
- C. The greater the water pressure, the more oxygen production occurs.
- D. The rate of oxygen production is not related to depth.

Answer: A

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5. Which species have been on the Earth for the shortest amount of time.

- A. Humans
- B. Insects
- C. Fish
- D. Reptiles

Answer: A

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6. How are warm-blooded animals different from cold-blooded animals?

- A. Warm-blooded animals have a higher metabolism in warm weather.
- B. Warm-blooded animals are more aggressive in captivity.
- C. Warm-blooded animals always have a higher blood temperature.
- D. Warm-blooded animals normally maintain a fairly constant internal temperature at all air temperatures.
- E. Warm-blooded animals are found only in warm climates.

Answer: D

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7. How could you find out how old a tree is after it is cut?

Answer: Should include counting the rings in a trunk referring to one ring for each year.

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8. The male insects in a population are treated to prevent sperm production. Would this reduce the insect population?

- A. No, because the insects would still mate.

- B. No, because it would not change the offspring mutation rate.
- C. Yes, because it would sharply decrease the reproduction rate.
- D. Yes, because the males would die.

Answer: C

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9. Which is made with the help of bacteria?

- A. Yogurt
- B. Cream
- C. Soap
- D. Cooking oil

Answer: A

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10. What is the main function of chloroplasts in a plant cell?

- A. To absorb light energy and manufacture food.
- B. To remove waste materials by active transport.
- C. To manufacture chemical energy from food.
- D. To control the shape of a cell.

Answer: A

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11. Which BEST explains why green marine algae are most often restricted to the top 100 meters of the ocean?

- A. They have no roots to anchor them to the ocean floor.
- B. They can live only where there is light.
- C. The pressure is too great for them to survive below 100 meters.
- D. If the algae lived below 100 meters they would be eaten by animals.

Answer: B

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12. A girl found the skull of an animal. She did not know what the animal was but she was sure that it preyed on other animals for its food. What clues led to this conclusion?

- A. The eye sockets faced sideways.
- B. The skull was much longer than it was wide.
- C. There was a projecting ridge along the top of the skull.
- D. Four of the teeth were long and pointed.
- E. The jaws could move sideways as well as up and down.

Answer: D

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13. When a bird sings it is most likely singing in order to

- A. frighten away other types of birds
- B. mark the bird's territory against another type of bird
- C. attract insects

D. wake up other animals

Answer: B

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14. On cold days, snakes usually lie very still and eat very little or nothing, while birds usually move around and eat a lot of food. Which statement best explains this?

A. Both animals are cold-blooded, but without feathers to keep warm, snakes get too cold to move.

B. Unlike birds, snakes are warm-blooded; they must hibernate during cold weather.

C. Unlike snakes, birds are cold-blooded; they are less affected by the cold than snakes.

D. Unlike snakes, birds are warm-blooded; they must eat food to maintain a constant temperature.

Answer: D

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15. Which of these meals would give you most of the nutrients that you need?

A. Meat, milk, and a piece of chocolate

B. Bread, vegetables, and fish

C. Vegetables, fruit, and water

D. Meat, fish, and bread

Answer: B

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16. Years ago farmers found that corn plants grew better if decaying fish were buried near by. What did the decaying fish probably supply to the plants to improve their growth?

A. energy

B. minerals

C. protein

D. oxygen

E. water

Answer: B

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17. Which is the most basic unit of living things?

A. Cells

B. Bones

C. Tissues

D. Organs

Answer: A

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18. Write down the reason why we get thirsty on a hot day and have to drink a lot.

Answer: Should refer to perspiration and its cooling effect and the need to replace

lost water.

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19. Jose caught influenza. Write down one way he could have caught it.

Answer: Should refer explicitly to the transmission of germs.

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20. What happens when an animal hibernates?

- A. There is no life in any of its parts.
- B. It stops breathing.
- C. Its temperature is higher than when it is active.
- D. It is absorbing energy for use when it is active.
- E. It is using less energy than when it is active.

Answer: E

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21. What digestive substance is found in the mouth? What does it do?

Answer: Should name saliva and the fact that it helps to make food moist or soft.

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22. What is the advantage of having two eyes to see with rather than one eye?

Answer: Should mention that two eyes allow for better depth perception or the perception of distance.

