



Exam Preparation for Science and Social Studies Program

EXPRESS

June 8 through June 19
2009

TEACHER

Georgia High School Graduation Test Science Content

Cells and Heredity

- Evaluates the nature of the relationships between structures and function in living cells by explaining the roles of cell organelles and by analyzing the function of the four major macromolecules.
- Evaluates how biological traits are passed on to successive generations by comparing and contrasting the roles of DNA and RNA.
- Analyze the role of DNA in storing and transmitting cellular information.
- Explains Mendel's laws and the role of meiosis in reproductive variability.
- Investigates the use of DNA technology in forensics, medicine, and agriculture.
- Derives the relationship between single-celled and multi-celled organisms by analyzing the complexity and organization of organisms in their ability for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organisms.

Ecology

- Describes the interdependence of all organisms on one another and evaluates the relationships among organisms, populations, communities, ecosystems, and biomes.
- Analyzes the flow of matter and energy through ecosystems as components of a food chain or food web.

Structure and Properties of Matter

- Analyzes the structure of the atom in terms of proton, electron, and neutron locations as well as atomic mass, atomic number, atoms with different numbers of neutrons and different numbers of protons.
- Explains properties of solutions.

Energy Transformations

- Distinguishes the characteristics and components of radioactivity and explains the process of half-life as related to radioactive decay.
- Analyzes the atomic/molecular motion of solids, liquids, gases and plasmas.
- Identifies and explains energy transformation within a system.
- Investigates and describes molecular motion as it relates to thermal energy changes in conduction, convection, and radiation.

Forces, Waves, and Electricity

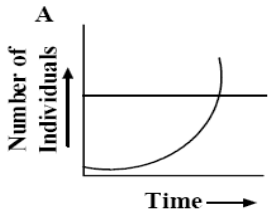
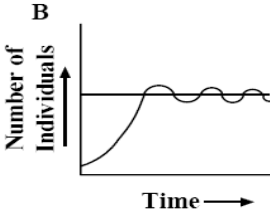
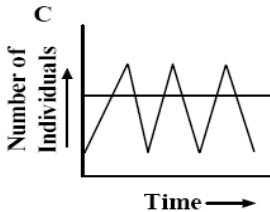
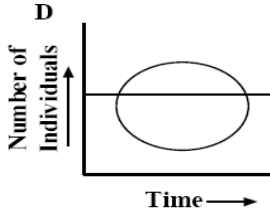
- Analyzes relationships between force, mass, and motion by applying the calculations of velocity and acceleration.
- Evaluates the application of Newton's three laws in everyday situations related to inertia explaining falling objects as related to gravitational force.
- Applies mass and weight to appropriate situations.
- Applies the calculations of work and mechanical advantage to complex systems.
- Analyzes the properties of waves by explaining the transfer of light, heat, and sound energy through the application of wave theory.
- Explains the properties of electricity and magnetism by applying and relating these to electromagnets and simple motors.

Instructional Calendar at a Glance

Day	Content
Monday June 8	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students describe the structures of cells and the structure and function of their components. • Students examine the similarities and differences between prokaryotic and eukaryotic cells.
	Domain: Structure and Properties of Matter <ul style="list-style-type: none"> • Students describe atoms, understanding the structure of an atom. • Students identify the symbol, atomic number, and atomic mass of the first 20 elements on the periodic table.
Tuesday June 9	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students explain the process of inheritance of genetic traits. • Students differentiate between DNA and RNA, recognizing the role of each in heredity.
	Domain: Structure and Properties of Matter <ul style="list-style-type: none"> • Students apply the properties of solutions, analyzing solutions in terms of solutes and solvents.
Wednesday June 10	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students analyze the similarities and differences between organisms of different kingdoms.
	Domain: Energy Transformations <ul style="list-style-type: none"> • Students understand radioactivity. • Students examine the phases of matter and the related atomic and molecular motion.
Thursday June 11	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students explain the process of inheritance of genetic traits. <ul style="list-style-type: none"> ❖ Students demonstrate understanding of Mendel's Laws in genetic inheritance and variability. • Students discuss the use of DNA technology in the fields of medicine and agriculture.
	Domain: Energy Transformations <ul style="list-style-type: none"> • Students investigate and describe molecular motion as it relates to thermal energy changes in conduction, convection, and radiation. • Students analyze energy transformations and the flow of energy in systems.
Friday June 12	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students differentiate how organisms from different kingdoms obtain, transform, and transport, energy and/or material. • Students understand the relationships between single-celled and multi-celled organisms, on a broad, conceptual level.
	Progress Assessment

