

GRADE 11

HIGH SCHOOL STUDENT PRACTICE TEST BOOKLET

Student Name: _____



MEA

Maine Educational Assessment

RELEASED 2017 SCIENCE ITEMS

Maine Department of Education

SCIENCE PRACTICE TEST

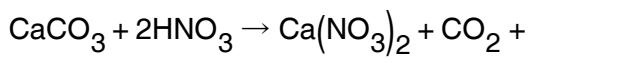
This practice session has twenty multiple-choice and two constructed-response questions.

Choose the best answer for each multiple-choice question and mark your answer choices for questions 1 through 20 in the spaces provided on page 2 of your practice test answer booklet.

1. Each pair of animals listed below has similar adaptations.
- Rabbits and lizards are fast runners.
 - Tortoises and clams have hard shells.
 - Sea urchins and hedgehogs have spines.

What do all the animals in the list have in common?

- (A) The animals are prey to the same predators.
 - (B) The animals compete for the same food.
 - (C) Each adaptation helps the animals obtain food.
 - (D) Each adaptation protects the animals from predators.
2. The balanced chemical equation below occurs between marble and nitric acid, a component of acid rain.



What is the missing product in the chemical equation?

- (A) 2HO
- (B) O₂
- (C) H₂O
- (D) H₂

3. The information below describes a change in a moth population.

In the 1700s, a population of moths in Britain were mostly light-colored. Some moths were also dark-colored. Most of the tree trunks where the moths rested were light-colored. After the Industrial Revolution, most of the tree trunks became dark-colored because of soot from smokestacks.

Which statement helps explain why the moth population contained mostly dark-colored moths after the Industrial Revolution?

- (A) Dark-colored moths were camouflaged to survive, and then reproduced more than light-colored moths.
- (B) Light-colored moths were less healthy than dark-colored moths and rarely reproduced.
- (C) Most of the light-colored moths became dark-colored through genetic mutations.
- (D) The gene for dark color was dominant, so the moth offspring were mostly dark-colored in each successive generation.

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4. A teacher dips a wire into a chemical and then places the wire into a flame and observes the color. The data table below shows the results of flame tests with four different chemicals.

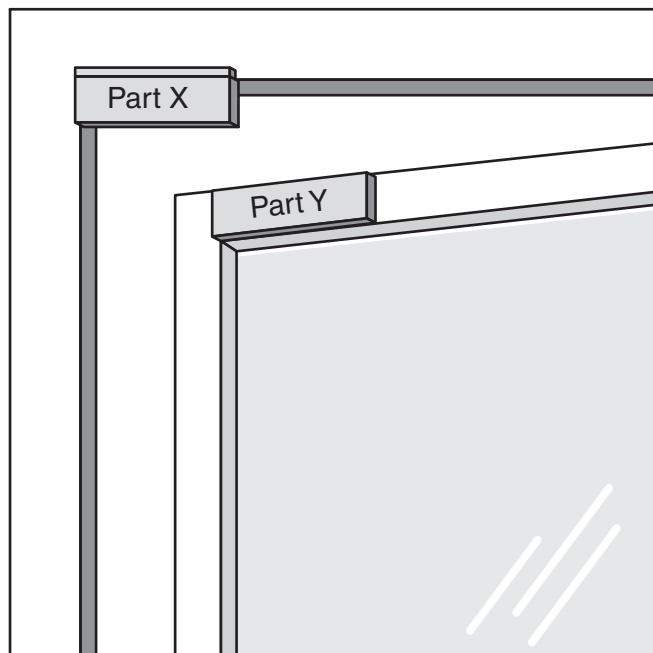
Results of Flame Tests

Chemical	Color of Flame
Barium carbonate	Green
Calcium carbonate	Orange
Copper carbonate	Blue
Strontium carbonate	Red

Which statement explains what the flame tests show?