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23. What could be the unwanted consequences of introducing a new species to a certain area? Give an example.

Answer: Should state that the natural (ecological) balance will be upset. A realistic example of a species could be given.

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24. Suppose you want to investigate how the human heart rate changes with changes in activity. What materials would you use and what procedures would you follow?

Answer: Should describe a procedure in which i. Somebody (or self) measures pulse at rest using a timer or watch, ii. Then the student does an exercise (physical activity). iii. Pulse is remeasured during or after exercise.

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## Physics

1. A metal spoon, a wooden spoon, and a plastic spoon are placed in hot water. After 15 seconds, which spoon will feel the hottest?

- A. The metal spoon
- B. The wooden spoon
- C. The plastic spoon
- D. The three spoons will feel the same.

Answer: A

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2. Which form of solar radiation causes sunburn?

- A. Visible
- B. Ultraviolet
- C. Infrared
- D. X-rays
- E. Radio waves

Answer: B

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3. Air is colorless, odorless, and tasteless. Describe one way that air can be shown to exist.

Answer: Should include that you can see or feel effects of air movement.

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4. Machine A and Machine B each used to clear a field. The table shows how large an area each cleared in 1 hour and how much gasoline each used.

	Area of field cleared in 1 hour	Gasoline used in 1 hour
Machine A	2 hectares	3/4 liter
Machine B	1 hectare	1/2 liter

Which machine is more efficient in converting the energy in gasoline to work? Explain your answer.

Answer: Machine A because it uses less gas per hectare.

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5. The crews of two boats at sea can communicate with each other by shouting. Why is it impossible for the crews of two space ships a similar distance apart in space to do this?

- A. The sound is reflected, more in space.
- B. The pressure is too high inside the spaceships.
- C. The spaceships are traveling faster than sounds.
- D. There is no air in space for sound to travel through.

Answer: D

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6. A flashlight close to a wall produces a small circle of light compared to the circle it makes when the flashlight is far from the wall. Does more light reach the wall when the flashlight is further away?

Yes

No

(Check one)

Explain your answer

Answer: No, the answer should explain that the same amount of light reaches the



wall.

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7. A tight metal lid on a jar of pickles may loosen when it has been held in hot water. This is because the hot water causes the
- A. glass jar to contract
  - B. metal lid to contract
  - C. glass jar to expand more than the metal lid expands
  - D. metal lid to expand more than the glass jar expands

Answer: D

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8. A glass of water with ice cubes in it has a mass of 300 grams. What will the mass be immediately after the ice has melted? Explain your answer.

Answer: Should be 300 g and include an explanation.

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9. When white light strikes on Peter's shirt, the shirt looks blue. Why does the shirt look blue?
- A. It absorbs all the white light and turns most of it into blue light.
  - B. It reflects the blue part of the light and absorbs most of the rest.
  - C. It absorbs only the blue part of the light.
  - D. It gives off it's own blue light.

Answer: B

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10. Electric energy is used to power a lamp.

Is the amount of light energy produced more than, or less than, or the same as the amount of electrical energy used?

The amount of light energy produced is

more than

less than

the same as the amount of electrical energy used

(check one)

Give a reason to support your answer.

Answer: Less. Should mention that (much) energy is transformed to heat.

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11. One day when the temperature was just below 0 degrees C, Peter and Ann made snowballs. They put a thermometer into one of the snowballs and it showed 0 degrees C. They tries to make the snowball warmer by holding it in their hands. What do you think the thermometer showed after two minutes? Explain your answer.

Answer: Should include that the same temperature exists because snow cannot get

warmer than 0 degrees.

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## Chemistry

1. The words *cloth*, *thread*, and *fiber* can be used in the following sentence: *cloth* consists of *threads* which are made of *fiber*. Use the words *molecules*, *atoms*, and *cells* to complete the following sentence:

\_\_\_\_\_ consists of \_\_\_\_\_ which are made of \_\_\_\_\_.

Answer: Cells-Molecules-Atoms.

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2. Which is an example of a chemical reaction?

- A. The melting of ice
- B. The grinding of salt crystals to powder.
- C. The burning of wood.
- D. The evaporation of water from a puddle.