Day	Content
Monday June 15	Domain: Ecology <ul style="list-style-type: none"> • Students evaluate relationships between organisms, populations, communities, ecosystems, and biomes.
	Domain: Forces, Waves, and Electricity <ul style="list-style-type: none"> ▪ Analyzes relationships between force, mass, and motion by applying the calculations of velocity and acceleration.
Tuesday June 16	Domain: Ecology <ul style="list-style-type: none"> • Students describe the flow of matter and energy through an ecosystem by organizing the components of food chains and webs.
	Domain: Forces, Waves, and Electricity <ul style="list-style-type: none"> ▪ Students evaluate the application of Newton’s three laws in everyday situations related to inertia explaining falling objects as related to gravitational force. <ul style="list-style-type: none"> ❖ Applies the calculations of work and mechanical advantage to complex systems.
Wednesday June 17	Domain: Cells and Heredity <ul style="list-style-type: none"> • Students differentiate the functions of the macromolecules. • Students describe the structures of cells and the structure and function of their components.
	Domain: Forces, Waves, and Electricity <ul style="list-style-type: none"> • Students describe the properties of waves.
Thursday June 18	Domain: Ecology <ul style="list-style-type: none"> • Students use diagrams to interpret the interactions of organisms within food chains and webs. • Students determining the role of different organisms in food chains and webs.
	Domain: Forces, Waves, and Electricity <ul style="list-style-type: none"> • Students understand the properties of electricity and magnetism.
Friday June 19	Biology Key Concepts – Review
	Physical Science Key Concepts –Review
	Administration of the Georgia High School Graduation Test

Practice Test

- Which occurrence is a major source of the gases that can produce acid rain?
 - a hole in the ozone layer
 - burning of fossil fuels
 - cloud-seeding by airplanes
 - emissions by nuclear reactors
- Cells use passive and active transport to move materials across cell membranes in order to maintain a constant internal environment. What is the process of maintaining a constant internal environment called?
 - diffusion
 - evolution
 - homeostasis
 - respiration
- Which of the following examples illustrates osmosis?
 - Water leaves the tubules of the kidney in response to the hypertonic fluid surrounding the tubules.
 - Digestive enzymes are excreted into the small intestine.
 - White blood cells consume pathogens and cell debris at the site of an infection.
 - Calcium is pumped inside a muscle cell after the muscle completes its contraction.
- The observed trait that appears in an organism as a result of its genetic makeup is called the organism's
 - allele
 - genotype
 - phenotype
 - Karyotype
- Unlike prokaryotic cells, eukaryotic cells have the capacity to
 - assemble into multicellular organisms
 - establish symbiotic relationships with other organisms
 - obtain energy from the Sun
 - store genetic information in the form of DNA
- An undisturbed deer population grows until its carrying capacity is reached. Which of the graphs below BEST resembles this deer population?
 - 
 - 
 - 
 - 
- Which of the following practices is MOST likely to slow the buildup of CO₂ in the atmosphere?
 - increased use of tropical rain forest areas for agriculture
 - increased use of genetically engineered plants
 - decreased pesticide use in favor of biological controls
 - decreased use of fossil fuels

8. Humans have had a tremendous impact on the environment. What has caused an increase in the amount of acid rain?

- A. use of chlorofluorocarbons
- B. use of pesticides
- C. coal burning power plants
- D. nuclear power plants

9. Which of the following is a primary function of carbohydrates?

- A. storage of energy
- B. transmission of genetic material
- C. acceleration of chemical reactions
- D. transport of molecules across membranes

10. Genetic information usually flows in one specific direction. Which of the following best represents this flow?

- A. DNA → Protein → RNA
- B. Protein → RNA → DNA
- C. RNA → Protein → DNA
- D. DNA → RNA → Protein

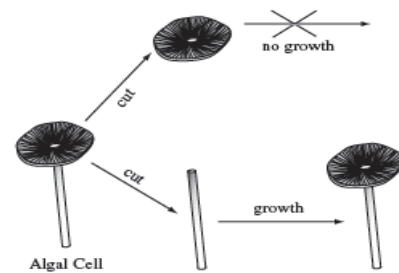
11. Which of the following is an example of codominance in genetic traits?

