

GRADE 11

HIGH SCHOOL STUDENT PRACTICE TEST BOOKLET

Student Name: _____



MEA

Maine Educational Assessment

RELEASED 2015 SCIENCE ITEMS

Maine Department of Education

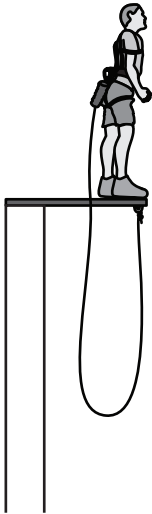
SCIENCE PRACTICE TEST

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.

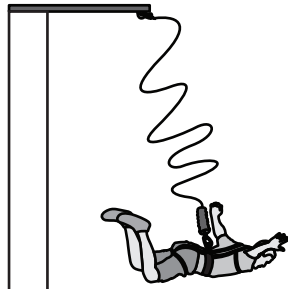
1. In a bungee jump, a person jumps from a high place while attached to a strong elastic cord. Diagram X shows a bungee jumper before jumping. Diagram Y shows the same bungee jumper shortly after jumping.

Diagram X



Before jumping

Diagram Y



Shortly after jumping

Which energy transformation is occurring at the time illustrated in Diagram Y?

- (A) Gravitational potential energy is changing into kinetic energy.
- (B) Gravitational potential energy is changing into elastic potential energy.
- (C) Kinetic energy is changing into gravitational potential energy.
- (D) Elastic potential energy is changing into gravitational potential energy.

- 2. What causes stem cells to differentiate into other cell types?
 - (A) They change by responding to sun and moon cycles.
 - (B) They change by responding to different cell-division rates.
 - (C) They change when they receive an increased influx of water.
 - (D) They change when they are given specific chemical and physical stimuli.

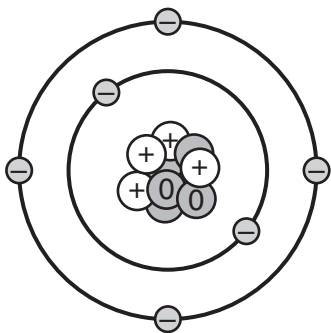
- 3. Which scientific law best explains why seatbelts are installed in cars?
 - (A) For every action there is an equal and opposite reaction.
 - (B) Any object exerts a force of attraction on any other object.
 - (C) A body in motion will remain in motion unless an outside force acts upon it.
 - (D) An object accelerates at a rate dependent on its mass and the force applied to it.

- 4. Which evidence-based theory best describes the origin of the universe?
 - (A) big bang
 - (B) gravity
 - (C) relativity
 - (D) star formation

PLEASE GO ON →

5. Populations of grasses and herbivores within a prairie ecosystem vary over time. How is it possible for this ecosystem to remain stable over many years?
- (A) As one population changes in size, other populations in the ecosystem also change in size.
 - (B) As a population changes in size, succession occurs.
 - (C) As populations of prey decrease in size, new sources of food are used by predators.
 - (D) As a population of predators increases in size, the size of the territory used by each predator increases.

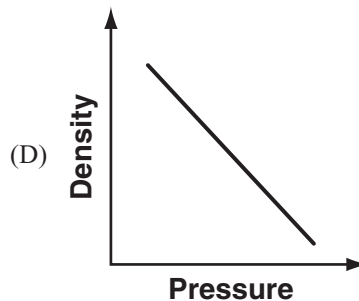
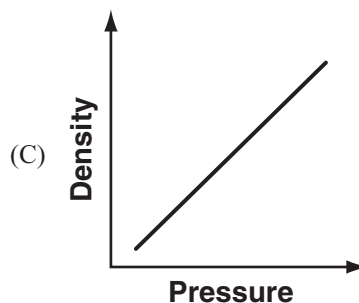
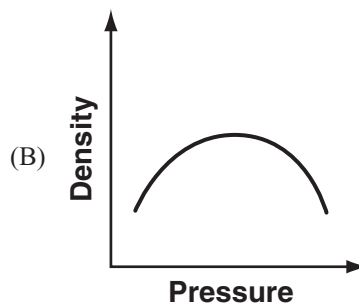
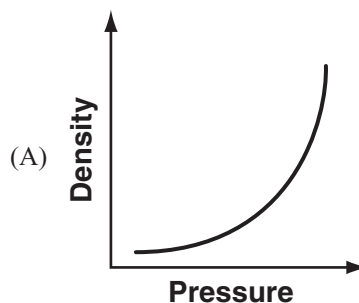
6. The diagram below shows the charges of particles in a carbon atom.



Which type of particle is marked "0"?