- (A) The atoms in barium carbonate have a greater atomic mass than the atoms in copper carbonate.
 - (B) The atoms in barium carbonate have a different solubility than the atoms in strontium carbonate.
 - (C) The atoms in copper carbonate undergo a different energy change than the atoms in calcium carbonate.
 - (D) The atoms in strontium carbonate have a similar rate of reaction to that of the atoms in calcium carbonate.
5. Individual body cells undergo differentiation to become specialized in structure and function. For example, one cell may become a nerve cell and another may become a muscle cell. Differentiation occurs as a result of which of the following?
- (A) asexual reproduction
 - (B) genetic diversity
 - (C) mitosis
 - (D) selective gene expression

6. An engineer is designing a door lock. Part X is located in the doorframe; Part Y is located at the top of the door, as shown in the diagram below.



What materials should the engineer use for Parts X and Y?

- (A) Parts X and Y should both be iron so that an electric force will cause them to attract.
- (B) Parts X and Y should both be iron so that a magnetic force will cause them to attract.
- (C) Part X should be iron and Part Y should be a magnet so that an electric force will cause them to attract.
- (D) Part X should be an electromagnet and Part Y should be iron so that a magnetic force will cause them to attract.

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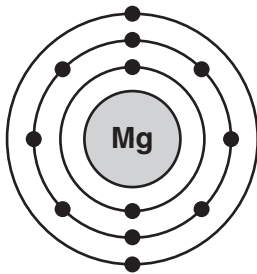
7. SRY is a gene that is found in most mammals. The DNA sequence of the SRY gene is identical in lions and leopards. Which conclusion is best supported by this information?

- (A) Lions are the ancestors of leopards.
- (B) Lions and leopards belong to the same species.
- (C) Lions can interbreed with leopards.
- (D) Lions and leopards share a common ancestor.

8. Why is carbon an essential part of life processes?

- (A) It forms the core structure of organic molecules.
- (B) It has an extremely high melting temperature.
- (C) It combines with oxygen to produce carbon dioxide.
- (D) It helps to maintain a steady body temperature.

9. The diagram below shows the distribution of electrons in a magnesium (Mg) atom.



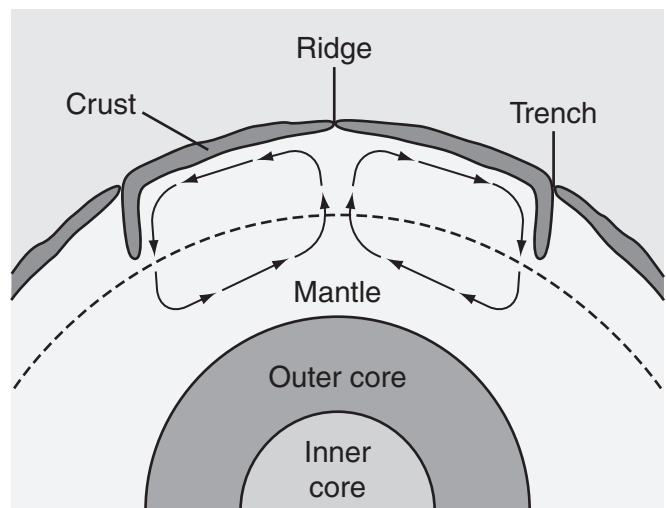
Which statement best predicts what happens to Mg atoms in a chemical reaction?

- (A) They tend to gain 6 electrons to form Mg^{6-} ions.
- (B) They tend to lose 2 electrons to form Mg^{2+} ions.
- (C) They tend to share 8 electrons equally with other atoms.
- (D) They tend to share 2 electrons equally with other atoms.