- A. A tall pea plant and a short pea plant produce tall pea plants.
- B. An orange cat and a black cat produce an orange-and-black kitten.
- C. A blue-eyed man and a brown-eyed woman produce a blue-eyed child.
- D. A color-blind woman and a man with normal vision produce a color-blind son.

12. A cell has a defect that results in the loss of its ability to regulate the passage of water, food, and wastes into and out of the cell. In which of the following cell structures is this defect most likely to be located?

- A. ribosomes
- B. chloroplasts
- C. cell membrane
- D. endoplasmic reticulum

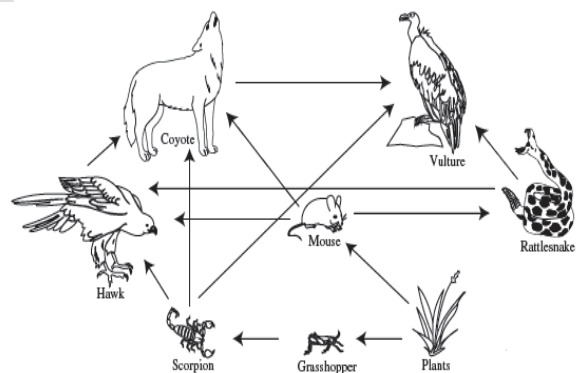
13. The algal cell picture below is a single-celled organism.



When the algal cell is cut in two as shown, the bottom part can grow into a complete cell, but the top part cannot. What conclusion does this support?

- A. The ribosomes are found in the top of the cell.
- B. The nucleus is found in the bottom of the cell.
- C. The top of the cell contains most of its chromosomes.
- D. The bottom of the cell contains most of its cytoplasm.

14. The diagram below shows some of the feeding relationships in a desert food web.



Which of the following trophic levels is not shown in this diagram?

- A. producers
- B. decomposers
- C. primary consumers
- D. secondary consumers

15. A mutation that prevents a maple tree from efficiently taking gases from the air would most directly affect which of the following processes
- reproduction
 - photosynthesis
 - water uptake
 - DNA replication
16. As you move from left to right across a row of elements in the periodic table, what happens to the number of neutrons in a typical atom?
- It stays the same.
 - It increases.
 - It decreases.
 - It decreases until you reach the middle and then it increases.
17. Which of the following could be used to convert light energy to electrical energy?
- a windmill
 - a chemical storage battery
 - a solar cell
 - rotating coils in a magnetic field
18. In a restaurant kitchen, lamps are used to keep food warm. Which type of electromagnetic radiation do the lamps emit that is primarily responsible for keeping the food warm?
- gamma
 - infrared
 - ultraviolet
 - visible
19. Carbon atoms can link themselves together into long chains and rings to form a vast number of highly complicated molecules. Which of the following statements BEST explains why carbon atoms behave this way?
- They easily form ionic bonds with each other.
 - They easily form covalent bonds with each other.
 - They easily combine with atoms of oxygen.
 - They easily become highly charged ions.
20. Which of the following situations violates the law of conservation of energy?
- A ball dropped from the top of a building increase in speed until it hits the ground.
 - A block sliding freely on level ice increases in speed until it hits a wall.
 - A child playing on a swing moves fastest at the bottom of the swing's path.
 - The height a ball bounces decreases with each bounce.
21. Aluminum oxide, Al_2O_3 , is produced by combining Al^{3+} and O^{2-} particles. What type of compound has been formed?
- covalent
 - ionic
 - metallic
 - molecular
22. Which of the following pairs are isotopes of the same element?
- atom J (27 protons, 32 neutrons) and atom L (27 protons, 33 neutrons)
 - atom Q (56 protons, 81 neutrons) and atom R (57 protons, 81 neutrons)
 - atom V (8 protons, 8 neutrons) and atom W (7 protons, 8 neutrons) atom
 - S (17 protons, 18 neutrons) and atom T (18 protons, 17 neutrons)