- (A) alpha
- (B) electron
- (C) neutron
- (D) proton

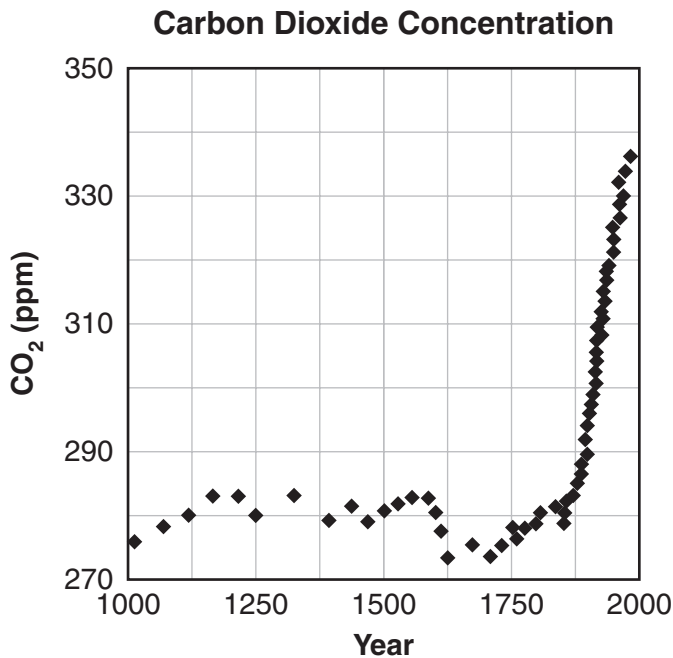
7. Pressure on a sample of nitrogen gas increases at a constant temperature. Which graph shows the relationship between gas density and pressure?



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8. What is the primary difference between a liver cell and a skin cell?
- (A) The cells contain different organelles.
 (B) The cells undergo different types of cell division.
 (C) The cells have different numbers of chromosomes and carry different DNA.
 (D) The cells have different shapes and perform different functions in the body.

9. The graph below shows the concentration of carbon dioxide changing over time.



What is the most likely reason for the increase in concentration of carbon dioxide after the 1800s?

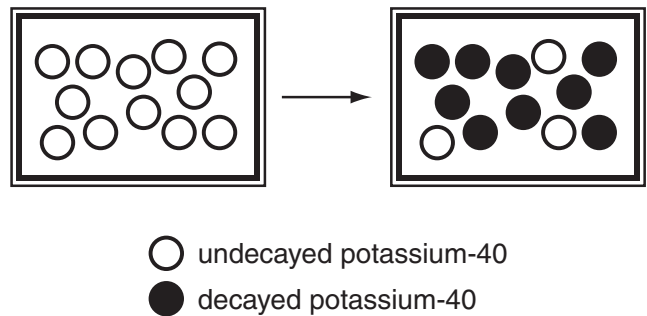
10. Red squirrels feed mainly on conifer and hardwood seeds. They make nests in dead trees. Hawks are one of their key predators.

Based on this information, which habitat would give the red squirrel the largest carrying capacity?

- (A) a new-growth forest that is recovering from an area that has been clear-cut
 (B) a mature old-growth forest with a variety of tree species
 (C) a grassy meadow area with a few mature hardwood trees spread over the area
 (D) a marsh area that is dense with plants such as blueberries and blackberries

- (A) changes in solar radiation
 (B) changes in plant growth
 (C) increase in burning fossil fuels
 (D) increase in volcanic eruptions

11. Potassium-40 is used to determine the age of rocks. The diagram below shows a rock sample in which some of the potassium-40 atoms have undergone radioactive decay.



According to the diagram, how many half-lives has the rock sample undergone?

- (A) 9 half-lives
 (B) 3 half-lives
 (C) 2 half-lives
 (D) 1 half-life
12. The current theory estimates that the universe is 13.7 billion years old. What does this age signify?
- (A) The Sun is 13.7 billion years old.
 (B) The big bang occurred 13.7 billion years ago.
 (C) The universe stopped expanding 13.7 billion years ago.
 (D) The first planets were formed 13.7 billion years ago.

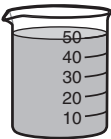
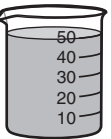
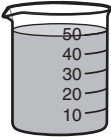
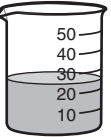
PLEASE GO ON →

13. During cellular respiration, energy released from glucose is used for life processes. What is another product of cellular respiration?
- (A) carbon dioxide
 - (B) hydrogen sulfate
 - (C) nitrogen
 - (D) oxygen
14. What will always happen to a moving object when an unbalanced force acts on it?
- (A) It will keep traveling at the same speed.
 - (B) It will eventually come to a complete stop.
 - (C) It will start to travel in a curved path.
 - (D) It will have a change in velocity.
15. What would happen if the genes involved in differentiation were removed from a newly fertilized frog egg?
- (A) The embryo would become a tadpole but not an adult.
 - (B) The embryo would develop only one type of cell.
 - (C) The adult frog would have cells capable of becoming any other type of cell.
 - (D) The adult cells would do every job required by the organism.
16. Which of the following could disrupt the dynamic equilibrium usually seen in an ecosystem?
- (A) a seasonal drought in a grassland
 - (B) clearing of a forest to build housing developments
 - (C) protection of a tropical rain forest
 - (D) a major snowstorm in a low-lying coastal area
17. Which observation best supports the big bang theory for the origin of the universe?
- (A) Matter and energy are conserved.
 - (B) New atoms are continuously being created.
 - (C) Distant galaxies are moving away from Earth.
 - (D) All locations in the universe look alike.
18. All cells in a newly formed human embryo are the same. Why is it possible for one cell to become a skin cell and another cell to become a brain cell?
- (A) Cellular structure and function are determined by environmental factors outside the embryo.
 - (B) Cellular structure and function are predetermined by internal factors during ovulation and fertilization.
 - (C) Genes that code for the development of a skin cell are activated in some cells, and genes that code for the development of a brain cell are activated in other cells.
 - (D) Cells located on one side of the embryo become skin cells, and cells located on the other side of the embryo become brain cells.