10. Which mechanism would most likely help a population adapt to a changing environment over time?

- (A) a genetic mutation that slows aging in the body cells of an organism
- (B) random genetic mutations that occur in the reproductive cells of organisms
- (C) a genetic mutation that controls cell division in the body cells of an organism
- (D) reproduction that produces offspring with traits identical to those of the parent organisms

11. The diagram below shows a model of convection cells in Earth's mantle.



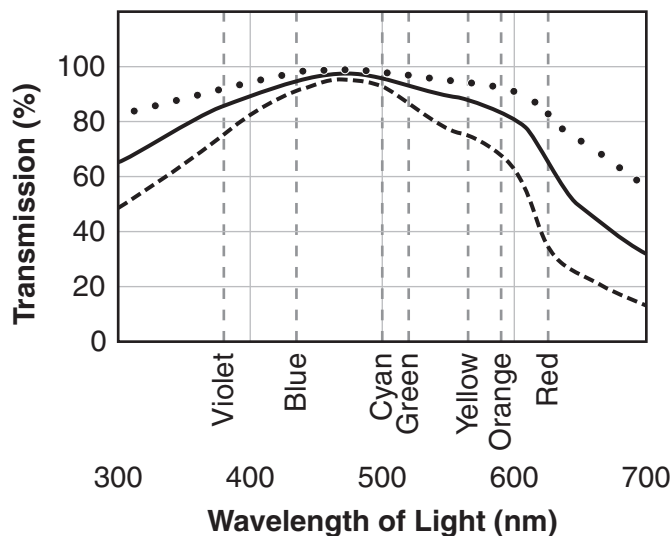
Based on the model, what processes occur at the ridge?

- (A) Old crust melts and becomes absorbed by the mantle.
- (B) Solar radiation is absorbed by the crust and transferred to the mantle.
- (C) Heat energy from the mantle is released and new crust forms.
- (D) Metals from the inner core reach Earth's surface and become part of the crust.

PLEASE GO ON →

12. The diagram below shows how different wavelengths of sunlight interact with clear ocean water at different depths.

Percent Transmission of Light vs. Wavelength and Depth of Clear Ocean Water



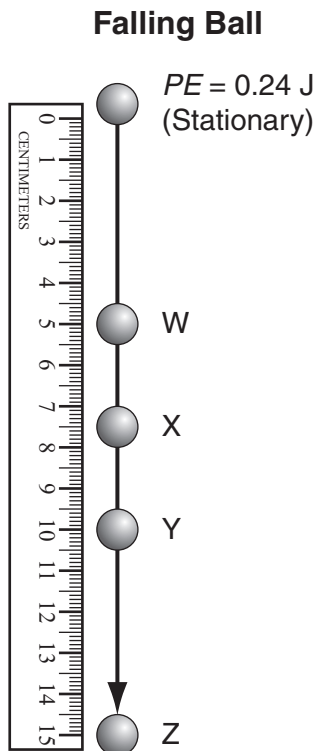
Key	
•••••	1 m deep
————	2 m deep
-----	4 m deep

A diver is preparing to take digital color photos underwater. Based on the transmission characteristics of the ocean water, what conclusion can be made about the available light?

- (A) Cyan light is absorbed more than green light as depths increase.
- (B) Violet light is absorbed more than orange light as depths increase.
- (C) Red light is absorbed more than blue light as depths increase.
- (D) Blue light is absorbed more than yellow light as depths increase.
13. On a hot summer day, a can of soda expanded in a parked car. Which statement best explains why the pressure in the can increased enough to cause the expansion?
- (A) The kinetic energy of the molecules in the can increased.
- (B) The number of molecules in the can increased.
- (C) The potential energy of the molecules in the can increased.
- (D) The size of the molecules in the can increased.
14. A protoplanetary disk is a rotating disk of matter that surrounds a star in the early stages of a solar system. What force plays the greatest role in the formation of a planet from dust and rocks in a protoplanetary disk?
- (A) magnetic
- (B) electrostatic
- (C) gravitational
- (D) frictional
15. Mature red blood cells do not have DNA or cell organelles. How does not having DNA or cell organelles affect mature red blood cells?
- (A) They can only reproduce through mitosis.
- (B) They have cell membranes that contain no lipids.
- (C) They must make DNA through replication.
- (D) They cannot use genetic information to make proteins.