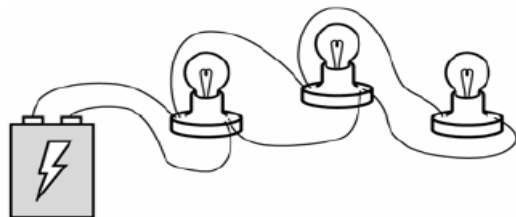
23. An ionic bond typically forms between certain types of elements. Which pair of elements will form an ionic compound?

- A. Na and Cu
- B. K and Cl
- C. Ne and O
- D. Li and Mg

24. Albert stirs a mug of hot chocolate with a metal spoon. What type of heat transfer is responsible for the spoon getting hot?

- A. conduction
- B. convection
- C. thermoelectric
- D. radiation

25. A student connects three identical light bulbs in a parallel to a dry cell as shown below. What happens when the student removes one of the light bulbs from its socket?

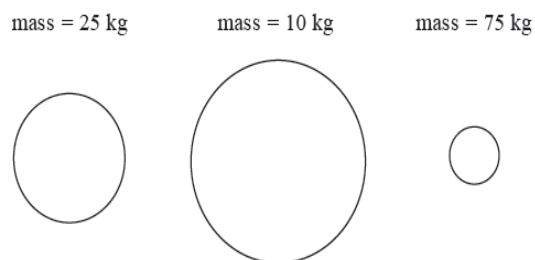


- A. All the light bulbs go out.
- B. The other light bulbs remain on and will be equally bright.
- C. The other light bulbs remain on, one less bright and the other the same brightness as before.
- D. The other light bulbs remain on, one brighter and the other less bright than before.

26. Which of the following are transferred or shared when two atoms react chemically?

- A. protons
- B. neutrons
- C. electrons
- D. photons

27. In the absence of air resistance, which of these objects will fall at the fastest rate when dropped?

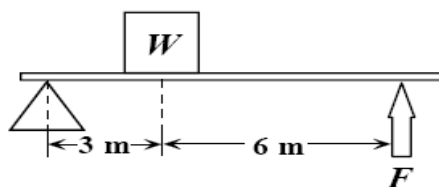


- A. the ball with a mass of 75 kg
- B. the ball with a mass of 25 kg
- C. the ball with a mass of 10 kg
- D. They all fall at the same rate.

28. Which pair of elements is MOST similar?

- A. Ca and F
- B. Na and Cl
- C. Ne and Ar
- D. Li and H

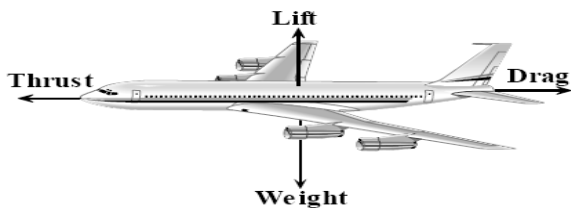
29. A box of weight W is lifted by a force F using a lever as shown below.



What is the mechanical advantage of the lever?

- A. $\frac{1}{2}$
- B. 2
- C. 3
- D. 6

30. An airplane in level flight is acted on by four basic forces. Drag is air resistance, lift is the upward force provided by the wings, thrust is the force provided by the airplane's engines, and weight is the downward force of gravity acting on the airplane.



In level flight at constant speed, which pair of forces must be equal

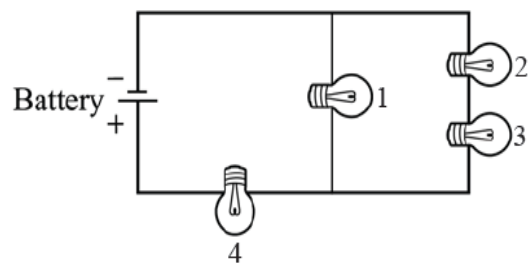
- A. lift and drag
 B. drag and weight
 C. lift and weight
 D. thrust and lift
31. Pat measures a small rubber ball and then makes three other balls of the same diameter from lead, foam, and wood. Which ball has the greatest inertia?
- A. the rubber ball
 B. the lead ball
 C. the foam ball
 D. the wood ball

32. A sound wave is produced and begins to travel from left to right through four different media. The speed of the wave varies as it travels. The media are solid, liquid, gas, and vacuum, but not necessarily in that order.