Answer: C

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3. Animals are made up of many atoms. What happens to the atoms after an animal has died?

- A. The atoms stop moving.
- B. The atoms recycle back into the environment.
- C. The atoms split into simpler parts and then combine to form other atoms.
- D. The atoms no longer exist once the animal has decomposed.

Answer: B

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4. Which gas could cause a glowing splint to burst into flame?

- A. Neon
- B. Oxygen
- C. Nitrogen
- D. Carbon dioxide

Answer: B

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5. Which of the following is NOT a mixture?

- A. Air
- B. Blood
- C. Orange juice
- D. Salt

Answer: D

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6. When oil is burning, the reaction will

- A. only release energy
- B. only absorb energy
- C. neither absorb nor release energy
- D. sometimes release and sometimes absorb energy depending on the oil

Answer: A

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7. Which is a chemical change?
- A. Element 1 is hammered into a thin sheet.
  - B. Element 2 is heated and turns to a liquid.
  - C. Element 3 turns a greenish color as it sits in air.
  - D. Element 4 is ground up into a fine, slippery powder.

Answer: C

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8. If a neutral atom loses an electron, what is formed?
- A. A gas
  - B. An ion
  - C. An acid
  - D. A molecule

Answer: B

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9. A mixture of powdered iron and sulfur is heated. What will be formed?
- A. a single element
  - B. two other elements
  - C. a solution
  - D. an alloy
  - E. a compound

Answer: E

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10. Which is NOT an example of a chemical change?
- A. Boiling water
  - B. Rusting iron
  - C. Burning wood
  - D. Baking bread

Answer: A

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11. Carbon dioxide is the active material in some fire extinguishers. How does carbon dioxide extinguish a fire?

Answer: Should include that carbon dioxide keeps oxygen away, response should include a specific reference to oxygen.

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12. It takes 10 painters 2 years to paint a steel bridge from one end to the other. The paint that is used lasts about 2 years, so when the painters have finished painting at one end of the bridge, they go back to the other end and start painting again.

a. Why MUST steel bridges be painted?

b. A new paint that lasts 4 years has been developed and costs the same as the old paint. Describe 2 consequences of using the new paint.

Answer: a. Must include that the bridge should be painted to avoid corrosion.

Answer: b. Must include that the new paint will be cheaper for the community.

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## Environment

1. Maria collected the gas given off by a glowing piece of charcoal. The gas was then bubbled through a small amount of colorless limewater. Part of Maria's report stated, "After the gas was put into the jar, the limewater gradually changed to a milky white color." This statement is

A. an observation

B. a conclusion

C. a generalization

D. an assumption of the investigation

E. a hypothesis

Answer: A

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2. Juanita did several experiments to germinate corn. She summed up her results as follows:

1. Moist grains of corn germinate in the light.

2. Moist grains of corn germinate in the dark.

What can you conclude from her results?

Answer: Should include that light is not required for moist corn to germinate.

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3. Write down one example of how computers help people do their work.

Answer: Should refer to writing or editing text.

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4. A cupful of water and a similar cupful of gasoline were placed on a table near a window on a hot sunny day. A few hours later it was observed that both the cups had less liquid in them but that there was less gasoline left than water. What does this experiment show?

A. All liquids evaporate

B. Gasoline gets hotter than water

C. Some liquids evaporate faster than others.

D. Liquids will only evaporate in sunshine.

E. Water gets hotter than gasoline.

Answer: C

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5. One of the principal causes of acid rain is
- A. waste acid from chemical factories being pumped into rivers
  - B. acid from chemical laboratories being pumped into rivers
  - C. gases from burning coal and oil dissolving in water in the atmosphere
  - D. gases from air conditioners and refrigerators escaping into the atmosphere

Answer: C

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6. Whenever scientists carefully measure any quantity many times, they expect that
- A. all of the measurements will be exactly the same
  - B. only two of the measurements will be exactly the same
  - C. all but one of the measurements will be exactly the same
  - D. most of the measurements will be close, but not exactly the same

Answer: D

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7. Since water is a renewable resource and so much of it falls each year, theoretically there should be enough water for everyone on Earth. Write down TWO reasons why not everyone has enough water.

Answer: Should mention the uneven distribution of rain or other sources of water.