PLEASE GO ON →

19. The table below shows the amount of evaporation that occurred for two different liquid compounds over the same amount of time.

Evaporation of Two Compounds

Compound	Molecular Mass (AMU)	Initial	Final
Water	18.0		
Isopropanol	60.1		

Based on the table, what is the best conclusion about the polarity and hydrogen bonding of the molecules?

- (A) The water molecules are less polar than the isopropanol molecules and therefore have weaker hydrogen bonding.
- (B) The water molecules are more polar than the isopropanol molecules and therefore have weaker hydrogen bonding.
- (C) The water molecules are more polar than the isopropanol molecules and therefore have stronger hydrogen bonding.
- (D) The water molecules are less polar than the isopropanol molecules and therefore have stronger hydrogen bonding.

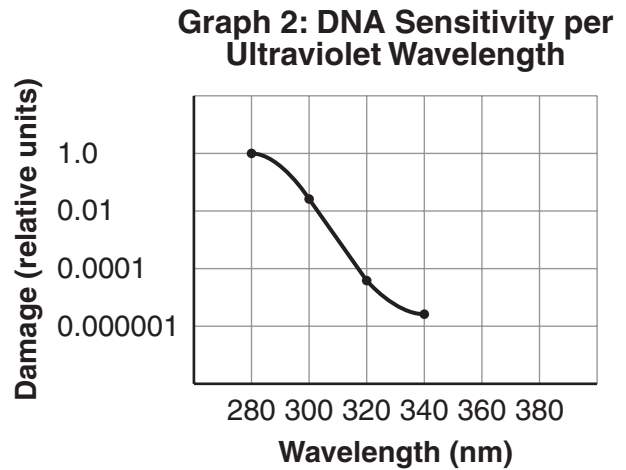
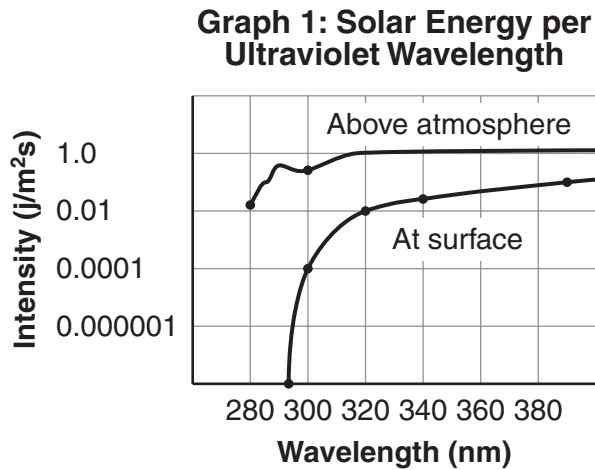
20. What must happen to a cell during meiosis?

- (A) The cell's mitochondria must double in number.
- (B) The cell's nucleus must divide its number of chromosomes in half.
- (C) The cell must divide without the nucleus dividing.
- (D) The cell must form a protective wall around the nucleus.

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. Graph 1 below provides information about the intensity of ultraviolet solar energy above Earth's atmosphere and at Earth's surface. Graph 2 provides information regarding DNA sensitivity to ultraviolet energy.



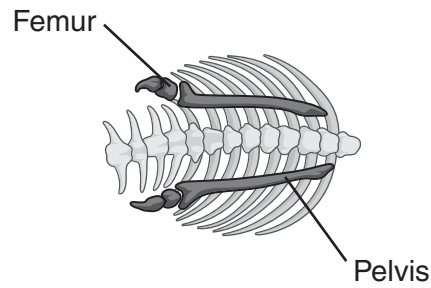
- a. Based on the graphs, estimate the intensity of ultraviolet solar energy that would reach Earth's surface if Earth did not have an atmosphere. Explain your reasoning.

Ultraviolet solar energy below 300 nm is almost completely screened out by ozone and oxygen in the atmosphere and thus does not reach Earth's surface.

- b. Describe how an abrupt decrease in atmospheric ozone would most likely affect the habitability of Earth. Use information from both graphs to support your answer.

PLEASE GO ON →

22. The diagram below shows a partial skeleton of a snake. The skeleton has small femurs and pelvises. Snakes do not have legs and cannot walk. In many other organisms, the femur and pelvis form a junction that allows legs to move so organisms can walk.



- Based on the diagram, make a statement about snake evolution.
- Use evidence from the diagram to support your statement in part a.
- Describe the general scientific ideas about how new groups of organisms evolve and explain how these ideas connect to your statement in part a.