1	2	3	4
344 m/sec	5000 m/sec	1450 m/sec	No transmission

Which speed MOST likely represents a gas?

- A. 1
 B. 2
 C. 3
 D. 4
33. A car was sitting in sunlight all day long. The heat that is now contained in the car was transferred to the car primarily by which of the following processes?
- A. convection
 B. conduction
 C. radiation
 D. electrical energy transfer
34. Four identical light bulbs are connected in a circuit as shown below.



The current is greatest through which of the light bulbs?

- A. 1
 B. 2
 C. 3
 D. 4

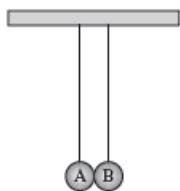
35. What property of electromagnetic waves makes it possible to use these waves to transmit information between a space shuttle and NASA mission control centers on the ground?

- A. Electromagnetic waves are transverse waves.
- B. Electromagnetic waves have very low velocity.
- C. Electromagnetic waves are all visible to human eyes.
- D. Electromagnetic waves can travel through a vacuum.

36. Which of the following is certain to change as a ball accelerates?

- A. mass of the ball
- B. inertia of the ball
- C. velocity of the ball
- D. force acting on the ball

37. The diagram below shows two aluminum spheres



Aluminum sphere A contains a small negative charge and is touched by aluminum sphere B, which has a larger negative charge. Which of the following occurs next?

- A. Protons flow from sphere B to sphere A.
- B. Protons flow from sphere A to sphere B.
- C. Electrons flow from sphere B to sphere A.
- D. Electrons flow from sphere A to sphere B.

38. The chart below shows a portion of the electromagnetic spectrum.

Gamma	X-rays	Ultraviolet	Visible	Infrared	Microwave	Radio
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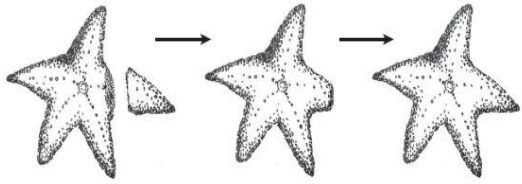
A plastic filter is fitted over a light. The light emits white light, but the filter only lets the longest wavelengths of visible light pass through. Which color would a person looking at the filtered light see?

- A. green
- B. red
- C. violet
- D. yellow

39. A party shop delivers helium-filled balloons to homes and businesses. The owners realize from experience that on hot summer days they should inflate the balloons only three-quarters full. On cold winter days they can fully inflate the balloons. Which of the following is the **best** hypothesis to explain this observation?

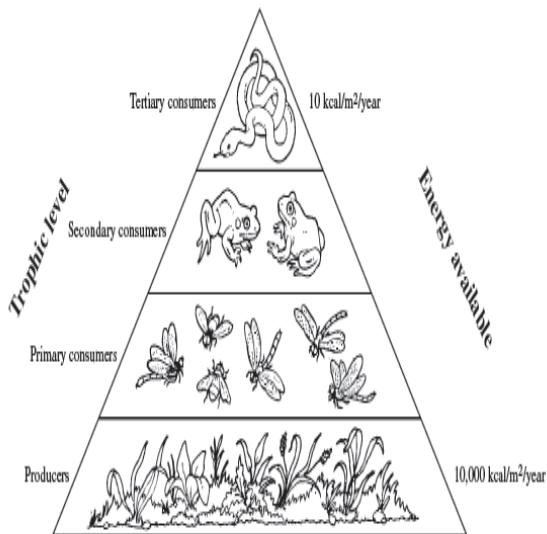
- A. The helium gas is more active in the winter season.
- B. Air outside the balloons leaks into the balloons.
- C. As the temperature increases, the helium in the balloons expands.
- D. Outdoor air pressure in the summer is less than indoor air pressure.

40. The diagram below shows a sea star in various stages of regeneration.



What cellular process is directly responsible for this regeneration?