PLEASE GO ON →

16. The diagram below shows a small steel ball with 0.24 J of potential energy (PE) falling from a height of 15 cm.



Assuming there are no energy losses due to air resistance, at which position will the steel ball have a potential energy of 0.08 J?

- (A) position W
(B) position X
(C) position Y
(D) position Z
17. What essential need of human populations has produced significant changes in Earth's biosphere?
- (A) a need for light
(B) a need for energy
(C) a need for research
(D) a need for movement

18. The sulfur-35 isotope emits a beta particle as it undergoes radioactive decay. The table below shows changes in the number of ^{35}S atoms in a single sample over time.

^{35}S Change Over Time

Time (in days)	^{35}S Atoms Remaining
0	1500
23	1250
51	1000
88	750
139	500
227	250
492	30
1020	0

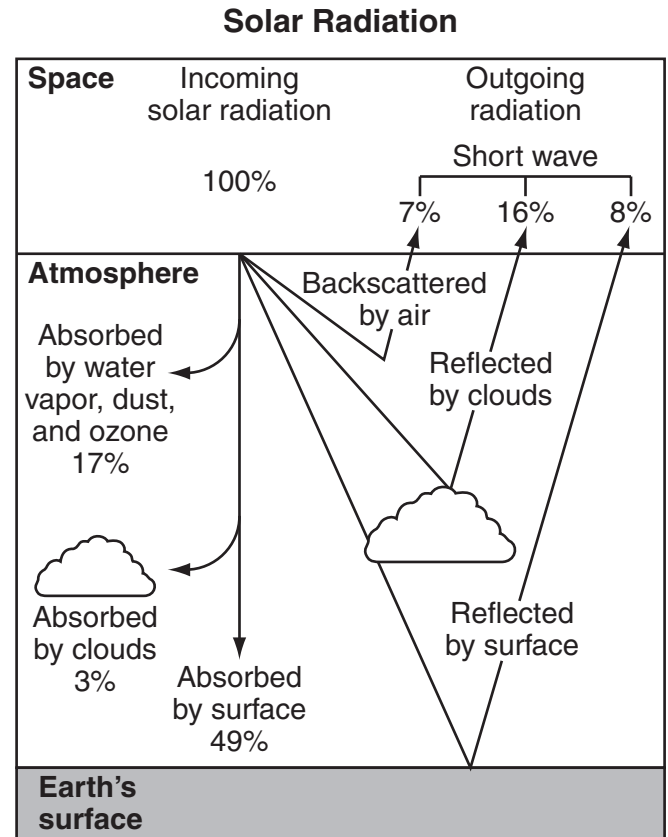
Which statement tells the half-life of the sulfur-35 isotope and how to use the data to find the half-life?

- (A) The half-life is approximately 88 days; use the data to determine the number of sulfur-35 atoms remaining at half the time needed for the sample to completely decay.
- (B) The half-life is approximately 88 days; use the data to calculate half of the sulfur-35 atoms present at the start and determine the time needed for that number to decay.
- (C) The half-life is approximately 510 days; use the data to determine the time needed for the sample to completely decay and divide that number in half.
- (D) The half-life is approximately 510 days; use the data to calculate the number of sulfur-35 atoms remaining after one-half of the sample has undergone decay.

PLEASE GO ON →

19. The Panamanian golden frog is almost extinct in the wild. Several zoos breed this species and lend male frogs to other zoos in order to build populations. Eventually, some of these frogs will be released to the wild. Why does the practice of lending male frogs for breeding increase the probability that the golden frog species will survive in the wild?
- (A) The practice identifies which male frogs are successful in adapting to new environments.
- (B) The practice increases the genetic diversity of the frog populations to be released.
- (C) The practice allows only the healthiest male frogs to reproduce in the wild.
- (D) The practice provides clues about why the golden frog species is almost extinct.