- A. meiosis
 B. mitosis
 C. transpiration
 D. respiration
41. The diagram below shows an energy pyramid.



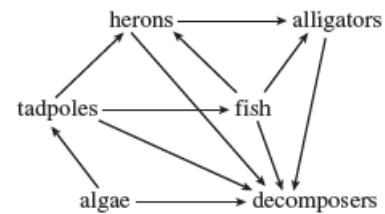
Approximately how much energy is available to the secondary consumers in this energy pyramid?

- A. 10 kcal/m²/year
 B. 100 kcal/m²/year
 C. 1,000 kcal/m²/year
 D. 5,000 kcal/m²/year

42. DNA and RNA are similar because the both contain

- A. deoxyribose
 B. nucleotides
 C. thymine
 D. double helices

43. The diagram below shows a food web.

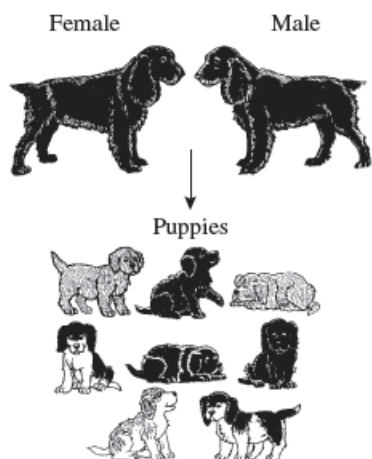


Which population would probably increase if the tadpole population decreased?

- A. herons
 B. alligators
 C. fish
 D. algae
44. Many animals have internal or external skeletons that provide support and structure. Which of the following parts of plant cells play a similar role?

- A. cell membranes
 B. cell walls
 C. chloroplasts
 D. cytoplasm

45. The picture below shows two dogs and their puppies.



The parent dogs are each heterozygous for two traits: fur color and white spotting. Both parent dogs are solid black. Their puppies, however, have four different phenotypes as listed below.

- solid black
- black with white spots
- solid red
- red with white spots

Which of the following explains how these parent dogs can produce puppies with these four phenotypes?

- A. The genes for these traits are sex-linked.
B. The genes for these traits mutate frequently.
C. The genes for these traits assort independently.
D. The genes for these traits are on the same chromosome.

46. A student heated a 10 g sample of a compound in an open container. A chemical reaction occurred. The mass of the sample was measured again and found to be less than before. Which of the following explains the change in mass of the sample?

- A. The heat caused the compound to become less dense.
B. The reaction gave off more heat than was added.
C. Some of the lighter atoms were converted to energy.
D. One of the reaction products was a gas.

47. Which of the following represents a pair of isotopes?

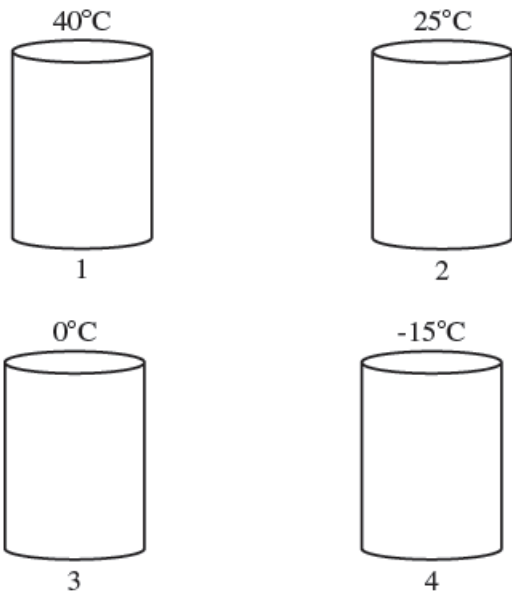
- A. ^1H and ^3H
B. $^{16}\text{O}^{2-}$ and $^{19}\text{F}^{1-}$
C. ^{40}K and ^{40}Ca
D. $^{16}\text{O}^{2-}$ and $^{32}\text{S}^{2-}$

48. The water from hot springs near the Ebeko volcano in the Pacific Ocean has a very low pH.

A low pH indicates which of the following about the water?

- A. It has no detectable H^+ or OH^- ions.
B. It has equal concentrations of H^+ and OH^- ions.
C. It has high concentrations of H^+ ions.
D. It has equal numbers of positive and negative ions.

49. The illustration below shows four containers. Each container is full of helium gas at a different temperature.



If all of the containers are closed and have a pressure of 1 atm, which container has helium particles with the **greatest** average kinetic energy?

- A. 1
- B. 2
- C. 3
- D. 4

50. While hiking through Granville State Forest, a student finds an unusual plant-like organism that appears to lack chlorophyll. When the student examines a sample using a microscope, he sees many cells with cell walls and no chloroplasts. This organism is **most likely** a member of what Kingdom?

- a. Animalia
- b. Eubacteria
- c. Fungi
- d. Protista

**Practice Test
Answer Sheet**

Name: _____

Question

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)
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20. (A) (B) (C) (D)

Question

21. (A) (B) (C) (D)
22. (A) (B) (C) (D)
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24. (A) (B) (C) (D)
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38. (A) (B) (C) (D)
39. (A) (B) (C) (D)
40. (A) (B) (C) (D)

Question

41. (A) (B) (C) (D)
42. (A) (B) (C) (D)
43. (A) (B) (C) (D)
44. (A) (B) (C) (D)
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58. (A) (B) (C) (D)
59. (A) (B) (C) (D)
60. (A) (B) (C) (D)

General Resources

DRAFT

PERIODIC TABLE

PERIODS	GROUP 1 (Ia)		GROUP 2 (IIa)		GROUP 13 (IIIa) - 18 (VIIIa)																																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14 (IVa)	15 (Va)	16 (VIA)	17 (VIIa)	18 (VIIIa)																								
1	H Hydrogen 1.00794																	He Helium 4.0026																								
2	Li Lithium 6.941	Be Beryllium 9.0122											B Boron 10.811	C Carbon 12.011	N Nitrogen 14.0067	O Oxygen 15.9994	F Fluorine 18.998	Ne Neon 20.183																								
3	Na Sodium 22.9898	Mg Magnesium 24.312											Al Aluminum 26.9815	Si Silicon 28.086	P Phosphorus 30.9738	S Sulfur 32.064	Cl Chlorine 35.453	Ar Argon 39.948																								
4	K Potassium 39.102	Ca Calcium 40.08											Ga Gallium 69.72	Ge Germanium 72.59	As Arsenic 74.9216	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80																								
5	Rb Rubidium 85.47	Sr Strontium 88.905											In Indium 114.82	Sn Tin 118.69	Sb Antimony 121.75	Te Tellurium 127.60	I Iodine 126.9045	Xe Xenon 131.30																								
6	Cs Cesium 132.905	Ba Barium 137.34											Tl Thallium 204.37	Pb Lead 207.19	Bi Bismuth 208.9806	Po Polonium (209)	At Astatine (210)	Rn Radon (222)																								
7	Fr Francium (223)	Ra Radium (226)											Hf Hafnium 178.49	Ta Tantalum 180.9488	Re Rhenium 186.2	Os Osmium 190.2	Ir Iridium 192.2	Pt Platinum 195.09	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.37	Pb Lead 207.19	Bi Bismuth 208.9806	Po Polonium (209)	At Astatine (210)	Rn Radon (222)																
													V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.9380	Fe Iron 55.847	Co Cobalt 58.9332	Ni Nickel 58.71	Cu Copper 63.546	Zn Zinc 65.37	Ga Gallium 69.72	Ge Germanium 72.59	As Arsenic 74.9216	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80																
													Ti Titanium 47.90	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.9380	Fe Iron 55.847	Co Cobalt 58.9332	Ni Nickel 58.71	Cu Copper 63.546	Zn Zinc 65.37	Ga Gallium 69.72	Ge Germanium 72.59	As Arsenic 74.9216	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80															
													Zr Zirconium 91.22	Nb Niobium 92.906	Mo Molybdenum 95.94	Tc Technetium (97)	Ru Ruthenium 101.07	Rh Rhodium 102.905	Pd Palladium 106.4	Ag Silver 107.868	Cd Cadmium 112.40	In Indium 114.82	Sn Tin 118.69	Sb Antimony 121.75	Te Tellurium 127.60	I Iodine 126.9045	Xe Xenon 131.30															
													Hf Hafnium 178.49	Ta Tantalum 180.9488	W Tungsten 183.85	Re Rhenium 186.2	Os Osmium 190.2	Ir Iridium 192.2	Pt Platinum 195.09	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.37	Pb Lead 207.19	Bi Bismuth 208.9806	Po Polonium (209)	At Astatine (210)	Rn Radon (222)															
													Sc Scandium 44.956	Ti Titanium 47.90	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.9380	Fe Iron 55.847	Co Cobalt 58.9332	Ni Nickel 58.71	Cu Copper 63.546	Zn Zinc 65.37	Ga Gallium 69.72	Ge Germanium 72.59	As Arsenic 74.9216	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80														
													Y Yttrium 88.905	Zr Zirconium 91.22	Nb Niobium 92.906	Mo Molybdenum 95.94	Tc Technetium (97)	Ru Ruthenium 101.07	Rh Rhodium 102.905	Pd Palladium 106.4	Ag Silver 107.868	Cd Cadmium 112.40	In Indium 114.82	Sn Tin 118.69	Sb Antimony 121.75	Te Tellurium 127.60	I Iodine 126.9045	Xe Xenon 131.30														
													La Lanthanum 138.905	Ce Cerium 140.12	Pr Praseodymium 140.908	Nd Neodymium 144.24	Pm Promethium (145)	Sm Samarium 150.36	Eu Europium 151.964	Gd Gadolinium 157.25	Tb Terbium 158.925	Dy Dysprosium 162.50	Ho Holmium 164.930	Er Erbium 167.259	Tm Thulium 168.930	Yb Ytterbium 173.054	Lu Lutetium 174.967	Hf Hafnium 178.49	Ta Tantalum 180.9488	W Tungsten 183.85	Re Rhenium 186.2	Os Osmium 190.2	Ir Iridium 192.2	Pt Platinum 195.09	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.37	Pb Lead 207.19	Bi Bismuth 208.9806	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
													Sc Scandium 44.956	Ti Titanium 47.90	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.9380	Fe Iron 55.847	Co Cobalt 58.9332	Ni Nickel 58.71	Cu Copper 63.546	Zn Zinc 65.37	Ga Gallium 69.72	Ge Germanium 72.59	As Arsenic 74.9216	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80														
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KEY