20. The diagram below shows what happens to solar radiation that enters Earth's atmosphere.



Some scientists think that an increase in the average global temperature will produce more water evaporation from oceans. How would this increased evaporation most likely affect the amount of solar radiation that reaches Earth's surface?

- (A) It would remain the same because the Sun would still emit the same amount of light.
- (B) It would decrease because more clouds would form.
- (C) It would increase because the atmosphere would have more oxygen from water vapor.
- (D) It would double because more incoming solar radiation would be absorbed.

PLEASE GO ON →

Write your answers to constructed-response questions 21 and 22 in the boxes provided on pages 2 and 3 of your practice test answer booklet. Be sure to answer and label all parts (a, b, c, etc.) of the questions.

21. The data table below shows the ages of five of the oldest materials found in our solar system.

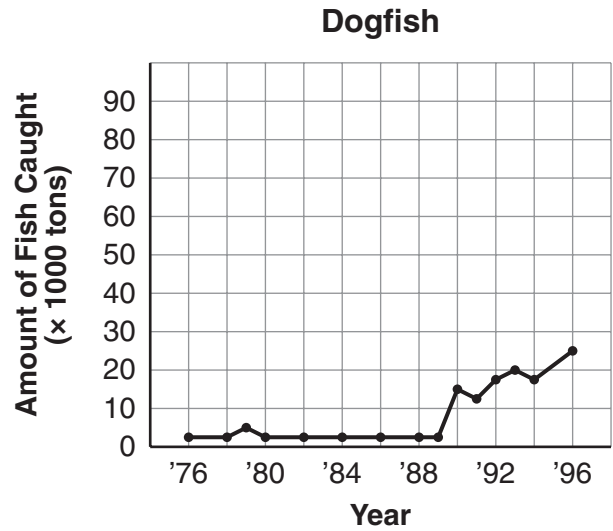
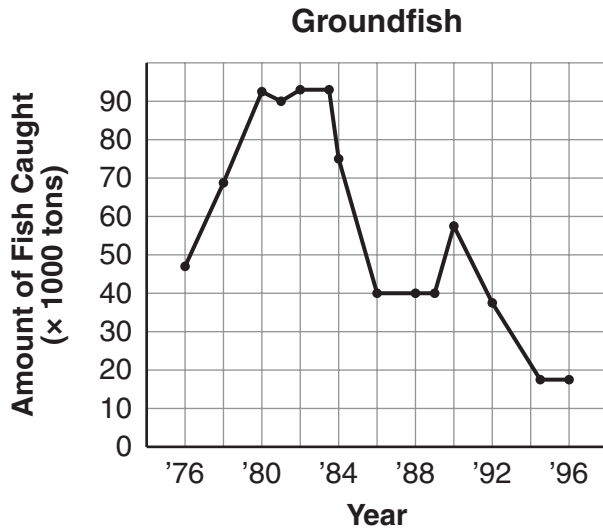
Ages of Five Materials in Our Solar System

Name	Location Found	Sample Type	Age (billion years)
Northwest Africa 2364	Africa	Meteorite	4.57
Norite clast B	Moon	Lunar rock	4.46
Zircon	Australia	Mineral	4.37
Acasta Gneiss	Greenland	Metamorphic rock	4.0
Genesis Rock	Moon	Lunar rock	4.0

- Describe how evidence from the data table can be used to support the claim that our solar system formed about 4.6 billion years ago.
- Explain why Earth's oldest rock, Acasta Gneiss, is younger than the oldest meteorite, Northwest Africa 2364.

PLEASE GO ON →

22. The graphs below display the amount of groundfish and dogfish caught in New England over a 20-year period. (Assume the number of fish caught correlates with the population size of the fish species.) The groundfish and dogfish adults prey on each other's young.



- Write a conclusion about what the populations of groundfish and dogfish will be in another 20 years if the trends in the graphs stay the same. Use evidence from both graphs to support your conclusion.
- Identify whether these fish populations are in dynamic equilibrium for the period shown in the graphs. Explain the reasoning for your answer by relating it to the data in the graphs.