atomic number - 5
 atomic symbol - **B**
 name of element - Boron
 atomic weight - 10.811
 electron arrangement - 2, 3

SCIENCE FACTS AND FORMULAS

Some of the questions in this test require you to solve problems. This page contains all the basic facts and formulas you will need to solve those problems. You may refer to this page as often as you wish while you take the test. Some questions may require information from the periodic table on the previous page.

Basic Facts

- Acceleration due to gravity = 9.8 meters/second/second (9.8 m/s^2)
- Weight = Mass (m) \times Acceleration due to gravity (g) ($W = mg$)
- Density = Mass/Volume
- Volume of a Rectangular Solid = Length \times Width \times Height ($V = lwh$)
- 1 Newton = 1 kilogram·meter/second/second
- 1 joule = 1 Newton·meter
- 1 watt = 1 Newton·meter/second = 1 joule/second

Motion

$$\text{Velocity } (V) = V_0 + at,$$

Where V_0 = Initial Velocity, a = Acceleration, and t = Time

$$\text{Acceleration} = \text{Change in Velocity/Time Elapsed} \quad \left(a = \frac{V - V_0}{t} \right)$$

Force

$$\text{Force} = \text{Mass} \times \text{Acceleration} \quad (F = ma)$$

Mechanical Advantage

$$\text{Actual Mechanical Advantage:} \quad \left(AMA = \frac{F_R}{F_E} \right)$$

Where F_R is Force due to resistance and F_E is Force due to effort.

$$\text{Ideal Mechanical Advantage:} \quad \left(IMA = \frac{\text{Effort Length}}{\text{Resistance Length}} \right)$$

Work

$$\text{Work} = \text{Force} \times \text{Distance} \quad (W = F \cdot d)$$

Electricity

$$\text{Voltage} = \text{Current} \times \text{Resistance} \quad (V = I \cdot R)$$